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BEFORE THE GUAM PUBLIC UTILITIES COMMISSION

IN THE MATTER OF:	)	**GWA DOCKET NO. 23-08**
	)	
GWA LEACHATE DISPOSAL RATE	)	**PETITION TO CREATE A NEW AND SPECIFIC RATE CLASSIFICATION FOR WASTEWATER DISCHARGE FOR LEACHATE**

COMES NOW, the GUAM WATERWORKS AUTHORITY ("GWA"), by and through its counsel of record, THERESA G. ROJAS, ESQ., and hereby files its Petition seeking the PUC's approval for GWA to create a new and specific rate class for wastewater discharge for leachate ("leachate disposal rate"). The new rate shall effectively reclassify GWA's wastewater disposal rate currently applied to solid waste facilities, from a Commercial 3 facility rate, to a specific leachate disposal rate in line with GWA's cost-of-service for leachate disposal.

I. BACKGROUND

In Civil Case No. 02-00022, *United States of America v. Government of Guam*, the U.S. District Court of Guam, appointed federal receiver Gershman, Brickner & Bratton, Inc. ("GBB") to manage and construct the closure of DPW's Ordot Dump for the Government of Guam Department of Public Works ("DPW"), Division of Solid Waste Management ("GSWA"). The work for the dump's closure was performed in compliance with federal regulations under the Resource Conservation and Recovery Act ("RCRA") codified under 40 CFR Parts 239 through 282 as administered by the U.S Environmental Protection Agency ("USEPA"). As part of the

court's Order and these RCRA regulations and requirements, GBB was required to cease any and all discharge of solid waste leachate into the Lonfit River. Leachate as defined in 40 CFR §258.2 is *"a liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials removed from such waste."* In order to cease the discharge of liquid solid waste leachate emerging from beneath the Ordot Dump, GBB was required to collect and contain the leachate and discharge it into GWA's sanitary sewer or wastewater collection system. GBB began coordinating these requirements in 2009 and met with GWA management, Engineering, and Compliance & Safety Division personnel in November of 2012 to plan for the discharge of leachate into the GWA system.

GBB retained engineering consultants to evaluate the capacity of GWA's sewer system to receive the anticipated volume of leachate generated, to evaluate the impact of leachate disposal at GWA's wastewater treatment plants, and to design the necessary improvements to be constructed in order to convey the leachate into GWA's system. In early 2013, GWA first accepted terms under which it would begin to accept the discharge of leachate into GWA's collection system, including certain agreed-upon conditions to include but not limited to volume limits that were not to exceed 50,000 gallons per day ("GPD"). GBB/GSWA further agreed to "pay leachate disposal rates set by the Guam Public Utilities Commission *based on the data from the installed flow meter.*"

In late 2014, upon completion of GBB/GSWA's construction of and their application for wastewater service connection to the Ordot Dump closure site into GWA's wastewater system, GWA established an account for the Ordot Dump facility using the most applicable wastewater tariff rate in effect at the time. The applicable rate was GWA's Commercial 3 sewer rate. This rate was selected and accepted based on data received from GBB and an evaluation by GWA's

Compliance & Safety Division as there had not been any data developed from the "installed flow meter" referenced in an acceptance letter from GWA and shared above.

In January of 2015, after construction of the Ordot Dump Closure was completed and the necessary improvements to connect the facility to GWA's sewer system were constructed, GWA received the first leachate flows from the Ordot Dump. The average daily flow over the first full year of flows was 18,500 GPD, and the maximum daily flow derived from the average GPD as of November 2015 was 45,867 GPD. The rate applied to the account when it was first established was $20.33 per thousand gallons ("Kgal"). *See* **Exhibit A**, GWA Tariff Sheet, Wastewater (Sewer Rates) for Commercial 3. The current tariff, following approved rate increases since the initial establishment of the account, is now $28.92 per Kgal. *See* **Exhibit B**, GWA Tariff Sheet, Wastewater (Sewer Rates) for Commercial 3.

II. COST-OF-SERVICE ANALYSIS

As a requirement of the Guam Public Utilities Commission's (PUC) February 17, 2020 FY2020 Rate Order in GWA Docket 19-08, GWA completed a Cost-of-Service Analytical Study in March of 2021. The Cost-of-Service Analysis ("COSA") study was performed in support of GWA's Comprehensive Review and Update of its 5-Year (FY2020 – FY2024) Financial Plan and was submitted to the PUC on May 1, 2021. The analysis was performed by GWA's consultants and was developed in accordance with industry standard guidance manuals from the American Water Works Association (AWWA), and the Water Environment Federation ("WEF") and included an analysis of leachate disposal as a separate component of wastewater costs in the COSA. Section 3.3 of the COSA presents wastewater costs of service, and Section 3.4.3 provides conclusions for wastewater cost of service. *See* **Exhibit C.** The methodology includes:

- functionalization of each component of the revenue requirement (O&M expenses, debt service, internally funded capital requirements, etc.) and allocating them into system functions
- allocation of the functionalized revenue requirement by dividing it among the wastewater system service characteristics (flow, biochemical oxygen demand (BOD), total suspended solids (TSS), etc.)
- distribution of costs by calculating rate revenue requirement for each customer class according to the percentage of each service characteristic for which that class is responsible

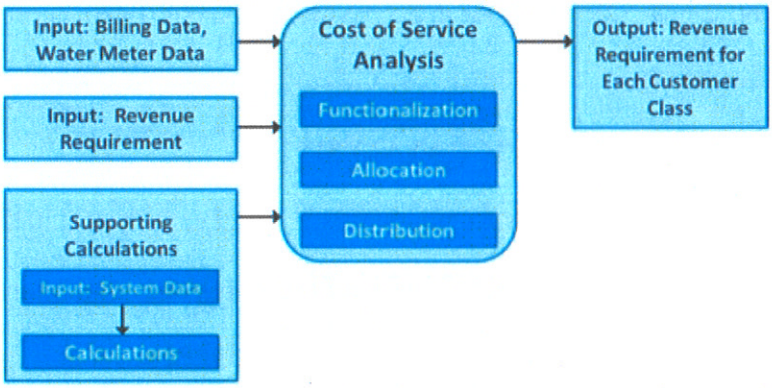

Figure 2-1. Cost of Service Methodology

The figure at the left from Section 2 of the COSA analytical study provides a summary of the methodology used and the inputs and outputs resulting from the performance of the analysis.

This study was accepted by the PUC and their consultants in GWA Docket 19-08 and there were no comments or exceptions taken to the analysis presented or the conclusions drawn. The analysis served as the basis for rate relief requested for FY2022 through FY2024 in GWA's 19-08 rate case in which the PUC has already acted. Herein, GWA now presents certain data from this vetted and accepted COSA as an appropriate and documented basis for the development

of a specific service rate for the disposal of leachate by GSWA into GWA's wastewater collection and treatment system.

III. REQUEST FOR APPROVAL

Pursuant to law, the PUC has the power to regulate and set rates for the public utilities and no rates, charges, assessments, or costs shall be established, abandoned, modified, departed from or changed without a -public hearing and the prior approval of the Commission. *See* 12 G.C.A. 12116 (a). Further, GWA may only modify its rates (or charges) for its water and wastewater services subject to the approval of the PUC and it must demonstrate that its rates are just and reasonable enabling the utility to repay its debts and so that it may recover the full costs of providing such services to the ratepayers before any rate change is made or newly established. *See* 12 G.C.A. 14104 (d) and 12 G.C.A. 12118.

In line with the above, GWA now submits its request for a rate change proposal in order to align GWA's cost-of-service to treat Guam's leachate and to reclassify GWA's wastewater disposal rate currently applied to solid waste facilities, from a Commercial 3 facility rate, to a specific and standalone leachate disposal rate for approval. The new rate will effectively change and reduce the currently applied disposal rate from $28.92 per kgal, at GWA's present Commercial 3 facility rate, to a specific leachate rate of $14.72 per kgal. The new rate, even if lower, is in line with GWA's cost-of-service and permits GWA to recover its full costs for leachate treatment and disposal.

A. DETERMINATION OF THE PROPOSED LEACHATE RATE

The COSA was developed as a basis for developing rates for GWA beginning in FY2022 and projected through the end of its current 5-year rate plan in FY2024. GWA's determination for a new and specific leachate rate begins with the cost-of-service for leachate in the intended year using the COSA data from FY2022.

Table 3-24. FY 22 - FY 24 Rate Revenue Requirement for Each Wastewater Customer Class			
	Rate Revenue Requirement		
Customer Class	FY22	FY23	FY24
Residential	$21,552,945	$22,651,392	$23,334,845
Commercial 1+	4,201,316	4,652,787	5,070,481
Commercial 2-	803,463	972,920	1,147,995
Commercial 3	2,193,845	2,759,380	3,352,843
Hotels	6,063,698	7,466,983	8,931,964
Government	3,234,734	3,423,410	3,561,868
GIAA Water System	430,564	469,281	503,485
Navy	6,879,550	7,593,263	8,212,336
Septage	1,457,645	1,585,561	1,690,566
Leachate	244,285	271,191	294,926
Total	$47,062,043	$51,846,168	$56,101,310

To arrive at a cost-of-service rate (R) for leachate disposal, the total cost of service (c) for the applicable period is divided by the anticipated wastewater flows (f) for the applicable period. See formula below:

$$R = c / f$$

1. COST OF SERVICE COMPONENT (OF THE PROPOSED LEACHATE RATE)

In this case, GWA has applied its FY2022 cost of service amounts of $244,285 (see Table 3-24 above) for leachate collection and treatment, and then increases this rate by 5.5% based on the approved rate relief ordered by the PUC and provided to GWA in FY2023 through PUC Docket 19-08. Next, based on GWA's FY2024 proposed revenue requirements (needed increases) to 27% of GWA's FY 2023 rate amounts, the leachate cost allocation for FY2023 becomes **$327,305.00**. ***See*** Rate Calculation Sheet attached as **Exhibit D**.

2. WASTEWATER FLOW COMPONENT (OF THE PROPOSED LEACHATE RATE)

For leachate flows GWA proposes to use projected leachate flows projected for FY2024 from the two facilities operated by GSWA, the Layon landfill and the Ordot dump closure site. The projection of flow has been complicated by recently publicized issues at the Ordot dump closure site where leachate flows have risen dramatically over the last eight (8) years since the leachate collection system has been operating at this facility. GWA has contributed in part to these increases because of leaks in its water distribution main adjacent to the Ordot Dump. Still, those leaks, which are estimated to have begun in 2018, were repaired in December 2022, and GWA has confirmed, that there are no existing leaks on the distribution main which can be attributed to the increased leachate captured at the facilities, as of June 2023.

A regression analysis was used to account for the impact of the GWA water leaks on the leachate flows and correlated the flows to recorded rainfall figures for all the years the facility has been operating. This analysis is presented and attached as **Exhibit E.** For both facilities, using the projected flows of 137,490 gallons per inch or rain at the Ordot facility, and 77,566 gallons per inch of rain at the Layon facility, the total leachate flows projected for FY2024 with an average annual rainfall over the historical period of 2016-2022 of 95.8-inches, is **22,239,473 gallons** or **22,239.5 kgals**. GWA projects that it must bill to treat this amount of leachate over the applicable period so the **22,239.5 kgals** is also referred to as the billing determinant. Applying the cost-of-service figure and the anticipated wastewater flows to our Leachate Rate formula the new rate becomes **$14.72 per kgals**. See formula below:

Leachate rate (R) = $327,305 / 22,239.5 kgal

= $14.72 per kgal

By comparison, the proposed wastewater disposal rate for the Commercial 3 customer class (current GSWA rate for both Layon and Ordot facilities) is projected to be about 2.5x higher at $36.73 per kgal beginning in FY 2024.

B. RATEPAYER BILL OF RIGHTS & OTHER REQUIREMENTS

12 G.C.A. §12102.1 and §12102.2 requires GWA to comply with notice and other requirements of the Ratepayer Bill of Rights before the PUC can properly address a petition for rate increases. As no rate increases are sought at this time and since the approval to create a standalone and specific rate class for leachate disposal only affects a single ratepayer, GWA has asked both GSWA and GBB to enter a stipulation waiving all requirements of the Ratepayer Bill of Rights. GWA has also asked GSWA and GBB and for their agreement to the proposed rates herein and for their input on when the rates requested should take effect to avoid a protracted rate proceeding. Following a review of this petition both GSWA and GBB have advised that they will each consider GWA's request to file a stipulation.

IV. CONCLUSION

Based on the foregoing, GWA respectfully requests the PUC approve and authorize GWA to reclassify GWA's current leachate disposal rate, from GWA's present Commercial 3 facility rate at $27.42 per kgal, to a specific leachate rate of $14.72 per kgal as it is reasonable and prudent. This new and specific rate is subject to future reviews and change only upon further or future approval by the PUC.

RESPECTFULLY SUBMITTED this day of July 6th 2023.

By: _____

THERESA G. ROJAS
GWA Legal Counsel

EXHIBIT A

TARIFF SHEET

WATER/SEWER RATES

Tariff reflects the new rates effective **December 2014** billing cycle pursuant to PUC Docket No.: 13-01 FY2014 Rate Decision dated December 1, 2014.

WATER
RESIDENTIAL WATER

Meter Size	Basic Water Charge	Lifeline Water Consumption Per K/Gal for Less than 5000 Gallons	Water Consumption Per K/Gal for Greater Than 5000 Gallons
¾"	18.44	2.91	8.78
1"	21.52	2.91	8.78
1 ½"	33.78	2.91	8.78
2"	43.03	2.91	8.78
3"	76.84	2.91	8.78
4"	107.55	2.91	8.78
6"	199.73	2.91	8.78
8"	291.90	2.91	8.78
10"	399.45	2.91	8.78
12"	476.24	2.91	8.78

COMMERCIAL & GOVERNMENT WATER

Meter Size	Basic Water Charge	Water Consumption Per K/GAL
¾"	18.44	10.92
1"	21.52	10.92
1 ½"	33.78	10.92
2"	43.03	10.92
3"	76.84	10.92
4"	107.55	10.92
6"	199.73	10.92
8"	291.90	10.92
10"	399.45	10.92
12"	476.24	10.92

AGRICULTURE & IRRIGATION WATER

Meter Size	Basic Water Charge	Water Consumption Per K/GAL
¾"	18.44	3.63
1"	21.52	3.63
1 ½"	33.78	3.63
2"	43.03	3.63
3"	76.84	3.63
4"	107.55	3.63
6"	199.73	3.63
8"	291.90	3.63
10"	399.45	3.63
12"	476.24	3.63

WASTEWATER

Sewer Rates	Rate
Residential (flat Monthly Rate)	26.61
Commercial 1 (per 1000 gallons**)	6.02
Commercial 2 (per 1000 gallons**)	14.66
Commercial 3 (per 1000 gallons**)	20.33
Government and Federal (per 1000 gallons**)	8.61

SURCHARGES

SUPPLEMENTAL ANNUITY SURCHARGE: A rate of 3.70% of the non-lifeline portion of bills for all customer classes and types established for the purpose of allowing GWA to recover costs assessed by the Guam Legislature for the purpose of paying benefits to retirees of the Guam Waterworks Authority and the Public Utility Agency of Guam.

MISCELLANEOUS CHARGES

Description	Meter/Detail	Rate
Service Reconnection	3/4" to 1-1/2" meters	$45.00
	2" meter and larger	$145.00
Special Reading		$15.00
Bill Analysis		$10.00
Verification time test		$45.00
Bench Test	1st. Test (w/in one year)	no charge
	3/4" to 1-1/2" meters	$85.00
	2" meter and larger	$175.00
Fire Hydrant Fee		$25.00/month
Bulk Water Sales		$3.00/kgal
Meter Relocation		at cost
Return Check Charge		$30.00
Sewer Connection Permit:	Residential	$50.00
	Commercial	at cost
	Government	at cost
Bulk Sewage Dumping	Permit Charge	$200.00/truck
	Discharge (<5 kgal)	$25.00/truck
	Discharge (5> kgal)	$5.00/truck
Meter Installation		at cost
Water Service Deposit	3/4"	$32.00
	1"	$37.00
	1 1/2"	$55.00
	2"	$73.00
	3"	$123.00
	4"	$178.00
	6"	$313.00
	8"	$378.00
	10"	$660.00
	12"	$773.00
Sewer Service Deposit	Residential	$20.00
	Commercial I	$60.00
	Commercial II	$650.00
	Commercial III	$1,400.00
	Metered Industrial	$5,000.00

Pressure Reading		**$25.00**
Direct Service (authorized by GWA)	**3/4"**	**$60.00**
	1"	**$60.00**
	1 1/2"	**$70.00**
	2"	**$120.00**
	3"	**$180.00**
	4"	**$240.00**
	6"	**$360.00**
	8"	**$480.00**
	10"	**$600.00**
	12"	**$720.00**
Illegal Connection	**Basic Water Charge**	**Plus Estimated Water*** **
3/4"	**2,500.00**	**$10.92 kgal**
1"	**2,500.00**	**$10.92 kgal**
1 1/2"	**5,000.00**	**$10.92 kgal**
2"	**5,000.00**	**$10.92 kgal**
3"	**7,500.00**	**$10.92 kgal**
4"	**10,000.00**	**$10.92 kgal**
6"	**12,500.00**	**$10.92 kgal**
8"	**15,000.00**	**$10.92 kgal**
10"	**17,500.00**	**$10.92 kgal**
12"	**20,000.00**	**$10.92 kgal**
14"	**22,500.00**	**$10.92 kgal**
16"	**25,000.00**	**$10.92 kgal**
Fire Hydrant	**15,000.00**	
Meter Tampering		
Penalty	**$500.00 plus**	
	Estimated Water Loss	
Illegal Sewage Dumping		
Penalty	**$500.00**	

Tiyan Estimated Monthly Bill

Basic Water Charge	$18.44
Basic Sewer Charge	$26.61
Water Usage @ 7,360 Gals	$35.27
Supplemental Annuity Surcharge	$1.45
Total Estimated Charge	$81.77

**Rates applied to 80% of water consumption.

***Based on the prevailing Water Rate at Consumption Period.

SCHEDULE OF WATER SYSTEM DEVELOPMENT CHARGES ADOPTED BY THE GUAM PUBLIC UTILITIES COMMISSION

Actual Meter Size (Inches)	SDC By Water Meter Size
5/8 x 3/4"	$2,126
3/4"	$3.190
1"	$5,316
1 1/2"	$10,632
2"	$17,011
3"	$34,022
4"	$53,160
6"	$106,320
8"	$170,112
10"	$244,536

SCHEDULE OF WASTEWATER SYSTEM DEVELOPMENT CHARGES ADOPTED BY THE GUAM PUBLIC UTILITIES COMMISSION

Actual Meter Size (Inches)	SDC By Water Meter Size
5/8 x 3/4"	$3,474
3/4"	$5,212
1"	$8,686
1 1/2"	$17,372
2"	$27,795
3"	$55,590
4"	$86,860
6"	$173,720
8"	$277,952
10"	$399,556

EXHIBIT B

TARIFF SHEET

FOR WATER/SEWER RATES EFFECTIVE October 01, 2022

Tariff reflects Five Percent (5.5%) effective October 1, 2022 billing cycle approved pursuant to Public Utilities Commission Docket No. 19-08 during the PUC meeting dated September 22, 2022.

WATER

RESIDENTIAL WATER

Meter Size	Basic Water Charge	Lifeline Water Consumption Per K/Gal for Less than 5000 Gallons	Water Consumption Per K/Gal for Greater Than 5000 Gallons
¾"	26.24	3.01	12.49
1"	30.62	3.01	12.49
1 ½"	48.04	3.01	12.49
2"	61.19	3.01	12.49
3"	109.30	3.01	12.49
4"	153.00	3.01	12.49
6"	284.12	3.01	12.49
8"	415.24	3.01	12.49
10"	568.25	3.01	12.49
12"	677.49	3.01	12.49

COMMERCIAL & GOVERNMENT WATER

Meter Size	Basic Water Charge	Water Consumption per K/GAL
¾"	26.24	15.53
1"	30.62	15.53
1 ½"	48.04	15.53
2"	61.19	15.53
3"	109.30	15.53
4"	153.00	15.53
6"	284.12	15.53
8"	415.24	15.53
10"	568.25	15.53
12"	677.49	15.53

AGRICULTURE WATER

Meter Size	Basic Water Charge	Water Consumption Per K/GAL
¾"	25.35	4.99
1"	29.58	4.99
1 ½"	46.43	4.99
2"	59.13	4.99
3"	105.62	4.99
4"	147.82	4.99
6"	274.52	4.99
8"	401.20	4.99
10"	549.03	4.99
12"	654.57	4.99

IRRIGATION WATER

Meter Size	Basic Water Charge	Water Consumption Per K/GAL
¾"	26.24	5.16
1"	30.62	5.16
1 ½"	48.04	5.16
2"	61.19	5.16
3"	109.30	5.16
4"	153.00	5.16
6"	284.12	5.16
8"	415.24	5.16
10"	568.25	5.16
12"	677.49	5.16

WASTEWATER

Sewer Rates	Rate
Residential (flat Monthly Rate)	27.54
Commercial 1 (per 1000 gallons**)	8.56
Commercial 2 (per 1000 gallons**)	20.86
Commercial 3 (per 1000 gallons**)	28.92
Government and Federal (per 1000 gallons**)	12.24

SURCHARGES

SUPPLEMENTAL ANNUITY SURCHARGE: A rate of 3.50% of the non-life portion of bills for all customer classes and types established to allow GWA to recover costs assessed by the Guam Legislature for the purpose of paying benefits to retirees of the Guam Waterworks Authority and the Public Utility Agency of Guam.

MISCELLANEOUS CHARGES

Description	Meter/Detail	Rate
Service Reconnection	3/4" to 1-1/2" meters	$45.00
	2" meter and larger	$145.00
Special Reading		$15.00
Bill Analysis		$10.00
Verification time test		$45.00
Bench Test	First Test within One Year	No charge
	3/4" to 1-1/2" meters	$85.00
	2" meter and larger	$175.00
Fire Hydrant Fee		$25.00/month
Bulk Water Sales		$3.00/kgal
Meter Relocation		at cost
Return Check Charge		$30.00
Sewer Connection Permit:	Residential	$50.00
	Commercial	at cost
	Government	at cost
Bulk Sewage Dumping	Permit Charge	$200.00/truck
	Discharge (<5 kgal)	$25.00/truck
	Discharge (5> kgal)	$5.00/truck
Meter Installation		at cost
Water Service Deposit	3/4"	$32.00
	1"	$37.00
	1 1/2"	$55.00
	2"	$73.00
	3"	$123.00
	4"	$178.00
	6"	$313.00
	8"	$378.00
	10"	$660.00
	12"	$773.00
Sewer Service Deposit	Residential	$20.00
	Commercial I	$60.00
	Commercial II	$650.00
	Commercial III	$1,400.00
	Metered Industrial	$5,000.00
Pressure Reading		$25.00
Direct Service (authorized by GWA)	3/4"	$60.00

	1"	$60.00
	1 1/2"	$70.00
	2"	$120.00
	3"	$180.00
	4"	$240.00
	6"	$360.00
	8"	$480.00
	10"	$600.00
	12"	$720.00
Illegal Connection	Basic Water Charge	Plus Estimated Water***
3/4"	2,500.00	$15.53 kgal
1"	2,500.00	$15.53 kgal
1 1/2"	5,000.00	$15.53 kgal
2"	5,000.00	$15.53 kgal
3"	7,500.00	$15.53 kgal
4"	10,000.00	$15.53 kgal
6"	12,500.00	$15.53 kgal
8"	15,000.00	$15.53 kgal
10"	17,500.00	$15.53 kgal
12"	20,000.00	$15.53 kgal
14"	22,500.00	$15.53 kgal
16"	25,000.00	$15.53 kgal
Fire Hydrant	15,000.00	
Meter Tampering		
Penalty	$500.00 plus Estimated Water Loss	
Illegal Sewage Dumping		
Penalty	$500.00	

Tiyan Estimated Monthly Bill

Basic Water Charge	$26.24
Basic Sewer Charge	$27.54
Water Usage @ 7,360 Gals	$44.53
Supplemental Annuity Surcharge	$2.00
Total Estimated Charge	$100.31

**Rates applied to 80% of water consumption.

***Based on the prevailing Water Rate at Consumption Period.

SCHEDULE OF WATER SYSTEM DEVELOPMENT CHARGES ADOPTED BY THE GUAM PUBLIC UTILITIES COMMISSION

Actual Meter Size (Inches)	SDC by Water Meter Size
5/8 x 3/4"	$2,126
3/4"	$3.190
1"	$5,316
1 1/2"	$10,632
2"	$17,011
3"	$34,022
4"	$53,160
6"	$106,320
8"	$170,112
10"	$244,536

SCHEDULE OF WASTEWATER SYSTEM DEVELOPMENT CHARGES ADOPTED BY THE GUAM PUBLIC UTILITIES COMMISSION

Actual Meter Size (Inches)	SDC by Water Meter Size
5/8 x 3/4"	$3,474
3/4"	$5,212
1"	$8,686
1 1/2"	$17,372
2"	$27,795
3"	$55,590
4"	$86,860
6"	$173,720
8"	$277,952
10"	$399,556

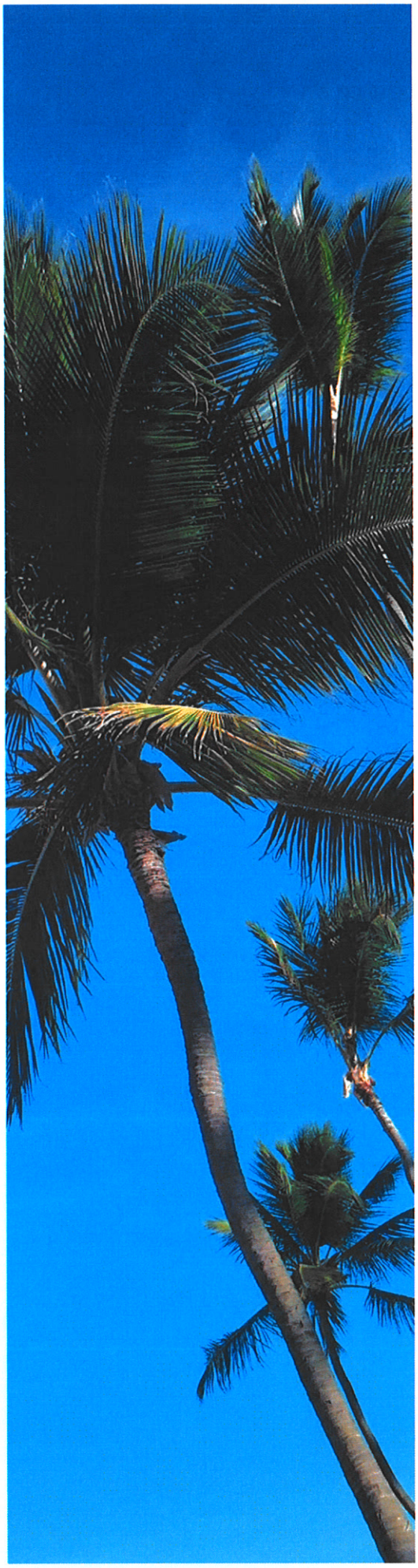

EXHIBIT C

GUAM WATERWORKS AUTHORITY

Final Report
Analytical Study #3
Cost of Service Analysis

Prepared for:
Guam Waterworks Authority
Hagatna, Guam

May 15, 2021

Prepared by:

fgSolutions

Brown AND Caldwell

697 Grand St. #118
Brooklyn, NY 11211
www.fg-solutions.com

Analytical Study 3 Cost of Service Analysis

Prepared for
Guam Waterworks Authority
Hagatna, Guam
May 15, 2021

Brown AND Caldwell

fgSolutions

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List of Abbreviations

AWWA	American Water Works Association
BC	Brown and Caldwell
BOD	Biochemical Oxygen Demand
BU	Business Unit
COS	Cost of Service
COSA	Cost of Service Analysis
CCU	Consolidated Commission on Utilities
DSCR	Debt Service Coverage Ratio
GIAA	Guam International Airport Authority
GPM	Gallons per Minute
cf	Cubic Feet
ChST	Chamorro Standard Time
CIP	Capital Improvement Program
CPI	Consumer Price Index
FG Solutions	FG Solutions, LLC
FTE	Full-Time Equivalent
FY	Fiscal Year (Oct 1 – Sept 30)
GCG	Georgetown Consulting Group
GRG	Galardi Rothstein Group
GWA	Guam Waterworks Authority
IFCIP	Internally Funded CIP
kgal	Thousand Gallon(s)
MG	Million Gallons
mgd	Million Gallons per Day
NDWWTP	Northern District WWTP
O&M	Operations and Maintenance
PUC	Public Utilities Commission
T&D	Transmission and Distribution
TSS	Total Suspended Solids
WEF	Water Environment Federation
WRMPU	Water Resources Master Plan Update
WWTP	Wastewater Treatment Plant

Executive Summary

Background

Guam Waterworks Authority (GWA), is tasked with performing seven Analytical Studies in accordance with the Stipulation and Rate Order issued by the Public Utilities Commission (PUC) in February 2020. In July 2019, the Guam Waterworks Authority (GWA) filed a Petition for Approval of GWA's Third Five-Year Financial Plan and Base Rate Relief. This application was subject to a review process with the Guam PUC consultant, which led to stipulations filed with the PUC on January 17, 2020 that were subsequently incorporated into the PUC's FY 2020 Rate Decision Order issued on February 27, 2020. The stipulated provisions enumerated: "Analytical Studies to be Undertaken to Support the FY 2022 Comprehensive Review and Update of GWA's Financial Plan and subsequent annual review processes." In relevant part, the stipulated provisions GWA engaged FG Solutions, as a subconsultant to Brown and Caldwell (BC), to perform the Cost of Service (COS) portion of Analytical Study 3, the Cost of Service Analysis (COSA). Rate design will be evaluated separately.

Two workshops were held with Georgetown Consulting Group (GCG). Feedback and questions from these workshops were incorporated into this report.

Methodology

The COSA was developed using guidance from two industry standards: the American Water Works Association (AWWA) M1 Manual, and the Water Environment Federation (WEF) M27 Manual. The inputs to the COSA are billing data and water meter data and detailed data on utility system revenue requirements.

In collaboration with other Analytical Studies, the COSA relies on supporting calculations that incorporate GWA system data, such as information from the 2018 Water Resources Master Plan Update (WRMPU), electric bills, the Capital Improvement Plan, and detailed expense data from other Business Units.

The first step is disaggregation of the combined rate revenue requirement into water and wastewater components. Major components are O&M expenses, debt service, Internally Funded Capital (IFCIP) and transfers from GWA reserves. Refer to Section 2 for more details on methodology.

For both water and wastewater COSA, the next step after disaggregation is to functionalize the disaggregated expenses. The functionalization step is the process of separating the rate revenue requirement into categories defined by the various functions of utility service. For a water system, examples of functionalization categories include source and treatment, booster pumping, storage, transmission and distribution (T&D), customer, and meter. Table E-1 shows examples of how key expenses were functionalized.

Table E-1. Water COS Functionalization Methodology

Type of Expense	Functionalization Methodology
Electricity	89% source, 11% booster pumping, based on GWA power account data
Water purchases	Source
Medical/dental/life and Information Technology Business Unit	Administration
Finance Business Unit	Insurance: as plant; billing related: as customer; balance: administration
Line and Leak Repairs Business Unit	Transmission/distribution
Engineering Business Unit	Administration
Debt service	Based on the projects funded by each debt issuance

Allocation is defined as the process of separating the functionalized revenue requirement into categories defined by utility service characteristics. The allocation step takes the functionalized rate revenue requirement and divides it among water system service characteristics.

Distribution is defined as the process of calculating the rate revenue requirement for each customer class, by distributing costs according the percentage of each service characteristic which each customer class is responsible. The distribution step takes the rate revenue requirement and distributes it among the customer classes, according to each customer class use of the service characteristics. See Section 2.2.2 for more details.

The wastewater system has an analogous methodology. The functionalization step takes each component of the revenue requirement, such as operating expenses, debt service, IFCIP, transfers, and change in fund balance, and allocates them into system functions. Examples are shown in Table E-2 below.

Table E-2. Wastewater COS Functionalization Methodology

Type of Expense	Functionalization Methodology
Electricity	41% treatment; 59% collection, based on GWA power account data
Finance Business Unit	Insurance: as plant; billing related: as customer; balance: administration
Maintenance Business Unit	Collection
Treatment Business Unit	Treatment
Debt service	Based on the projects funded by each debt issuance

The allocation step takes the functionalized rate revenue requirement, and divides it among the wastewater system service characteristics. The service characteristics used in the wastewater COSA are related to wastewater flow, biochemical oxygen demand (BOD), total suspended solids (TSS), customer, and administration. BOD and TSS are measured parameters in wastewater that wastewater treatment plants (WWTPs) are designed to remove. The amount of BOD and TSS in wastewater is one factor that determines the cost to build, operate, and maintain wastewater system infrastructure, particularly at WWTPs.

The COSA must take into account the contractual requirements of the Navy as a customer, given that contractual requirements that specify costs that cannot be allocated to the Navy (Department of the Navy Utility Service Contract No. N62766-72-C-0044, effective July 1, 1972). Section 3.3.6 describes wastewater service to the Navy in more detail.

Treatment flow and collection flow are separated in this COSA to facilitate identification of the cost to provide septage treatment services. Septage haulers are required under GWA service rules to deliver septage to WWTPs, and do not use the GWA collection system.

As with the water COSA, distribution in the wastewater COSA is defined as the process of calculating the rate revenue requirement for each customer class, by distributing costs according the percentage of each service characteristic which each customer class is responsible. The distribution step takes the rate revenue requirement and distributes it among the customer classes, according to each customer class use of the service characteristics, discussed in Section 2.3.2.

Cost of Service Analysis

Revenue Requirements based on GWA's financial plan, developed by others, are input values for the COSA. GWA uses the cash basis in defining its revenue requirement. Using the cash basis, the revenue requirement includes operation and maintenance expenses, debt service costs, cash-financed capital improvements, reserve fund requirements, taxes, and consideration of debt coverage requirements.

The Key Assumptions for the COSA are stated below.

1. This COSA was developed to be consistent with the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan, as follows:
    a. Projected water and wastewater demands were determined by Analytical Study #1, Demand Forecasting.
    b. O&M expenses are based on GWA FY 22 budget, consistent with GWA's recently adopted new business unit structure.
    c. Projected rate revenue requirements reflect the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. The rate revenue requirement includes GWA's FY 22 budget, incremental O&M expenses identified in the various Analytical Studies, capital spending, debt service, debt service coverage, and reserve requirements.
    d. The COSA includes a revenue back calculation, which is a comparison of the revenue requirement for each customer class with actual revenues generated by each customer class. The revenue back calculation is based on the Proposed FY 22 Rates.
    e. The Proposed FY 22 Rates are part of the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan.
2. The COSA uses FY 22 as the test year in which the COSA is based, using projected data for FY22.
3. The effects of the pandemic are incorporated into the Demand Forecast.
4. Consistent with AWWA M1 and WEF M27 Manuals.
    a. Deviations from these manuals were made where appropriate to reflect the unique characteristics of GWA's water and wastewater system.
    b. Deviations from these manuals were made where necessary to make the water and wastewater methodologies consistent with each other,

The results of the COSA establish revenue requirements for each customer class. These results are inputs to the Rate Design efforts that are part of the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. The results of disaggregating water and wastewater expenses are summarized in Table E-3 below.

Table E-3. Summary of Disaggregated Water and Wastewater Expenses

Type of Expense	$ Water	$ Wastewater	Total
O&M Expenses	51,262,987	28,972,409	80,235,396
Debt Service	18,402,947	17,473,683	35,876,630
Transfers (from) to Reserves	(4,445,849)	(3,234,128)	(7,679,977)
Internally Funded CIP	4,631,107	3,368,893	8,000,000
Non-Rate Revenues and Revenue Adjustments	341,238	481,186	822,424
Total	$70,192,430	$47,062,043	$117,254,473

In this report, the term "Customer Classes" refers to groupings of customers created to facilitate the COSA, Rate Design (completed by others), and the other Analytical Studies (completed by others). The term Customer Classes should be distinguished from GWA's Rate Classes. GWA's Rate Classes are those defined by GWA's rate schedule, which is adopted by the Consolidated Commission on Utilities (CCU) and approved by the PUC. Customer Classes that differ from GWA's Rate Classes should not be considered a policy decision that GWA has, or is intending, on changing their Rate Classes. Changes to GWA's Rate Classes will be addressed in the Rate Design component of the Analytical Studies, being prepared by others. See Table E-4 below for water Customer Class details.

Table E-4. Water System Customer Classes

Existing Rate Class	COS Customer Classes	Change to Customer Class
Residential	Residential	No change
Commercial & Government	Commercial I + Golf Courses Commercial II minus Hotels Commercial III	Commercial and Government were separated in the Wastewater Rate Classes.
	Hotels	Hotels were separated from Commercial II
	GIAA Water System	New customer class created for the COS Analysis
	Private Fire Protection	New customer class created for the COS Analysis
Agriculture	Agriculture	No change
Irrigation	Irrigation	No change

The Residential Rate Class and the Residential Customer Class have no changes. Commercial and Government Rate Class was divided into Commercial I + Golf, Commercial II minus Hotels, Commercial III, Hotels, GIAA, and Private Fire Protection. The Commercial Rate Class was split into four customer classes, for the purposes of the COS analysis. The new Commercial Customer Classes were developed to maintain consistency with GWA's wastewater Rate Classes. The Hotel customer class was created to be consistent with the Demand Forecast Analytical Study. The 2020 Stipulation required separate demand forecasts for Hotels. A new Customer Class was created for the Guam International Airport Authority (GIAA) Water System.

A new Private Fire Protection customer class was created for the purposes of the COSA. It is also intended to establish a new rate class that properly allocates Private Fire Protection expenses.

Similar to the water rate classes, the wastewater Rate Classes were split into new Customer Classes for the purposes of the COSA. Table E-5 summarizes the comparison of GWA Rate Classes and COSA Customer Classes.

Table E-5. Wastewater Customer Classes

Existing Rate Class	COS Customer Classes	Change to Customer Class
Residential	Residential	No Change
Commercial I	Commercial I	No Change
Commercial II + Hotels	Commercial II Hotels	Commercial II and Hotels were separated
Commercial III	Commercial III	No Change
Government + Federal	Government GIAA Navy	Government and Federal customer class was split into three customer classes.
	Septage	New Customer Class
	Leachate	New Customer Class

The Residential and Commercial I Customer Classes remain unchanged. Commercial II + Hotels were separated into two customer classes. The Hotel customer class was created to be consistent with the Demand Forecast Analytical Study. The 2020 Stipulation required separate demand forecasts for Hotels. Commercial III is unchanged.

A new Customer Class was developed for the Navy, to incorporate contractual requirements described later in this Section, and to facilitate the analysis. The existing contract with the Navy specifies that rates charged to the Navy must exclude laterals and certain capacity increasing capital projects.

The Septage Customer Class was created to facilitate an update to septage rates. The intention in this COSA is to isolate septage costs to promote equitable cost recovery from septage haulers.

Landfill Leachate is a new Customer Class developed to facilitate the creation of a new rate class. Leachate is currently charged as Commercial, but has lower TSS than commercial wastewater and therefore warrants separate consideration. There are two leachate customers, the Ordot Landfill and the Layzon landfill. Both landfills are connected to the collection system via a pipe, where the leachate is transported to a wastewater treatment plant.

Results

In a COSA, a key result is the comparison of the revenue requirement responsibility for each customer class with the revenues generated by rate revenues for each customer class. Table E-6 below shows the comparison of the Rate Revenue Requirement for each water customer class with the projected revenues generated by the Proposed FY 22 Rates. The total of Table E-6 illustrates how the Proposed FY 22 water rates collect more than the FY 22 cost of service.

Table E-6. Water COS Analysis - Comparison of Rate Revenue Requirement with Revenues for Each Customer Class

Customer Class	FY 22 Test Year Cost of Service	Projected FY 22 Revenues (Proposed FY 22 Rates)	Difference Dollars	Difference Percent
Residential	$47,096,089	$40,506,875	($6,589,214)	-16.27%
Commercial 1+	7,227,445	10,983,420	3,755,975	34.20%
Commercial 2-	820,249	1,288,007	467,758	36.32%
Commercial 3	1,507,422	2,338,108	830,686	35.53%
Hotels	7,405,518	11,792,936	4,387,418	37.20%
Government	4,584,524	7,129,961	2,545,437	35.70%
GIAA Water System	508,858	748,625	239,767	32.03%
Agriculture	941,596	539,362	(402,234)	-74.58%
Irrigation	95,410	59,081	(36,329)	-61.49%
Private Fire Protection	5,321	0	(5,321)	0.00%
Total	$70,192,430	$75,386,375	$5,193,945	6.8898%

Table E-6 also shows that some water customer classes are currently paying more than their cost of service. These customers include commercial customers, hotels, government customers, and GIAA water system customers. Customer classes paying less than their cost of service include residential, agricultural, and irrigation customers.

Table E-7 shows the comparison of the Rate Revenue Requirement for each wastewater customer class with the projected revenues generated by the Proposed FY 22 rates. Table E-7 shows that the Proposed FY 22 wastewater rates under collect the FY 22 wastewater revenue requirement by approximately 15%.

Table E-7. Wastewater Cost of Service Analysis - Comparison of Revenue Requirement with Revenues for Each Customer Class

Customer Class	FY 22 Test Year Cost of Service	Projected FY 22 Revenues (Proposed FY 22 Rates)	Difference Dollars	Difference Percent
Residential	$21,552,945	$10,659,438	($10,893,507)	-102.20%
Commercial 1+	4,201,316	3,464,220	(737,096)	-21.28%
Commercial 2-	803,463	1,285,013	481,550	37.47%
Commercial 3	2,193,845	3,063,155	869,310	28.38%
Hotels	6,063,698	9,697,451	3,633,753	37.47%
Government	3,234,734	4,028,860	794,126	19.71%
GIAA Water System	430,564	428,133	(2,431)	-0.57%
Navy	6,879,550	7,498,160	618,610	8.25%
Septage	1,457,645	125,000	(1,332,645)	-1066.12%
Leachate	244,285	647,452	403,167	62.27%
Total	$47,062,043	$40,896,882	($6,165,161)	-15.07%

Table E-7 shows that the residential wastewater customer class pays approximately $10.7 million under the Proposed FY 22 rates, compared with a cost of service of over $21 million. Similarly,

Commercial I and GIAA Water System customers are paying less than their respective cost of service. With the overall 15% under collection noted, Commercial II, Commercial III, and Hotels are paying more than their respective cost of service. Leachate rates also collect more than the leachate cost of service.

The largest percentage difference between the COS and the revenues generated by customer class is septage. This difference is due to the current low septage rates which do not recover the costs to treat septage at GWA's WWTPs given the high BOD and TSS associated with septage.

Conclusions

The disaggregation of the combined rate revenue requirement produced separate rate revenue requirements for water and wastewater. For the combined system, the rate revenue requirement in FY 22 is $117,254,473, as developed in the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. From this combined system rate revenue requirement, the FY 22 water rate revenue requirement is $70,192,430, and the FY 22 wastewater rate revenue requirement is $47,062,043. See Table 3-4 for more details.

The Proposed FY 22 water system rates collect approximately 6.9% more than the water rate revenue requirement. For the wastewater system, the Proposed FY 22 rates collect nearly 15% less than the wastewater rate revenue requirement.

In FY 22, some water customer classes are projected to pay more than their cost of service. These customer classes, in no particular order, are Commercial, Hotels, Government, and GIAA. Customer classes that are paying less than their cost of service are Residential, Agriculture, and Irrigation.

The wastewater system has similar variances, where some wastewater customer classes are projected to pay more than their cost of service. These customer classes, in no particular order, are Commercial II, Commercial III, Hotels, Government, Navy and Leachate. The Proposed FY 22 rates applied to the GIAA collect approximately the cost of service for GIAA.

Some wastewater system customer classes are currently collecting less than their cost of service. These customer classes are Residential, Commercial I, and Septage. GWA's Proposed FY 22 Septage rates collect approximately $125,000 per year. Due to the high strength of Septage, the cost of service is approximately $1.46 million. Refer to Table 3-22 for more detail.

Section 1

Background and Introduction

Guam Waterworks Authority (GWA), is tasked with performing seven Analytical Studies in accordance with the Stipulation and Rate Order issued by the PUC in February 2020. In July 2019, following required public notices and Guam Consolidated Commission on Utilities (CCU) approvals, the Guam Waterworks Authority (GWA) filed a Petition for Approval of GWA's Third Five-Year Financial Plan and Base Rate Relief. This application was subject to a review process with the Guam PUC consultant, which led to stipulations filed with the PUC on January 17, 2020 that were subsequently incorporated into the PUC's FY 2020 Rate Decision Order issued on February 27, 2020. The stipulated provisions enumerated: "Analytical Studies to be Undertaken to Support the FY 2022 Comprehensive Review and Update of GWA's Financial Plan and subsequent annual review processes." In relevant part, the stipulated provisions GWA engaged FG Solutions, as a subconsultant to Brown and Caldwell (BC), to perform the Cost of Service (COS) portion of Analytical Study 3, the Cost of Service Analysis (COSA). Rate design will be evaluated separately[1] to coordinate consideration of a Customer Assistance Program.

The projected water and wastewater system expenses are obtained from the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan filed by GWA on May 1, 2021. The COSA is based on a FY 22 test year which incorporates GWA's Fiscal Year 2022 budget, augmented by other Analytical Studies required by the Stipulation.

In a COSA, a key result is the comparison of the revenue requirement responsibility for each customer class with the revenues generated by existing rates for each customer class. This comparison allows for identification of which customer classes are paying more than their cost of service, and which customer classes are paying less than their cost of service. The projected water and wastewater revenues are based on the Proposed FY 22 Rates. This comparison is used in developing water and wastewater rate proposals contained in GWA's May 1, 2020 submittal.

1.1 Overview

From the Citizen-Centric Report for Fiscal Year 2019, issued July 2020: GWA is a public authority governed by the CCU, subject to the regulations of the Guam PUC. GWA provides water to all of the civilian population of Guam. They also provide wastewater service to much of Guam. In FY 2019, GWA served an average of 42,538 water customers and 29,332 wastewater customers.

GWA's water supply consists of 120 wells, 27 booster pump stations, 23 reservoirs, 586 miles of water distribution lines and approximately 3,814 fire hydrants.

GWA's wastewater system consists of 310 miles of gravity sewer network, 77 sewer pump stations, and approximately 27 miles of force main and five wastewater treatment plants (WWTP).

[1] An Affordability / Rate Design study is being conducted by Galardi Rothstein Group (GRG).

1.2 GWA Challenges

GWA is completing the Analytical Studies, preparing a five-year financial plan, and responding to the requirements of the Stipulation all in the context of navigating several external challenges. GWA challenges are described in GWA's Citizen-Centric Report, and GWA's Fiscal Year (FY) 2019-2020 Financial Statements, Additional Information and Independent Auditors' Report provides additional background information. Two of the external challenges are summarized here: ongoing regulatory oversight and COVID-19.

The Guam PUC regulates and approves GWA's rates, and has established various requirements and deadlines which require GWA actions. Stipulations filed with the PUC on January 17, 2020 were subsequently incorporated into the PUC's FY 2020 Rate Decision Order issued on February 27, 2020. The stipulated provisions required the completion of "Analytical Studies to be Undertaken to Support the FY 2022 Comprehensive Review and Update of GWA's Financial Plan and subsequent annual review processes". GWA is still required to comply with past stipulations which address several water and wastewater rate issues.

GWA is currently negotiating consent decree terms with the U.S. Environmental Protection Agency related to GWA's wastewater conveyance system, and GWA anticipates that an agreement will be reached in 2021.

GWA's FY 2019-2020 Audited Financial Statements also address GWA's response to the COVID-19 public health emergency: All essential services provided by GWA continued to be performed through the pandemic emergency. Supply chains have continued the provision of needed supplies to ensure sustained water and wastewater operations. Service disconnections have been suspended through this emergency period. Revenues were continuously monitored, a cost containment plan put into effect, and management made course corrections to ensure continuity of services to GWA's customers while keeping the safety of GWA staff at the highest priority. GWA also maintained timely execution of ongoing capital improvement plan (CIP) projects to enhance critical water and wastewater infrastructure systems, and to sustain economic activity related to these significant construction projects.

1.3 Collaboration with Georgetown Consulting Group

Two workshops were held with Georgetown Consulting Group (GCG). The first workshop was held virtually in November 2020. The second workshop was held virtually on March 11, 2021, ChST. The second workshop focused on the COSA, with a detailed presentation of the COSA process and how the outputs are being developed to provide inputs to the revenue requirement and rate design analyses.

A draft presentation was submitted to GCG for review. From this review, a list of comments and questions were provided from GCG. An effort was made to answer these questions during Workshop #2, with the balance of questions and comments from this Workshop to be addressed in this report.

Section 2

Cost of Service Methodology

This COSA was developed using guidance from two industry standards:

- Manual M1, Principles of Water Rates, Fees, and Charges, Seventh Edition, American Water Works Association (AWWA M1 Manual)
- Manual of Practice No. 27, Financing and Charges for Wastewater Systems, Water Environment Federation (WEF M27 Manual)

The AWWA M1 Manual provides the following definition of a Cost of Service Study

> "The process of determining the cost of providing water service to each of the defined customer classifications. This includes the functionalization and allocation of water system revenue requirements (the system cost of service) followed by the distribution of costs by customer classification based on the annual usage, peak demands, and customer-related costs for which each class of service is responsible."

The AWWA M1 Manual provides the following definition of a Cost of Service

> "Cost of Service: The total annual operation and maintenance expense and capital-related costs incurred in meeting various aspects of providing water utility service."

The COSA methodology is summarized in Figure 2.1 below. The inputs to the COSA are billing data and water meter data and detailed data on utility system revenue requirements

In collaboration with other Analytical Studies, COSA relies on supporting calculations that incorporate GWA system data, such as information from the 2018 Water Resources Master Plan Update (WRMPU), electric bills, the Capital Improvement Plan, and detailed expense data from other Business Units.

From these inputs, the COSA takes the data through the Functionalization, Allocation, and Distribution steps that are presented in detail in the following Section 3. The output from the COSA are the allocated cost-of-service based revenue responsibilities for each of the customer classes.

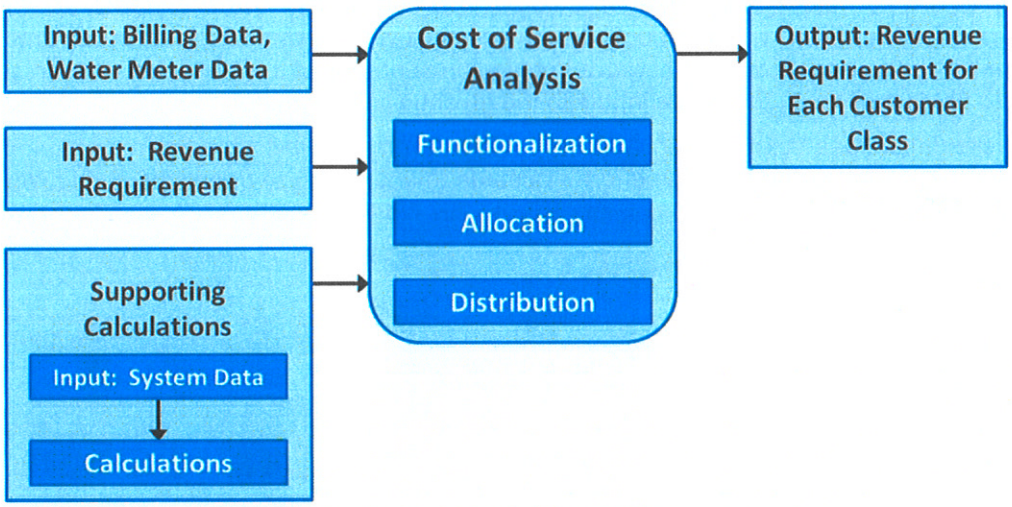

Figure 2-1. Cost of Service Methodology

The outputs of the COSA is a revenue requirement for each customer class. Sections 3.2.1 and 3.3.1 discuss how customer classes were revised and added, in order to inform the COS.

2.1 Disaggregation of the Rate Revenue Requirement

The term disaggregation describes the process of taking GWA's combined water and wastewater O&M expenses, and separating them into water and wastewater service characteristics. The first step of the analysis was to disaggregate the rate revenue requirement into water and wastewater components. Figure 2-2 below conceptually shows the before and after disaggregation of the existing rate revenue requirement. Prior to disaggregation, it is not possible to equitably assign values as either water or wastewater. Disaggregation is necessary to be able to identify which costs are dedicated to water or wastewater services. A key goal of a COSA is to identify how much it costs to serve each customer class.

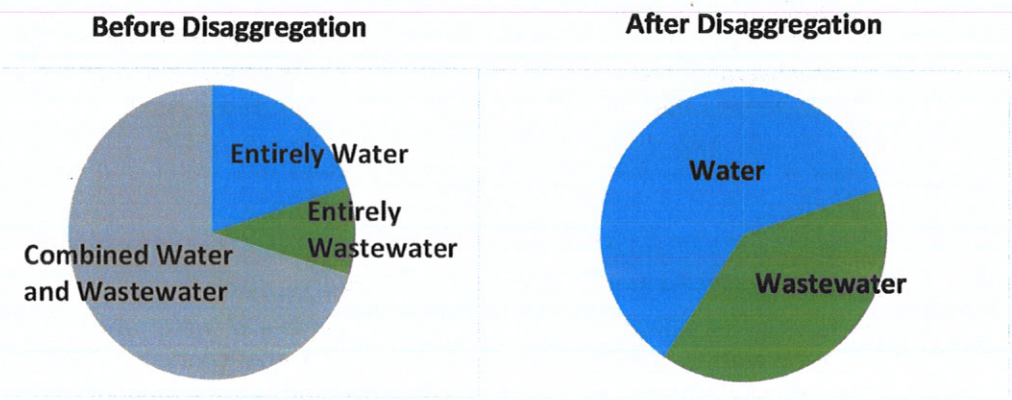

Figure 2-2. Rate Revenue Requirement Before and After Disaggregation

Table 2.1 below shows the methodology for how the different types of expenses were disaggregated from the combined O&M expenses. A key outcome of the disaggregation step is the comparison of disaggregated water and wastewater expenses with the revenues generated by water and wastewater rates.

Table 2-1. Disaggregating Water and Wastewater Expenses

Type of Expense	How Water and Wastewater Were Disaggregated
Debt Service	Review of Projects Funded by Each Individual Debt Issuance
Electricity	Review of FY20 Power Bill Data Provided by GWA. Data Shows Location of Each Power Account
Capital Improvement Plan	Review of Projects in Capital Improvement Plan for Rate Setting Period (FY22 Through FY24). Used to Disaggregate Internally Funded Capital and Proposed New Debt Service.
Administrative O&M Expenses	Average of the Following Factors:
	Net Plant (41% Water, 59% Wastewater)
	Capital Improvement Plan (58% W, 42% WW)
	Non-Admin FTEs (62% W, 38% WW)
	Number of Connections (59% W, 41% WW)
	Average: 55% W, 45% WW
Information Technology Business Unit, Finance Business Unit	As Administrative O&M
Engineering Business Unit	Number of Connections per GWA Staff
Fleet Management Business Unit	Based on Function of Unit per GWA Staff

GWA does not track all of their expenses separated by water or wastewater. Some expenses are exclusively water or wastewater, and were simple to disaggregate. Table 3-2 describes the expenses that were disaggregated into water or wastewater, and how the expenses were disaggregated.

Debt service required a review of the projects that were funded by each individual debt issuance. The list of projects that were funded by each debt issuance is tracked by GWA, as is the amount spent on each project.

Electricity is another expense that was disaggregated. GWA has separate electricity bills for each facility. The COSA reviewed FY 20 power bills as provided by GWA. A determination was made based on the location of each power account.

The Capital Improvement Plan required a review of all of the CIP projects for the Rate Setting period of FY 22 through FY 24. Projects were disaggregated into water or wastewater projects. The CIP was also used to separate Internally Funded Capital (IFCIP) and proposed new debt issuances.

A 4-factor average was developed to disaggregate Administrative O&M expenses. This was then applied to Administrative Business Units where water and wastewater expenses were combined. Table 2-1 above shows the 4-factor average of Net Plant (41% water, 59% wastewater), Capital Improvement Plan (58% W, 42% WW), Non-Admin FTEs (62% W, 38% WW), and the number of customer connections (59% W, 41% WW), with the arithmetic average of 55% water and 45% wastewater. The average of the four factors are used to split the Administrative O&M expenses into water and wastewater components.

Information Technology Business Unit and the Finance Business Units were disaggregated using the 4-factor average described above for Administrative O&M expenses.

The Engineering Business Unit was disaggregated based on the number of water and wastewater connections, provided by GWA staff. GWA staff indicated that the number of connections rather than a review of the combined CIP was a more appropriate and more accurate representation of costs.

The Fleet Management Business Unit was disaggregated based on the function of each unit, per GWA staff, described in percentage water and wastewater.

2.2 Water Cost of Service

2.2.1 Functionalization

The functionalization step is the process of separating the rate revenue requirement into categories defined by the various functions of utility service. For a water system, examples of functionalization categories include source and treatment, booster pumping, storage, transmission and distribution (T&D), customer, and meter. The functionalization categories allocated to system functions are as noted in Figure 2-3 below. Water system functions as shown in Figure 2-3 are industry standards, tailored to the specific attributes of the GWA water system.

The Guam International Airport Authority (GIAA) Water System account and demand data were separated out from Government + Federal to facilitate the isolation of GIAA Water System costs. Fire Protection is included as a functionalization factor, as the COSA includes developing a rate revenue requirement for Private Fire Protection. Fire protection includes private and public fire protection (hydrants). Developing Fire Protection rates is a requirement of the 2013 Stipulation.

Water Cost of Service Analysis - Functionalization Factors								
Source and Treatment	Booster Pumping	Storage	T&D	Customer	Meter	GIAA Water System	Fire Protection	Admin

Figure 2-3. Water Cost of Service Analysis – Functionalization Categories

Table 2-2 below shows the water system functionalization methodology. The items with the largest expenses are functionalized accordingly. More details are available in Appendix A.

Table 2-2. Water COS Functionalization Methodology

Type of Expense	Functionalization Methodology
Electricity	89% source, 11% booster pumping, based on GWA power account data
Water purchases	Source
Medical/dental/life and Information Technology Business Unit	Administration
Finance Business Unit	Insurance: as plant; billing related: as customer; balance: administration
Line and Leak Repairs Business Unit	Transmission/distribution
Engineering Business Unit	Administration
Debt service	Based on the projects funded by each debt issuance

2.2.2 Allocation

Allocation is defined as the process of separating the functionalized revenue requirement into categories defined by utility service characteristics. For a water system, examples of service characteristics are base consumption (equal to average water use), peak demands, and meters. The allocation step takes the functionalized rate revenue requirement and divides it among water system service characteristics. Figure 2-4 describes industry standard service characteristics derived from AWWA M1 manual, base-extra capacity method. GIAA Water System is not a standard service characteristic, and was added for this analysis.

Water Cost of Service Analysis - Allocation of Rate Revenue Requirement								
FY 2022		Extra Capacity		Customer		GIAA Water	Fire	
Test Year	Base	Max Day	Max Hour	Customer	Meter	System	Protection	Admin

Figure 2-4. Water Cost of Service Analysis – Allocation of Rate Revenue Requirement

Table 2-3 below describes the allocation step. From the functionalization step, the functionalized values are allocated to the service characteristics shown in Figure 2-4 above.

Table 2-3. Water COS Allocation Methodology		
Function	**Allocation Methodology**	**Reason**
Source Except Power, Water	Base and Max-Day Extra Capacity, divided per M1 method	Source sized for max-day demands
Booster Pumping Except Power	Base, Max-Day and Max-Hour Extra Capacity, divided per M1 method	Booster pumps sized for max-day (if storage in pressure zone) or max-hour (no storage in pressure zone), per WRMPU Table 7-1
Storage	69.5% Base, 12.9% Max-Day Extra Capacity, and 17.6% Fire Protection	Storage sizing criteria per WRMPU page 6-1
Transmission/Distribution	Base, Max-Day Extra Capacity. 10% to Customer	Pipes sized for max day demands. GWA currently does not size pipelines to supply fire flow to all customers in the distribution system. (WRMPU, page 8-1)
Water Purchases and Power Purchases	Base, except: (1) water losses split between base and customer (2) GWA use to administration	Price of water and power not related to peaks; water loss allocation analogous to I/I analysis in WEF Manual 27
Customer, Meter, GIAA, and Fire Protection	Direct allocation to respective system characteristics	Expenses flow through the allocation step.
Redistribution of Administration	Weighted average of other system components, less electricity and purchased water	M1 Manual

2.2.3 Distribution

Distribution is defined as the process of calculating the rate revenue requirement for each customer class, by distributing costs according the percentage of each service characteristic which each customer class is responsible. For example, if residential customers use 65 percent of the average water use, then 65 percent of the costs related to base consumption are distributed to the residential customer class. The distribution step takes the rate revenue requirement and distributes it among the customer classes, according to each customer class use of the service characteristics, discussed in Section 2.2.2.

2.3 Wastewater Cost of Service

2.3.1 Functionalization

The functionalization step takes each component of the revenue requirement, such as operating expenses, debt service, IFCIP, transfers, and non-rate revenues/revenue adjustments, and allocates them into system functions as noted in Figure 2-5.

Wastewater Cost of Service Analysis - Functionalization of Rate Revenue Requirement				
FY 2022				
Total	Treatment	Collection	Customer	Admin

Figure 2-5. Wastewater Cost of Service Analysis – Functionalization Categories

Table 2-4 shows how some of the key wastewater system expenses were functionalized. Electricity was functionalized based on review of GWA power account data. Most of GWA's business units were assigned to either treatment or collection based on the description of each Business Unit's activities. As with the water system, debt service was functionalized based on the projects funded by each debt issuance. Additional detail is found in Appendix A.

Table 2-4. Wastewater COS Functionalization Methodology

Type of Expense	Functionalization Methodology
Electricity	41% treatment; 59% collection, based on GWA power account data
Finance Business Unit	Insurance: as plant; billing related: as customer; balance: administration
Maintenance Business Unit	Collection
Treatment Business Unit	Treatment
Debt service	Based on the projects funded by each debt issuance

2.3.2 Allocation

The allocation step takes the functionalized rate revenue requirement, and divides it among the wastewater system service characteristics. The wastewater system components in Figure 2-6 are industry standards, specifically derived from the WEF M27 Manual and tailored to the specific attributes of the GWA wastewater system.

The service characteristics used in the wastewater COSA are related to wastewater flow, biochemical oxygen demand (BOD), total suspended solids (TSS), customer, and administration. BOD is the amount of dissolved oxygen needed by aerobic biological organisms to break down organic material present in a water sample at a certain temperature over a specific time period. TSS is a water quality parameter representing the quantity of material suspended in a known volume of water that is trappable in a filter.

BOD and TSS are measured parameters in wastewater that WWTPs are designed to remove. The amount of BOD and TSS in wastewater is one factor that determines the cost to build, operate, and maintain wastewater system infrastructure, particularly at WWTPs.

The COSA must take into account the contractual requirements of the Navy as a customer, given that contractual requirements that specify costs that cannot be allocated to the Navy (Department of the Navy Utility Service Contract No. N62766-72-C-0044, effective July 1, 1972). The requirements of the contract result in the system service characteristics identified below in Figure 2-6 that exclude the Navy. Section 3.3.6 describes wastewater service to the Navy in more detail.

Wastewater Cost of Service Analysis - Allocation of Rate Revenue Requirement

Treatment Flow	Collection Flow	Treatment Flow Less Navy	Collection Flow Less Navy	BOD	BOD Less Navy	TSS	TSS Less Navy	Customer	Admin

Figure 2-6. Wastewater Cost of Service Analysis – Allocation of Rate Revenue Requirement

Treatment flow and collection flow are separated in this COSA to facilitate identification of the cost to provide septage treatment services. Septage haulers are required under GWA service rules to deliver septage to WWTPs but do not use the GWA collection system.

Table 2-5 below shows how the functionalized revenue requirement was allocated. Additional detail is provided in Appendix A.

Table 2-5. Wastewater COS Allocation Methodology

Functional Category	Allocation Methodology	Reason
Treatment: power purchases	46.7% flow, 24.1% BOD, 18.1% TSS, 2.1% customer; 9.0% admin	Much of the treatment power expense is for pumping; some treatment plants do not have solids treatment processes; portion of I/I related power allocated to customer
Treatment: solids disposal	50% BOD, 50% TSS	Mass loadings of BOD and TSS in lb/year are of similar magnitude
Other Treatment O&M and Debt	1/3 flow, 1/3 BOD, 1/3 TSS, with adjustments to remove two capacity increasing projects from $ charged to Navy	Represents design parameters and function of treatment plant.
Collection: power purchases	80.8% flow, 3.7% customer; 15.5% admin	Collection system design based on flow. I/I portion split between flow and customer; flow volume attributed to failing meters to admin.
Collection	90% collection flow, 10% customer, with adjustments to remove lateral costs from $ charged to Navy	Collection system design based on flow. Customer allocation is allowance for low density of development impact on collection system costs

2.3.3 Distribution

As with the water COSA, distribution in the wastewater COSA is defined as the process of calculating the rate revenue requirement for each customer class, by distributing costs according the percentage of each service characteristic which each customer class is responsible. The distribution step takes the rate revenue requirement and distributes it among the customer classes, according to each customer class use of the service characteristics, discussed in Section 2.3.2.

Section 3

Cost of Service Analysis

Revenue Requirements based on GWA's financial plan, developed by others, are input values for the COSA. The AWWA M1 Manual defines revenue requirements as the total annual operation and maintenance expense and capital-related costs incurred in meeting various aspects of providing water utility service. Utilities derive revenues from utility rates and from other non-rate revenues (such as late fees and interest income). After considering the uses of non-rate revenue, the total annual operation and maintenance expense and capital-related costs coming from rate revenues is defined as the "rate revenue requirement".

In utilities, there are two general methods of determining the revenue requirement. Using the cash basis, the revenue requirement includes operation and maintenance expenses, debt service costs, cash-financed capital improvements, reserve fund requirements, taxes, and consideration of debt coverage requirements. GWA uses the cash basis in defining its revenue requirement. The utility basis is the other method, and the utility basis revenue requirement includes operation and maintenance expenses, depreciation expense, taxes, and return on rate base. GWA does not use the utility basis to define its revenue requirement.

New customer classes were created for the purpose of the COSA. Some existing customer classes were split for the analysis, the details are provided for both water and wastewater. This is explained in Sections 3.2.1 and 3.3.1.

The Key Assumptions for the COSA are stated below.

1. This COSA was developed to be consistent with the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan, as follows:
   a) Projected water and wastewater demands were determined by Analytical Study #1, Demand Forecasting.
   b) O&M expenses are based on GWA FY 22 budget, consistent with GWA's recently adopted new business unit structure.
   c) Projected rate revenue requirements reflect the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. The rate revenue requirement includes GWA's FY 22 budget, incremental O&M expenses identified in the various Analytical Studies, capital spending, debt service, debt service coverage, and reserve requirements.
   d) The COSA includes a revenue back calculation, which is a comparison of the revenue requirement for each customer class with actual revenues generated by each customer class. The revenue back calculation is based on the Proposed FY 22 Rates.
   e) The Proposed FY 22 Rates are part of the FY 2022 Comprehensive Review and Update to GWA's Five Year Financial Plan.
2. The COSA uses FY 22 as the test year in which the COSA is based, using projected data for FY22.
3. The effects of the pandemic are incorporated into the Demand Forecast.
4. Consistent with AWWA M1 and WEF M27 Manuals.

a) Deviations from these manuals were made where appropriate to reflect the unique characteristics of GWA's water and wastewater system.

b) Deviations from these manuals were made where necessary to make the water and wastewater methodologies consistent with each other,

The results of the COSA establish revenue requirements for customer class. These results are inputs to the Rate Design efforts that are part of the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan.

3.1 Disaggregation of Combined Water and Wastewater Expenses

An overview of the disaggregation of the combined O&M expenses from GWA was described in Section 2 of this report. Section 3.1.1 describes the combined O&M schedule for water and wastewater expenditures. These expenditures are based on the FY 22 test year, using GWA's new business unit structure.

The percentage of expenditures for water and wastewater respectively were determined. The next step was to calculate the dollar value of water and wastewater expenses, multiplying the test year total by the calculated percentages. Refer to Appendix A for additional details of the combined O&M expenses.

3.1.1 O&M Expenses

GWA categorizes its O&M expenses in a series of 44 Business Units. The requested FY 22 budget for each Business Unit is shown in Table 3-1. This table shows the total expense, and also the disaggregation of expenses between water and wastewater. In most cases, the Business Unit is either entirely water or entirely wastewater. Administrative Business Units combine water and wastewater expenses.

As described in Section 2, most of the combined Business Units were disaggregated using a four-factor allocation that considers net plant investment, Capital Improvement Plan costs, labor, and the number of water and wastewater utility customers.

In addition to the costs contained in GWA's requested FY 22 budget, there are additional O&M costs arising out of the other Analytical Studies that are referred to in this COSA as "incremental O&M". These O&M costs are associated with affordability programs, water loss reduction, and the septic tank study. The Water Loss Reduction Incremental O&M includes savings from reduced purchased water costs. The projected amount is consistent with the results of Analytical Study #2, Water Loss Reduction.

Overall, approximately 64 percent of O&M expenses are associated with the water system, and 36 percent are associated with the wastewater system.

Table 3-1. Combined O&M Expenses, Water and Wastewater

Business Unit	FY 2022	% Water	% Wastewater	$ Water	$ Wastewater
1000 - Company Wide Power Purchases	$15,545,238	83.6%	16.4%	$12,997,373	$2,547,865
1000 - Company Wide Water Purchases	$8,632,851	100.0%	0.0%	8,632,851	0
1000 - Company Wide Salaries & Wages	$0	55.1%	44.9%	0	0
1000 - Company Wide Medical/Dental/Life (DB)	$3,376,901	55.1%	44.9%	1,861,091	1,515,810
1000 - Company Wide Retiree COLA	$735,117	55.1%	44.9%	405,140	329,976
1000 - Company Wide Bad Debt	$2,912,784	55.1%	44.9%	1,605,305	1,307,479
1000 - Company Wide Capitalized Materials	($80,850)	57.9%	42.1%	(46,803)	(34,047)
Total Business Unit 1000 - Company Wide	$31,122,040	81.8%	18.2%	$25,454,958	$5,667,082
Total Business Unit 1001 - CCU	$226,294	55.1%	44.9%	$124,716	$101,578
Total Business Unit 1100 - General Manager	912,435	55.1%	44.9%	502,865	409,570
Total Business Unit 1101 - Asset Management	656,503	41.3%	58.7%	271,446	385,057
Total Business Unit 1102 - Internal Audit	183,332	55.1%	44.9%	101,038	82,293
Total Business Unit 1103 - Legal Counsel	552,013	55.1%	44.9%	304,228	247,785
Total Business Unit 1104 - Communications	234,394	55.1%	44.9%	129,180	105,214
Total Business Unit 1105 - Finance	4,763,002	55.1%	44.9%	2,625,005	2,137,997
Total Business Unit 1200 - Administrative Services - AGMAS	189,869	55.1%	44.9%	104,641	85,228
Total Business Unit 1210 - Procurement & Supply	992,320	55.1%	44.9%	546,891	445,429
Total Business Unit 1220 - Customer Care	371,661	55.1%	44.9%	204,831	166,829
Total Business Unit 1221 - Customer Service	1,391,732	58.8%	41.2%	818,929	572,803
Total Business Unit 1222 - Collections	428,136	58.8%	41.2%	251,926	176,210
Total Business Unit 1223 - Field Support/Meter Installation	727,223	100.0%	0.0%	727,223	0
Total Business Unit 1224 - Meters - Reading Unit	396,177	100.0%	0.0%	396,177	0
Total Business Unit 1225 - Meter Test Facility	242,251	100.0%	0.0%	242,251	0
Total Business Unit 1230 - Information Technology	2,970,252	55.1%	44.9%	1,636,977	1,333,275
Total Business Unit 1240 - Human Resources	815,826	55.1%	44.9%	449,622	366,205
Total Business Unit 1300 - Compliance - AGM-CS	772,370	55.1%	44.9%	425,672	346,698
Total Business Unit 1301 - Lab	1,521,743	55.1%	44.9%	838,669	683,074
Total Business Unit 1302 - Safety & Inspections	350,889	55.1%	44.9%	193,383	157,505
Total Business Unit 1500 - Operations Administration - AGMO & SCC/Dispatch	1,350,848	52.4%	47.6%	707,425	643,424
Total Business Unit 1510 - Production	324,820	100.0%	0.0%	324,820	0
Total Business Unit 1511 - Deepwells	1,654,937	100.0%	0.0%	1,654,937	0
Total Business Unit 1512 - Surface & Springs	1,113,786	100.0%	0.0%	1,113,786	0
Total Business Unit 1514 - Disinfection	1,399,590	100.0%	0.0%	1,399,590	0
Total Business Unit 1520 - W - Distribution	186,774	100.0%	0.0%	186,774	0
Total Business Unit 1521 - Leak Detection	187,851	100.0%	0.0%	187,851	0
Total Business Unit 1522 - Pressure Line Unit	2,772,992	100.0%	0.0%	2,772,992	0
Total Business Unit 1523 - Reservoirs	36,991	100.0%	0.0%	36,991	0
Total Business Unit 1524 - Water Pump Stations	1,333,524	100.0%	0.0%	1,333,524	0
Total Business Unit 1530 - WW Collection	221,605	0.0%	100.0%	0	221,605
Total Business Unit 1531 - Gravity Lines	0	0.0%	100.0%	0	0
Total Business Unit 1532 - WW Pump Stations	4,151,121	0.0%	100.0%	0	4,151,121
Total Business Unit 1533 - CCTV/Hot Spots	742,007	0.0%	100.0%	0	742,007
Total Business Unit 1540 - Treatment	1,791,350	0.0%	100.0%	0	1,791,350
Total Business Unit 1542 - Central	579,385	0.0%	100.0%	0	579,385
Total Business Unit 1541 - Northern	919,579	0.0%	100.0%	0	919,579
Total Business Unit 1543 - Southern	730,594	0.0%	100.0%	0	730,594
Total Business Unit 1551 - Construction	562,751	57.9%	42.1%	325,770	236,981
Total Business Unit 1553 - Fleet Maintenance	2,041,538	64.0%	36.0%	1,306,585	734,954
Total Business Unit 1554 - Instrumentation & Electrical	1,425,485	55.1%	44.9%	785,619	639,866

Table 3-1. Combined O&M Expenses, Water and Wastewater (continued)

Business Unit	FY 2022	% Water	% Wastewater	$ Water	$ Wastewater
Total Business Unit 1400 - Engineering	2,333,261	58.8%	41.2%	1,372,948	960,314
Total Business Unit 1404 - Planning/Special Projects	1,217,635	55.1%	44.9%	671,068	546,567
Incremental O&M, Affordability Program	5,250,000	55.1%	44.9%	2,893,401	2,356,599
Incremental O&M, Water Loss Program (Reduction in Purchased Water $)	(2,161,721)	100.0%	0.0%	(2,161,721)	0
Incremental O&M, Septic Tank Study, BU 1404	248,230	0.0%	100.0%	0	248,230
Total FY22 Projected O&M Expenses	$80,235,396	63.9%	36.1%	$51,262,987	$28,972,409

3.1.2 Existing Debt Service

GWA is currently making annual debt service payments on six outstanding debt issuances. Debt service issuances provide funding for both water and wastewater capital improvements. GWA tracks the amounts spent on each project for each debt issuance. The debt service payment for each debt issuance was disaggregated individually, based on GWA's records of what each debt issuance paid for. Debt service disaggregation is shown in Table 3-2 for each debt issuance. Capitalized Interest was disaggregated based on a weighted average of the respective water and wastewater components of the six outstanding debt issuances. In aggregate, existing debt service payments are split about 50/50 between water and wastewater.

Table 3-2. Debt Service Disaggregation

Issue	FY 22 Debt Svc Pmt	% Water	% Wastewater	$ Water	$ Wastewater
Series 2013 - Unrefunded Portion	$4,247,338	41.9%	58.1%	$1,780,032	$2,467,306
Series 2014	3,785,500	52.6%	47.4%	1,990,721	1,794,779
Series 2016	11,006,500	60.0%	40.0%	6,600,851	4,405,649
Series 2017	7,411,250	56.6%	43.4%	4,191,901	3,219,349
Series 2020A	6,700,000	41.9%	58.1%	2,807,927	3,892,073
Series 2020B	5,890,815	41.9%	58.1%	2,468,803	3,422,012
Capitalized Interest	(5,583,333)	50.8%	49.2%	(2,837,363)	(2,745,970)

3.1.3 Capital Improvement Plan

Table 3-3 Capital Improvement Plan Disaggregation shows the largest dollar value projects in GWA's CIP, with the value of the remaining projects shown as a single line item. Each project was determined to be a percentage water or wastewater, based on the intent of the project. See Appendix A for full CIP disaggregation details. Overall, the FY 22-24 projected CIP spending is approximately 58% water, and 42% wastewater.

Table 3-3. Capital Improvement Plan Disaggregation

Project Number	Project Name	FY 22-24 Total Expenditures & Encumbrances ($000)	% Water	% Wastewater
MP-WW-Pipe-01	Gravity Pipe Rehabilitation/Replacement Program	18,093		100.0%
MP-WW-Pump-01	Lift Station Rehabilitation/Replacement Program	13,214		100.0%
MP-WW-WWTP-08	Northern District WWTP Completion	5,300		100.0%
PW 09-03	Water Distribution System Pipe Replacement and Upgrades	6,141	100.0%	
MP-PW-Pipe-01	Astumbo Zone Piping	4,668	100.0%	
MP-PW-Pipe-12	Rehabilitation and Replacement Program	14,457	100.0%	
MP-PW-Pipe-14	Asbestos Cement Pipe Replacement Program	9,050	100.0%	
MP-WW-Pipe-27	Septic/Cesspool System Reduction Program	7,350		100.0%
MP-PW-Well-04	Capacity Enhancement – Well Development and Construction Program	4,379	100.0%	
MP-PW-Well-01	Well Rehabilitation Program	7,980	100.0%	
MP-Gen-EE-01	SCADA Implementation Phase A2 – Initial Project Completion	7,995	50.0%	50.0%
	Water Loss Study	7,903	100.0%	
	Remainder of Projects	82,858	61.6%	38.4%
	Total	$189,388	$109,635	$79,754
	As Percent		57.9%	42.1%

3.1.4 Transfers and Non-Rate Revenues

The FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan includes use of GWA reserves for a portion of the Revenue Requirement. In this COSA, use of GWA's reserves is referred to as "Transfers from (to) reserves", where a positive number indicates use of GWA reserves and a negative number indicates a transfer of rate revenue to GWA's reserves. Transfers from reserves is disaggregated between water and wastewater based on the CIP disaggregation described above, as the reserves would be used to pay for capital-related costs.

Non-rate revenues are sources of GWA revenues other than what is collected by water and wastewater rates. In FY 22, they are projected to be approximately $400,000. Most of the non-rate revenues were directly assigned to either water or wastewater based on the specific type of revenue. For example, GWA identifies installation fees, reconnection fees, and revenues from illegal connections as water system revenues. Similarly, septage revenues are wastewater system revenues.

Revenue adjustments are deductions from revenues made by GWA that are projected to total approximately $1.2 million in FY 22. These revenue adjustments are disaggregated between water and wastewater using the 4-factor average.

3.1.5 Summary of Disaggregated Water and Wastewater Expenses

The results of disaggregating water and wastewater expenses are summarized in Table 3-4 below. The disaggregated O&M expenses are shown above in Table 3-1, and the disaggregated debt service expenses are shown in Table 3-2. The IFCIP is disaggregated based on the disaggregation of the CIP shown in Table 3-3.

Non-rate revenues will decrease the total expenses shown in Table 3-4, and revenue adjustments will increase the total expenses shown in Table 3-4. The sum of non-rate revenues and revenue adjustments shown in Table 3-4 is positive, because the revenue adjustments are larger than the non-rate revenues.

Table 3-4 Summary of Disaggregated Water and Wastewater Expenses			
Type of Expense	$ Water	$ Wastewater	Total
O&M Expenses	51,262,987	28,972,409	80,235,396
Debt Service	18,402,947	17,473,683	35,876,630
Transfers (from) to Reserves	(4,445,849)	(3,234,128)	(7,679,977)
Internally Funded CIP	4,631,107	3,368,893	8,000,000
Non-Rate Revenues and Revenue Adjustments	341,238	481,186	822,424
Total	$70,192,430	$47,062,043	$117,254,473

Table 3-5 compares test year FY 22 water and wastewater expenses with projected water and wastewater revenues collected from the Proposed FY 22 rates.

As described in Section 1, this expenses in this COSA are based on the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. The revenue comparison is based on the Proposed FY 22 Rates.

Table 3-5 shows that the Proposed FY 22 water rates are projected to collect approximately 6.9% more than the water rate revenue requirement. The wastewater system Proposed FY 22 Rates under collect the wastewater rate revenue requirement by approximately 15%.

Table 3-5. Comparison of Disaggregated Expenses with Rate Revenues under Proposed FY 22 Rates			
Type of Expense	$ Water	$ Wastewater	Total
Cost of Service FY 2022	$70,192,430	$47,062,043	$117,254,473
Projected FY 22 Rate Revenues Under Proposed FY 22 Rates	75,386,375	40,896,882	116,283,257
Difference, $	(5,193,945)	6,165,161	971,216
Difference, as % of Projected Rate Revenues	-6.9%	15.1%	

3.2 Water Cost of Service

This section describes the results of the water COSA associated with the revenue requirement contained in the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. The methodology is discussed in Section 2, and additional detail can be found in Appendix A

3.2.1 Customer Classes

In this report, the term "Customer Classes" refers to groupings of customers created to facilitate the COSA, Rate Design (completed by others), and the other Analytical Studies (completed by others).

The term Customer Classes should be distinguished from GWA's Rate Classes. GWA's Rate Classes are those defined by GWA's rate schedule, which is adopted by the CCU and approved by the PUC.

As described below, there are differences between the Customer Classes used in this COSA and GWA's Rate Classes. Customer Classes that differ from GWA's Rate Classes should not be considered a policy decision that GWA has, or is intending, on changing their Rate Classes. Changes to GWA's Rate Classes will be addressed in the Rate Design component of the Analytical Studies, being prepared by others.

Table 3-6 summarizes GWA's existing water Rate Classes and water Customer Classes. For the purposes of the COSA, several new Customer Classes were created.

Table 3-6. Water System Customer Classes

Existing Rate Class	COS Customer Classes	Change to Customer Class
Residential	Residential	No change
Commercial & Government	Commercial I + Golf Courses	Commercial and Government were separated in the Wastewater Rate Classes.
	Commercial II minus Hotels	
	Commercial III	
	Hotels	Hotels were separated from Commercial II
	GIAA Water System	New customer class created for the COS Analysis
	Private Fire Protection	New customer class created for the COS Analysis
Agriculture	Agriculture	No change
Irrigation	Irrigation	No change

The Residential Rate Class and the Residential Customer Class are the same, with no changes. Commercial and Government Rate Class was divided into Commercial I + Golf, Commercial II minus Hotels, Commercial III, Hotels, GIAA, and Private Fire Protection. The Commercial Rate Class was split into four customer classes, for the purposes of the COSA. The four water Commercial Customer Classes were developed to maintain consistency with GWA's wastewater Rate Classes.

The Hotel customer class was created to be consistent with the Demand Forecast Analytical Study. The 2020 Stipulation required separate demand forecasts for Hotels.

Table 3-7 below describes differences between GWA Rate Classes and COSA Customer Classes in more detail. A new Customer Class was created for the GIAA Water System. Currently, GIAA customers are merged in GWA's Commercial and Government Rate Classes, depending on whether the specific customer is a governmental agency or a commercial entity.

GWA operates the GIAA Water System under a contract that is currently expired and in negotiations. GWA does not pay for certain expenses, such as power, and does not pay for capital improvements. Therefore, isolating GIAA Water System costs is necessary as GWA considers a separate rate class for the GIAA Water System.

A new Private Fire Protection customer class was created for the purposes of the COSA. It is also intended to establish a new rate class that properly allocates Private Fire Protection expenses. Currently, Private Fire Protection meters are being charged GWA's basic service charge.

Table 3-7. Water System Customer Classes: Changes from Existing GWA Customer Class Structure

Customer Class	Changes from Current Rate Structure	Reason
Commercial	Separated into four categories: WW Commercial I Customers, plus golf courses WW Commercial II customers, minus hotels WW Commercial III customers Hotels	Matches categorization in other Analytical Studies
GIAA Water System	Creation of a new customer class	GWA operates GIAA water system under contract, but does not pay for certain expenses (such as power) and does not pay for capital improvements. Customers on this water system are merged in GWA's Commercial and Government customer classes.
Private Fire Protection	Creation of a new customer class	Facilitates establishment of fire protection rates.

3.2.2 Functionalization

This section describes the results of the water functionalization step. The methodology is described in Section 2, and additional calculations are included in Appendix A. Table 3-8 provides examples of functionalization factors, which show how each individual debt issuance is functionalized. See Table COS-1 in Appendix A for more details.

Table 3-8. Water System Cost of Service Analysis, Debt Service Functionalization Factors

Functionalization Factors	Total	Functionalized Amount: Source and Treatment	Booster Pumping	Storage	T&D	Customer	Meter	GIAA Water System	Fire Protection	Admin
Series 2013 and Series 2020B	100.0%	12.5%	3.3%	55.9%	20.2%	0.0%	1.5%	0.0%	0.3%	6.3%
Series 2014	100.0%	31.9%	2.4%	4.7%	18.9%	0.0%	37.0%	0.0%	4.4%	0.6%
Series 2016	100.0%	4.5%	0.6%	85.3%	2.5%	0.0%	1.8%	0.0%	1.6%	3.7%
Series 2017	100.0%	16.0%	2.4%	33.8%	10.2%	0.0%	21.4%	0.0%	0.1%	16.1%
Series 2020A	100.0%	18.8%	4.2%	57.2%	15.3%	0.0%	0.0%	0.0%	0.3%	4.2%
Capitalized Interest	100.0%	13.4%	2.2%	56.1%	11.4%	0.0%	9.2%	0.0%	1.1%	6.6%

Table 3-9 shows the isolation of O&M costs for the GIAA Water System, excluding administrative costs. The GIAA Water System requires 2.1 FTEs, in addition to the annual expenses described below in the table.

Table 3-9. Water COS Functionalization: GIAA Water System

	# FTEs, GIAA Water System	$/Year
Business Unit 1511 - Deepwells	2.1	$117,352
GIAA Expenses (not labor)		$11,919
Additional Employees		$58,676
GAC, Non-Recurring in Past		$22,500
Total	2.1	$210,447

Table 3-10 shows the functionalized water Rate Revenue Requirement. The largest functionalized component of the water revenue requirement is related to Source and Treatment, largely due to purchased water and power costs. Debt service is approximately half storage, with smaller source/treatment, transmission/distribution, and meter components. For the transfers from reserves and the Internally Funded CIP, approximately half of the functionalized cost is related to transmission and distribution.

Administrative costs shown in Table 3-10 are primarily those of administrative Business Units, many of which are shown in Table 3-1 with the four-digit Business Unit number starting with 10, 11, or 12. See Table COS-4 in Appendix A for more details.

As described above in Section 3.1.5, the sum of non-rate revenues and revenue adjustments is positive, because the revenue adjustments, which increase the Rate Revenue Requirement, are larger than the non-rate revenues, which decrease the Rate Revenue Requirement.

Table 3-10. Functionalized Water Rate Revenue Requirement

Business Unit	FY 2022 Total $	Source and Treatment	Booster Pumping	Storage	T&D	Customer	Meter	GIAA Water System	Fire Protection	Admin
O&M Expenses	51,262,987	24,005,508	3,197,057	273,484	4,175,449	1,682,141	1,495,004	221,497	166,258	16,046,591
Debt Service	18,402,947	2,533,269	444,669	9,719,454	2,712,705	0	1,589,055	0	228,172	1,175,623
Transfers (from) to Reserves	(4,445,849)	(874,981)	(209,266)	(608,314)	(2,404,018)	0	(87,916)	0	(136,659)	(124,696)
Internally Funded CIP	4,631,107	911,441	217,986	633,662	2,504,192	0	91,579	0	142,353	129,892
Non-Rate Revenues and Revenue Adjustments	341,238	0	0	0	0	0	0	0	0	341,238
Total, $	$70,192,430	$26,575,237	$3,650,446	$10,018,286	$6,988,329	$1,682,141	$3,087,723	$221,497	$400,125	$17,568,647
Total, %	100.0%	37.9%	5.2%	14.3%	10.0%	2.4%	4.4%	0.3%	0.6%	25.0%

3.2.3 Water Allocation

Table 3-11 describes the allocation factors used in this COSA. The percentages shown in Table 3-11 are applied to the functionalized revenue requirement as described in Section 2, with more detail included in Appendix A.

Table 3-11. Water Cost of Service Allocation Factors

		Extra Capacity		Customer			Fire	
Allocation Method	Base	Max Day	Max Hour	Customer	Meter	GIAA	Protection	Admin
Direct: Base	100%							
Direct: Max Day		100%						
Direct: Max Hour			100%					
Direct: Customer				100%				
Direct: Meters & Services					100%			
Direct: GIAA						100%		
Direct: Fire Protection							100%	
Direct: Admin								100%
Storage	70%	12.9%					17.6%	
Transmission and Distribution	60%	8%	22%	10%				
Base and Max Day (kgal/day)	39284	5107						
Base and Max Day: %	88%	12%						
Base and Max Hour (kgal/day)	39284		14205					
Base and Max Hour: %	73%		27%					
Base, Max Day, Max Hour (kgal/day)	39284	5107	14205					
Base, Max Day, Max Hour: %	67%	9%	24%					
Electricity and Water Purchase	86%			4%				10%

Table 3-12 shows the results of the allocation step of the COSA. The majority of the Rate Revenue Requirement is allocated to Base Consumption. Also of note, there is no debt service allocated to the GIAA Water System, as GWA is not responsible for capital improvements to the GIAA Water System. As described above in Section 3.1.5, the sum of non-rate revenues and revenue adjustments is positive, because the revenue adjustments, which increase the Rate Revenue Requirement, are larger than the non-rate revenues, which decrease the Rate Revenue Requirement.

Table 3-12. Water Cost of Service Analysis - Allocation of Rate Revenue Requirement

	FY 2022		Extra Capacity		Customer		GIAA Water	Fire
	Test Year	Base	Max Day	Max Hour	Customer	Meter	System	Protection
O&M Expenses	51,262,987	37,190,565	2,689,600	1,956,193	5,280,452	3,210,202	475,617	460,359
Debt Service	18,402,947	11,779,665	1,932,649	632,253	289,782	1,697,495	0	2,071,103
Transfers (from) to Reserves	(4,445,849)	(2,914,569)	(403,084)	(539,649)	(247,339)	(90,453)	0	(250,755)
Internally Funded CIP	4,631,107	3,036,019	419,880	562,136	257,646	94,222	0	261,204
Non-Rate Revenues and Revenue Adjustments	341,238	207,715	27,673	19,251	43,046	32,339	4,506	6,708
Total	$70,192,430	$49,299,395	$4,666,718	$2,630,183	$5,623,587	$4,943,805	$480,123	$2,548,619

3.2.4 Water Distribution

As described in Section 2, the final step in the cost of service analysis distributes the allocated revenue requirement among customer classes. The result of the distribution step is the rate revenue requirement for each customer class. Table COS-7 in Appendix A shows the distribution calculations

in detail, and the rate revenue requirement for each water customer class is shown below in Section 3.2.7, Results.

3.2.5 Peaking Factors

A COSA relies on water consumption patterns for each customer class in the Allocation step. Three of the service characteristics used in this COSA are:

- Base Consumption – refers to average water use.
- Max-Day Extra Capacity - refers to the difference between max-day water consumption and average water consumption
- Max-Hour Extra Capacity - refers to the difference between max-hour water consumption and max-day consumption

In this COSA, Base Consumption, Max-Day Extra Capacity, and Max-Hour Extra Capacity are estimated for each customer class. With current metering at GWA, it is only possible to measure water consumption on a monthly basis, which is typical for the water industry. In the absence of measured water consumption on a daily or hourly basis, estimating max-day and max-hour consumption relies on month-to-month variations in metered consumption.

The following paragraphs describe how average and peak water use was used in the COSA. The calculations that support this discussion are found in Table COS-9 in Appendix A.

Analytical Study #1 (Demand Forecast) included the compilation of GWA billing data for each customer class. This data was used to define the FY 22 metered consumption for each customer class, referred to as the Base Consumption.

Figure 3-1 shows a normalized monthly water production for FY 18 and FY 19. For the purposes of this graph, normalization is defined as the monthly water production divided by the two-year average consumption. This graph shows that there are no seasonal peaks in water consumption. Over the two-year period, the month with the highest production (January) had water production that was only 2.6% higher than the average production rate over the entire year.

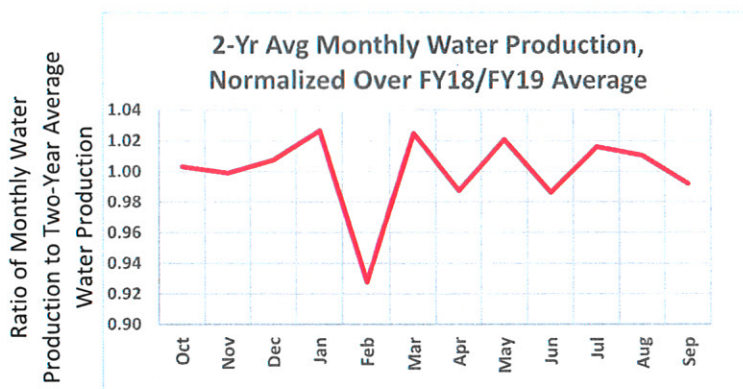

Figure 3-1. Normalized Monthly Metered Consumption During FY 18 and 19

Monthly metered consumption data for each customer class does show some peaking behavior. However, the peaks for individual customer classes occur during different seasons. In FY 19, monthly metered consumption for the residential customer class peaked in September. In February, the Hotel customer class peaked. Commercial accounts peaked in December, and agricultural accounts peaked in May.

Systemwide, the max day water production is estimated to be 1.13 times the average day water production. This peaking factor was calculated from data in GWA's WRMPU. To calculate the Max-Day Extra Capacity for each customer class, the 1.13 peaking factor was applied to the Base Consumption for each customer class, along with an adjustment that recognizes that water losses through leaks are not expected to vary seasonally.

Systemwide, the max hour water demand is estimated to be 1.32 times the max day water production. This peaking factor was determined as part of GWA's WRMPU, where hourly water use was measured over a 50-day period. This analysis showed that during the 11 AM hour, water use was 32 percent higher than the average use during that day.

To calculate the Max-Hour Extra Capacity for each customer class, the 1.32 peaking factor was applied to the estimated max-day demand for each customer class, along with an adjustment that recognizes that water losses through leaks are not expected to vary over the course of a day.

3.2.6 Fire Protection

In a COSA, the term "Fire Protection" is used in the functionalization and allocation steps to refer to the costs incurred by GWA to provide fire protection services. In the distribution step, Fire Protection is split into Public Fire Protection and Private Fire Protection components.

To distribute Fire Protection costs into Public Fire Protection and Private Fire Protection components, the number of "Fire Protection Equivalents" was determined. Fire Protection Equivalents were determined based on a weighting of the diameter of each connection raised to the 2.63 power. The 2.63 exponent is consistent with the AWWA M1 manual, which cites the relationship between the 2.63 exponent and the Hazen-Williams equation for flow through pressure conduits. GWA records the meter size associated with Private Fire Protection services, and for Public Fire Protection services (that is, fire hydrants) a 6-inch diameter is assumed.

In the distribution step, the costs of Public Fire Protection is distributed among customer classes according to the number of meter equivalents, also consistent with methodology published in the AWWA M1 Manual. Currently, GWA does not have a way to recover the costs of providing Public Fire Protection. Public Fire Protection costs are those incurred to supply adequate fire flows through public fire hydrants. Therefore, recovering these costs through water rates is required. Private Fire Protection rates will be developed by others.

3.2.7 Results

In a COSA, a key result is the comparison of the revenue requirement responsibility for each customer class with the revenues generated by rate revenues for each customer class. This comparison allows for identification of which customer classes are paying more than their cost of service, and which customer classes are paying less than their cost of service. This comparison is typically used in water and wastewater Rate Design efforts and in developing rate proposals.

Table 3-13 shows the comparison of the Rate Revenue Requirement for each water customer class with the projected revenues generated by the Proposed FY 22 Rates. The total of Table 3-13 illustrates how the Proposed FY 22 water rates collect more than the FY 22 cost of service.

Table 3-13. Water COS Analysis - Comparison of Rate Revenue Requirement with Revenues for Each Customer Class

Customer Class	FY 22 Test Year Cost of Service	Projected FY 22 Revenues (Proposed FY 22 Rates)	Difference Dollars	Difference Percent
Residential	$47,096,089	$40,506,875	($6,589,214)	-16.27%
Commercial 1+	7,227,445	10,983,420	3,755,975	34.20%
Commercial 2-	820,249	1,288,007	467,758	36.32%
Commercial 3	1,507,422	2,338,108	830,686	35.53%
Hotels	7,405,518	11,792,936	4,387,418	37.20%
Government	4,584,524	7,129,961	2,545,437	35.70%
GIAA Water System	508,858	748,625	239,767	32.03%
Agriculture	941,596	539,362	(402,234)	-74.58%
Irrigation	95,410	59,081	(36,329)	-61.49%
Private Fire Protection	5,321	0	(5,321)	0.00%
Total	$70,192,430	$75,386,375	$5,193,945	6.8898%

Table 3-13 also shows that some water customer classes are currently paying more than their cost of service, including commercial customers, hotels, government customers, and GIAA water system customers. Customer classes paying less than their cost of service include residential, agricultural, and irrigation customers.

Table 3-14 shows a revised comparison, where the revenues under the Proposed FY 22 Rates are decreased by 6.8898 percent to make the revenues equal the cost of service. The inclusion of this adjustment in this COSA report does not indicate any plan to propose or adopt an across-the-board change to water rates. It is presented solely to facilitate the interpretation of COSA results.

Table 3-14. Water COS Analysis - Comparison of Rate Revenue Requirement with Adjusted Revenues for Each Customer Class

Customer Class	FY 22 Test Year Cost of Service	Projected FY 22 Revenues (Proposed FY 22 Rates less 6.8898%)	Difference Dollars	Difference Percent
Residential	$47,096,089	$37,716,046	($9,380,043)	-24.87%
Commercial 1+	7,227,445	10,226,688	2,999,243	29.33%
Commercial 2-	820,249	1,199,266	379,018	31.60%
Commercial 3	1,507,422	2,177,018	669,596	30.76%
Hotels	7,405,518	10,980,430	3,574,913	32.56%
Government	4,584,524	6,638,723	2,054,200	30.94%
GIAA Water System	508,858	697,046	188,189	27.00%
Agriculture	941,596	502,201	(439,394)	-87.49%
Irrigation	95,410	55,010	(40,400)	-73.44%
Private Fire Protection	5,321	0	(5,321)	#DIV/0!
Total	$70,192,430	$70,192,430	$0	0.00%

The COSA results serve as inputs to the rate design proposal that is part of the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. As stated above, the COSA is prepared using a FY 22 test year. The rate design proposal also requires the rate revenue requirement for each customer class to be calculated for FY 23 and FY 24.

The FY 23 and FY 24 rate revenue requirements were estimated as follows:

- Use the combined FY 23 revenue requirement developed in the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. The combined FY 23 revenue requirement is 10.1656 percent higher than the FY 22 revenue requirement.
- Increase the allocated FY 22 revenue requirement by 10.1656 percent to estimate the allocated FY 23 revenue requirement.
- Complete the distribution step for the allocated FY 23 revenue requirement using projected billing determinants for FY 23 as determined in the Demand Forecast Analytical Study.
- Use the combined FY 24 revenue requirement developed in the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. The combined FY 24 revenue requirement is 8.2072 percent higher than the FY 23 revenue requirement.
- Increase the allocated FY 23 revenue requirement by 8.2072 percent to estimate the allocated FY 24revenue requirement.
- Complete the distribution step for the allocated FY 24 revenue requirement using projected billing determinants for FY 24 as determined in the Demand Forecast Analytical Study.

Table 3-15. FY 22 - FY 24 Rate Revenue Requirement for Each Water Customer Class

	Rate Revenue Requirement		
Customer Class	FY 22	FY 23	FY 24
Residential	$47,096,089	$50,348,261	$52,739,532
Commercial 1+	7,227,445	8,115,907	8,960,232
Commercial 2-	820,249	1,008,956	1,208,983
Commercial 3	1,507,422	1,923,230	2,371,566
Hotels	7,405,518	9,284,511	11,307,067
Government	4,584,524	4,931,716	5,223,669
GIAA Water System	508,858	560,446	606,242
Agriculture	941,596	1,043,820	1,137,279
Irrigation	95,410	105,206	113,528
Private Fire Protection	5,321	5,838	6,280
Total	$70,192,430	$77,327,891	$83,674,380

For most customer classes, the rate revenue requirement increases in FY 23 and FY 24 by similar percentages as the combined rate revenue requirement (10.1656 percent in FY 23 and 8.2072 percent in FY 24). The exceptions are the Residential and Hotel customer classes. The FY 23 and FY 24 percentage increases in the Residential customer class revenue requirement are less than the systemwide total because Residential water use is projected to decrease in future years. For Hotels, water use is projected to increase. As a result, the revenue requirement for the Hotel customer class is projected to increase at a greater rate than the systemwide total.

3.3 Wastewater Cost of Service

3.3.1 Customer Classes

As with the water COSA, the term "Customer Classes" refer to groupings of customers created to facilitate the COSA, Rate Design (completed by others), and the other Analytical Studies (completed by others). The term Customer Classes should be distinguished from GWA's Rate Classes. GWA's Rate Classes are those defined by GWA's rate schedule which is adopted by the CCU and approved by the PUC.

As described below, there are differences between the Customer Classes used in this COSA and GWA's Rate Classes. Customer Classes that differ from GWA's Rate Classes should not be considered a policy decision that GWA has, or is intending, on changing their Rate Classes. Changes to GWA's Rate

Classes will be addressed in the Rate Design component of the Analytical Studies, being prepared by others.

Similar to the water rate classes, the wastewater Rate Classes were split into new Customer Classes for the purposes of the COSA. Table 3-16 summarizes the comparison of GWA Rate Classes and COSA Customer Classes, with additional detail provided in Table 3-17.

Table 3-16. Wastewater Customer Classes

Existing Rate Class	COS Customer Classes	Change to Customer Class
Residential	Residential	No Change
Commercial I	Commercial I	No Change
Commercial II + Hotels	Commercial II Hotels	Commercial II and Hotels were separated
Commercial III	Commercial III	No Change
Government + Federal	Government GIAA Navy	Government and Federal customer class was split into three customer classes.
	Septage	New Customer Class
	Leachate	New Customer Class

The Residential and Commercial I Customer Classes remain unchanged. As with the water COSA, Commercial II + Hotels were separated into two customer classes, Commercial II and Hotels. The Hotel customer class was created to be consistent with the Demand Forecast Analytical Study. The 2020 Stipulation required separate demand forecasts for Hotels. Commercial III is unchanged.

From the Government + Federal rate class, a new Customer Class was developed for the Navy, to incorporate contractual requirements described later in this Section, and to facilitate the analysis. The existing contract with the Navy specifies that rates charged to the Navy must exclude laterals and certain capacity increasing capital projects.

The Septage Customer Class was created to facilitate an update to septage rates. Currently, septage haulers are charged a tiered flat fee, based on the size of the delivery truck. Charges per truckload range from $25 to $70, depending on the size of the vehicle. The intention in this COSA is to isolate septage costs to promote equitable cost recovery from septage haulers.

Landfill Leachate is a new Customer Class developed to facilitate the creation of a new rate class. Leachate is currently charged as Commercial, but has lower TSS than commercial wastewater and therefore warrants separate consideration. There are two leachate customers, the Ordot Landfill and the Layzon landfill. Both landfills are connected to the collection system via a pipe, where the leachate is transported to a wastewater treatment plant.

See Table 3-17 below for a summary.

Table 3-17. Wastewater System Customer Classes: Changes from Existing GWA Customer Class Structure

Customer Class	Changes from Current Rate Structure	Reason
Commercial II and Hotels	Commercial II and Hotels are separated	Matches categorization in other Analytical Studies
Navy	Creation of a new customer class	Existing contract specifies that the rates charged to the Navy must exclude laterals and certain capacity increasing capital projects.
Septage	Revision of septage rates	Septage is currently charged a tiered flat fee based on the size of delivery truck. Septage uses treatment plants but not the collection system
Landfill Leachate	Creation of a new customer class	Waste characterization differs from other customers. Specifically, very low TSS.

3.3.2 Functionalization

This section describes the results of the wastewater functionalization step. The methodology is described in Section 2, and additional calculations are included in Appendix A. Table 3-18 below describes how each individual debt issuance is functionalized, based on the specific projects funded by each debt issuance.

Table 3-18. Wastewater System Cost of Service Analysis, Debt Service Functionalization Factors

		Functionalized Amount			
Functionalization Factors	Total	Treatment	Collection	Customer	Admin
Series 2013 and Series 2020B	100.0%	97.8%	2.2%	0.0%	0.0%
Series 2014	100.0%	89.0%	9.9%	0.0%	1.2%
Series 2016	100.0%	91.9%	6.3%	0.0%	1.8%
Series 2017	100.0%	86.3%	8.4%	0.0%	5.3%
Series 2020A	100.0%	21.9%	73.5%	0.0%	4.5%
Capitalized Interest	100.0%	78.3%	19.4%	0.0%	2.3%

Table 3-19 shows the functionalized wastewater Rate Revenue Requirement. The largest component of the Rate Revenue Requirement is for wastewater treatment. As with water, Administrative costs are primarily O&M costs associated with the Business Units shown in Table 3-1 with the four-digit Business Unit number starting with 10, 11, and 12. As described above in Section 3.1.5, the sum of non-rate revenues and revenue adjustments is positive, because the revenue adjustments, which increase the Rate Revenue Requirement, are larger than the non-rate revenues, which decrease the Rate Revenue Requirement.

Table 3-19. Functionalized Wastewater Rate Revenue Requirement

	FY 2022	Functionalized Amount			
Business Unit	Total $	Treatment	Collection	Customer	Admin
O&M Expenses	$28,972,409	$6,951,720	$8,501,158	$1,248,296	$12,271,234
Debt Service	17,473,683	13,426,645	3,640,623	0	406,415
Transfers (from) to Reserves	(3,234,128)	(584,378)	(2,512,888)	0	(136,861)
Internally Funded CIP	3,368,893	608,729	2,617,600	0	142,564
Non-Rate Revenues and Revenue Adjustments	481,186	(5,109)	(21,969)	0	508,265
Total, $	$47,062,043	$20,397,607	$12,224,524	$1,248,296	$13,191,617
Total, %	100.0%	43.3%	26.0%	2.7%	28.0%

3.3.3 Wastewater Allocation

Table 3-20 shows an example of allocation factors used in this COSA. The percentages shown in Table 3-20 are applied to the functionalized revenue requirement as described in Section 2, with more detail included in Table COS-15 in Appendix A.

Table 3-20. Wastewater COS Allocation Factors

Allocation Method	Treatment Flow	Collection Flow	Treatment Flow Less Navy	Collection Flow Less Navy	BOD	BOD Less Navy	TSS	TSS Less Navy	Customer	Admin
Treatment	33.3%				33.3%		33.3%			
Collection		90.0%							10.0%	
Customer									100.0%	
Administrative										100.0%
Sludge Disposal					50.0%		50.0%			
Capacity Increasing Treatment Debt Service			33.3%			33.3%		33.3%		
Treatment Plant Power Purchases	46.7%				24.1%		18.1%		2.1%	9.0%
Collection Power Purchases		80.8%							3.7%	15.5%
Collection System O&M		98.8%		1.2%						

Table 3-21 shows the results of the allocation step. Here, the costs attributed to the various flow service characteristics are shown, as are those attributable to BOD, TSS, and customer. Administrative costs have been distributed among the other service characteristics consistent with industry standards included in the AWWA M1 and WEF M27 manuals. Also apparent in Table 3-21 are the costs (described in further detail below) that are excluded from being charged to the Navy. More details can be found in Appendix A. See Table COS-16 in Appendix A for more details.

As described above in Section 3.1.5, the sum of non-rate revenues and revenue adjustments is positive, because the revenue adjustments, which increase the Rate Revenue Requirement, are larger than the non-rate revenues, which decrease the Rate Revenue Requirement.

Table 3-21. Wastewater Cost of Service Analysis - Allocation of Wastewater Rate Revenue Requirement

	FY22 Total	Treatment Flow	Collection Flow	Treatment Flow Less Navy	Collection Flow Less Navy	BOD	BOD Less Navy	TSS	TSS Less Navy	Customer	Admin
O&M Expenses	28,972,409	4,207,967	14,290,445	0	159,686	3,970,613	0	3,906,799	0	2,436,900	0
Debt Service	17,473,683	4,172,179	3,354,584	409,944	0	4,172,179	409,944	4,172,179	409,944	372,732	0
Transfers (from) to Reserves	(3,234,128)	(203,400)	(2,361,535)	0	0	(203,400)	0	(203,400)	0	(262,393)	0
Internally Funded CIP	3,368,893	211,876	2,459,939	0	0	211,876	0	211,876	0	273,327	0
Non-Rate Revenues and Revenue Adjustments	481,186	30,263	351,359	0	0	30,263	0	30,263	0	39,040	0
Total	$47,062,043	$8,418,884	$18,094,792	$409,944	$159,686	$8,181,530	$409,944	$8,117,716	$409,944	$2,859,605	$0

3.3.4 Wastewater Distribution

As described in Section 2, the final step in the cost of service analysis distributes the allocated revenue requirement among customer classes. The result of the distribution step is the rate revenue requirement for each customer class. Table COS-17 in Appendix A shows the distribution calculations in detail, and the rate revenue requirement for each wastewater customer class is shown below in Section 3.3.7, Results.

3.3.5 Mass Balance

Part of a wastewater COSA is distribution of wastewater strength-related costs to customer classes. Strength-related costs are those associated with the BOD and TSS discharged to the wastewater system from customers. BOD and TSS in sewage from customers is not typically measured, and in order to complete a wastewater COSA, estimates of BOD and TSS concentrations must be made.

This COSA relies on BOD and TSS concentration data used in GWA's 2011 COSA, with some exceptions:

- Leachate BOD and TSS data is obtained from historical sampling completed where the landfill leachate enters the GWA wastewater system.

- Septage BOD and TSS data is obtained from historical data at the NDWWTP septage holding tank, combined with a composite sample taken in January 2021 from the septage holding tank.

A mass balance is performed to check the reasonableness of BOD and TSS concentration assumptions.

The first step in a mass balance is to compare billed wastewater flow with actual treatment plant influent flow. This comparison was done for FY 20, with calculations in the Appendix. This calculation showed that of the wastewater measured at the influent of GWA's five WWTPs, an estimated 37 percent is from infiltration and inflow (I/I) and the remainder is flow from customers.

Applying the estimated flow from customers and the estimated BOD and TSS concentrations produces a calculated BOD and TSS loading. This calculated BOD and TSS loading is compared with the actual BOD and TSS loading at the treatment plants.

The results of the mass balance are the BOD loading at the WWTPs is 8 percent higher than the calculated BOD loading from customers. The TSS loading at the WWTPs is 12 percent lower than the calculated TSS loading from customers. These mass balance results are within the range of reasonableness and indicate that in aggregate, BOD and TSS loading assumptions are reasonable.

3.3.6 Navy

In 1972, GWA's predecessor agency (Public Utility Agency of Guam) entered into a Utility Service Contract with the Department of the Navy. The Contract does not have a termination date. Instead, the contract continues in effect until terminated at the option of the Navy.

This Contract has provisions related to how wastewater service provided by GWA is billed to the Navy. Specifically:

- Section 3(d) states that "in consideration of the fact that the government owns and maintains its own laterals, the rates set forth herein exclude representing the cost of maintaining contractor-owned laterals and the contractor agrees to exclude all such charges and costs from any new rates applicable to the government.
- Section (d) identifies the circumstances under which GWA is allowed to charge the Navy for capital improvements. GWA is allowed to charge for replacement of major portions of the sewerage system serving Navy facilities but is not allowed to charge for replacements that increase the capacity of the system.

In this COSA, costs for maintenance of laterals and costs for capital improvements that increase the capacity of the system were isolated.

Costs associated with maintenance of laterals primarily consist of video inspections, cleaning, and maintenance, and are shown in detail in Table COS-19 in Appendix A. Costs shown in Table COS-19 were isolated using GWA's previous Business Unit structure, and total approximately $160,000 per year, including a proportionate allocation of administrative costs.

Two capacity-increasing projects were isolated: (a) expansion of the Agat-Santa Rita WWTP with incorporation of flows from the Baza Gardens WWTP, and (b) expansion and upgrades to the Umatac-Merizo WWTP.

The total project cost of the Agat-Santa Rita expansion was approximately $67 million, and it increased the capacity from 1.2 to 1.6 million gallons per day (mgd). Therefore, 25%, or approximately $16.7M, of the project was capacity increasing. The project was funded by the 2013 Bonds, of which the bond

proceeds totaled $138.1M. Approximately 12% of the 2013 Bond proceeds was for the Agat-Santa Rita WWTP expansion, and this amount was not charged to the Navy.

Similarly, the Umatac-Merizo WWTP expansion increased the capacity from 0.39 to 0.6 mgd. The cost of the project was approximately $23 million. Approximately 35% of the project cost, or $8.05 million, was capacity increasing. This project was funded by the 2016 Bonds. Approximately 6.24% of the 2016 Bond proceeds was for this project, and it was not charged to the Navy.

3.3.7 Results

Table 3-22 shows the comparison of the Rate Revenue Requirement for each wastewater customer class with the projected revenues generated by the Proposed FY 22 Rates. Table 3-22 shows that the Proposed FY 22 wastewater rates under collect the FY 22 wastewater revenue requirement by approximately 15%.

Table 3-22. Wastewater Cost of Service Analysis - Comparison of Revenue Requirement with Revenues for Each Customer Class

Customer Class	FY 22 Test Year Cost of Service	Projected FY 22 Revenues (Proposed FY 22 Rates)	Difference Dollars	Difference Percent
Residential	$21,552,945	$10,659,438	($10,893,507)	-102.20%
Commercial 1+	4,201,316	3,464,220	(737,096)	-21.28%
Commercial 2-	803,463	1,285,013	481,550	37.47%
Commercial 3	2,193,845	3,063,155	869,310	28.38%
Hotels	6,063,698	9,697,451	3,633,753	37.47%
Government	3,234,734	4,028,860	794,126	19.71%
GIAA Water System	430,564	428,133	(2,431)	-0.57%
Navy	6,879,550	7,498,160	618,610	8.25%
Septage	1,457,645	125,000	(1,332,645)	-1066.12%
Leachate	244,285	647,452	403,167	62.27%
Total	$47,062,043	$40,896,882	($6,165,161)	-15.07%

Table 3-22 shows that the residential wastewater customer class pays approximately $10.7 million under the Proposed FY 22 Rates, compared with a cost of service of over $21 million. Similarly, Commercial I customers are also paying less than their cost of service. With the overall 15.1% under collection noted, Commercial II, Commercial III, Hotels, Government and Navy are paying more than their cost of service. Leachate rates also collect more than the leachate cost of service.

The largest percentage difference between the COS and the revenues generated by customer class is septage. This difference is due to septage rates which do not recover the costs to treat septage at GWA's WWTPs, given the high BOD and TSS associated with septage.

Table 3-23 shows a revised comparison, where the revenues under the Proposed FY 22 Rates are increased by 15.1% to and make the revenues equal the cost of service.

As with Table 3-14 above, this across-the-board increase in rates have not been proposed or adopted by GWA. Its inclusion in this COSA report does not indicate any plan to propose or adopt an across-the-board rate increase of this magnitude. It is presented solely to facilitate the interpretation of COSA results.

Table 3-23. Wastewater Cost of Service Analysis - Comparison of Revenue Requirement with Adjusted Revenues for Each Customer Class

Customer Class	FY 22 Test Year Cost of Service	Projected FY 22 Revenues (Proposed FY 22 Rates + 15.075%)	Difference Dollars	Difference Percent
Residential	$21,552,945	$12,266,337	($9,286,608)	-75.71%
Commercial 1+	4,201,316	3,986,447	(214,868)	-5.39%
Commercial 2-	803,463	1,478,727	675,265	45.67%
Commercial 3	2,193,845	3,524,922	1,331,078	37.76%
Hotels	6,063,698	11,159,331	5,095,634	45.66%
Government	3,234,734	4,636,206	1,401,473	30.23%
GIAA Water System	430,564	492,674	62,109	12.61%
Navy	6,879,550	8,628,500	1,748,950	20.27%
Septage	1,457,645	143,844	(1,313,801)	-913.35%
Leachate	244,285	745,055	500,770	67.21%
Total	$47,062,043	$47,062,043	$0	0.00%

As with the water COSA results, the wastewater COSA results also serve as inputs to the rate design proposal that is part of the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. The wastewater rate design proposal also requires the rate revenue requirement for each customer class to be calculated for FY 23 and FY 24.

The FY 23 and FY 24 rate revenue requirements were estimated as follows:

- Use the combined FY 23 revenue requirement developed in the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. The combined FY 23 revenue requirement is 10.1656 percent higher than the FY 22 revenue requirement.
- Increase the allocated FY 22 revenue requirement by 10.1656 percent to estimate the allocated FY 23 revenue requirement.
- Complete the distribution step for the allocated FY 23 revenue requirement using projected billing determinants for FY 23 as determined in the Demand Forecast Analytical Study.
- Use the combined FY 24 revenue requirement developed in the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. The combined FY 24 revenue requirement is 8.2072 percent higher than the FY 23 revenue requirement.
- Increase the allocated FY 23 revenue requirement by 8.2072 percent to estimate the allocated FY 24 revenue requirement.
- Complete the distribution step for the allocated FY 24 revenue requirement using projected billing determinants for FY 24 as determined in the Demand Forecast Analytical Study.

Table 3-24. FY 22 - FY 24 Rate Revenue Requirement for Each Wastewater Customer Class

Customer Class	Rate Revenue Requirement		
	FY22	FY23	FY24
Residential	$21,552,945	$22,651,392	$23,334,845
Commercial 1+	4,201,316	4,652,787	5,070,481
Commercial 2-	803,463	972,920	1,147,995
Commercial 3	2,193,845	2,759,380	3,352,843
Hotels	6,063,698	7,466,983	8,931,964
Government	3,234,734	3,423,410	3,561,868
GIAA Water System	430,564	469,281	503,485
Navy	6,879,550	7,593,263	8,212,336
Septage	1,457,645	1,585,561	1,690,566
Leachate	244,285	271,191	294,926
Total	$47,062,043	$51,846,168	$56,101,310

3.4 Conclusions

3.4.1 Disaggregation of Combined Water and Wastewater Expenses

As a combined water and wastewater utility, the disaggregation of the rate revenue requirement produced separate rate revenue requirements for water and wastewater. For the combined system, the rate revenue requirement in FY 22 is $117,254,473, as developed in the FY 2022 Comprehensive Review and Update to GWA's Five-Year Financial Plan. FG Solutions disaggregated the combined O&M expenses, debt service, reserves and transfers, IFCIP, and non-rate revenues and revenue adjustments. This disaggregation resulted in separate water and wastewater rate revenue requirements.

From this combined system rate revenue requirement, the FY 22 water rate revenue requirement is $70,192,430, and the FY 22 wastewater rate revenue requirement is $47,062,043. See Table 3-4 for more details.

Separately, the Proposed FY 22 water system rates collect approximately 6.9% more than the water rate revenue requirement. For the wastewater system, the Proposed FY 22 Rates collect approximately 15.1% less than the wastewater rate revenue requirement.

3.4.2 Water Cost of Service

A COSA relies on water consumption patterns for each customer class. Typically, there is no discernable seasonal peak in water production, refer to Figure 3-1. Seasonal variations in water use for individual customer classes do exist, however they occur at different times of the year. In FY 19, monthly metered consumption peaked in September for the Residential customer class, Hotels peaked in February, the Commercial rate classes peaked in December, and the agricultural customer class peaked in May.

Some water customer classes are projected to pay more than their cost of service. These customer classes, in no particular order, are Commercial, Hotels, Government, and GIAA.

Customer classes that are projected to pay less than their cost of service are Residential, Agriculture, and Irrigation, see Table 3-13 for more detail.

3.4.3 Wastewater Cost of Service

The wastewater system has similar variances, where some wastewater customer classes are currently paying more than their cost of service. These customer classes are Commercial II, Commercial III,

Hotels, Government, Navy, and Leachate. The Proposed FY 22 Rates applied to GIAA collect approximately the cost of service for GIAA.

Some wastewater system customer classes are currently collecting less than their cost of service. These customer classes are Residential, Commercial I, and Septage. Septage is of particular interest, as Septage is much stronger wastewater than wastewater from other customer classes. The BOD and TSS is 12,900 and 5,400 mg/L respectively compared with less than 500 mg/L for all other customer classes. GWA's Proposed FY 22 Septage rates collect approximately $125,000 per year. Due to the high strength of Septage, the cost of service is approximately $1.46 million. Refer to Table 3-22 for more detail.

Section 4

Limitations

This document was prepared solely for GWA in accordance with professional standards at the time the services were performed and in accordance with the contract between GWA and BC, Indefinite Delivery/Indefinite Quantity (ID/IQ) For Professional Project/Construction Management Services – Cost of Service Study, Task Order No. 5; and the subcontract between FG Solutions and Brown and Caldwell dated August 10, 2020. This document is governed by the specific scope of work authorized by GWA; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by GWA and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

Appendix A: Cost of Service Analysis

GUAM WATERWORKS AUTHORITY

APPENDIX A

Guam Waterworks Authority

Water and Wastewater Cost of Service Study

Fiscal Year 2022 Test Year

Brown AND Caldwell fg fgSolutions

Tables included in this Appendix

Table C1
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Debt Service Supporting Calculations

Source: GWA, March 2021

2010 Bond (Refunded in 2017)

						Water Functionalization									Wastewater Functionalization			
Line	Project Number and Name		Total Expenditures and Encumbrances	Percent Water	Percent Wastewater	Source and Treatment	Booster Pumping	Storage	T&D	Customer	Meter	GIAA	Fire Protection	Admin	Treatment	Collection	Customer	Admin
1	PW 05-01	Ground Water Disinfection	$465,008	100%		100.0%												
2	PW 05-05	"A" Series Well Transmission Line	$475,709	100%					100.0%									
3	PW 05-06	Water Booster Pump Station	$500,000	100%			100.0%											
4	PW 05-07	Meter Replacement Program	$10,181,030	100%							100.0%							
5	PW 05-08	Barrigada Tank Repair/Replacement	$5,404,348	100%				100.0%										
6	PW 05-09	Leak Detection	$17,037	100%					100.0%									
7	PW 05-10	Potable Water System Planning	$210,487	100%		25.0%		25.0%	25.0%				25.0%					
8	PW 05-11	Implement Ground Water Rule	$1,699,998	100%		100.0%												
9	PW 05-12	Brigade II (Ugum Lift) BPS Upgrade	$252,820	100%			100.0%											
10	PW 05-13	Deep Well Rehabilitation	$548,000	100%		100.0%												
11	PW 05-14	New Deep Wells at Down Hard	$485,743	100%		100.0%												
12	PW 05-15	Rehabilitation of Asan Springs	$591,234	100%		100.0%												
13	PW 05-16	Master Meters	$1,489,957	100%		100.0%												
14	PW 09-01	Ugum Water Treatment Plant Intake	$610,340	100%		100.0%												
15	PW 09-02	Water Wells	$0	100%		100.0%												
16	PW 09-03	Water Distribution System	$3,174,688	100%					100.0%				0.0%					
17	PW 09-04	Pressure Zone Realignment /	$0	100%			100.0%											
18	PW 09-05	Northern System Water Distribution	$0	100%					100.0%				0.0%					
19	PW 09-06	Central Water Distribution System 2005	$709,033	100%					100.0%				0.0%					
20	PW 09-07	Southern Water Distribution System	$0	100%					100.0%				0.0%					
21	PW 09-08	Mechanical/Electrical Equipment	$1,200,000	100%		80.0%	20.0%											
22	PW 09-09	Water Reservoir Internal/External	$2,150,000	100%				100.0%										
23	PW 09-10	Water Reservoir Internal/External	$0	100%				100.0%										
24	PW 09-11	Water System Reservoirs 2005 Improve	$1,050,000	100%				100.0%										
25	PW 11-01	Distribution System Upgrades	$449,046	100%					100.0%									
26	PW 11-02	Ugum Water Treatment Plant Reservoir	$0	100%		50.0%		50.0%										
27	PW 12-01	Water Audit Program & Water Loss Cor	$78,459	100%										100.0%				
28	PW 12-02	Production Plan / Reduce Navy Purchas	$99,900	100%		100.0%												
29	PW 12-03	Hydraulic Assessment of Tank	$491,841	100%				100.0%										
30	PW 12-04	Agana Heights & Chaot Tanks	$4,647,524	100%				100.0%										
31	PW 12-05	Tank Major Repair Yigo#1 Mangilao#2 A	$1,842,787	100%				100.0%										
32	PW 12-06	Tank Major Repair Yigo#1 Mangilao#2 A	$0	100%				100.0%										
33	PW 12-07	Assessment of malojloj Elevated & Yigo	$200,000	100%				100.0%										
34	PW 12-08	Public Water System Asset Inventory/Co	$78,386	100%										100.0%				
35	PW 12-09	Public Water System GIS & Mapping	$50,000	100%										100.0%				
36	WW 05-04	Wastewater System Planning	$1,492,857		100%													100.0%
37	WW 05-05	Wastewater Vehicles	$209,795		100%													100.0%
38	WW 05-07	NDWWTP - Chlorine Tanks	$457,982		100%										100.0%			
39	WW 09-07	Tumon Bay Sewer Upgrades	$0		100%											100.0%		
40	WW 09-06	Wastewater Collection System Repl/Reh	$904,432		100%											100.0%		
41	WW 09-08	Facilities Plan/Design for Baza Gardens	$1,266,757		100%										100.0%			
42	WW 09-10	Facilities Plan/Design for Agat-Santa Rit	$899,630		100%										100.0%			
43	WW 11-02	Priority 1 Sewer Upgrades – Baza Garde	$0		100%										100.0%			
44	WW 11-03	Baza Gardens STP Replacement	$1,445,363		100%										100.0%			
45	WW 11-04	Facilities Plan/Design for Umatac Meriz	$853,858		100%										100.0%			
46	WW 11-08	Agat/Santa Rita STP Replacement	$2,216,473		100%										100.0%			
47	WW 12-01	Northern District WWTP Primary Treatm	$11,596,400		100%										100.0%			
48	WW 12-02	Biosolids Management Plan	$162,084		100%										100.0%			
49	WW 12-03	Agana WWTP Interim Measures	$11,321,978		100%										100.0%			
50	WW 12-04	I&I SSES Southern	$798,995		100%											100.0%		
51	WW 12-05	I&I SSES Central	$793,585		100%											100.0%		
52	WW 12-06	I&I SSES Northern	$0		100%											100.0%		
53	WW 12-07	Umatac Merizo Replacement	$248,018		100%											100.0%		
54	WW 17-02	Biosolids Management Plan	$1,000,000		100%										100.0%			

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55	EE 05-01	Well Electrical Protection	$0	100%		100.0%													
56	EE 05-02	SCADA Pilot Project	$19,812	50%	50%	40.0%	20.0%	40.0%							50.0%	50.0%			
57	EE 09-02	Electrical Upgrade - Water Wells	$354,227	100%		100%													
58	EE 09-03	Electrical Upgrade - Water Booster	$0	100%			100%												
59	EE 09-04	Electrical Upgrade -Water Booster	$0	100%			100%												
60	EE 09-05	Electrical Upgrade - Other Water	$0	100%		80.0%	20.0%												
61	EE 09-06	SCADA Improvements – Phase 1	$209,492	50%	50%	40.0%	20.0%	40.0%							50%	50%			
62	EE 09-07	SCADA Improvements – Phase 2	$1,033,380	50%	50%	40.0%	20.0%	40.0%							50%	50%			
63	EE 09-08	SCADA Improvements – Phase 3	$24,956	50%	50%	40.0%	20.0%	40.0%							50%	50%			
64	EE 09-09	SCADA Improvements – Phase 4	$0	50%	50%	40.0%	20.0%	40.0%							50%	50%			
65	MC 05-01	Laboratory Modernization	$0	50%	50%	50.0%			50.0%						100.0%				
66	MC 05-02	Land Survey	$476,081	50%	50%									100.0%					100.0%
67	MC 09-01	General Plant Improvements / Water	$7,202,237	100%										100.0%					
68																			
69	Subtotal, 2010 Bond		$84,141,764	$47,591,698	$36,550,066	$7,614,556	$1,121,584	$16,096,649	$4,878,134	$0	$10,181,030	$0	$52,622	$7,647,123	$31,542,435	$3,066,939	$0	$1,940,692	
70	As Percent			56.6%	43.4%	16.0%	2.4%	33.8%	10.2%	0.0%	21.4%	0.0%	0.1%	16.1%	86.3%	8.4%	0.0%	5.3%	

2013 Bond: Refunded as Series 2020B

			Total Expenditures and			Water Functionalization									Wastewater Functionalization			
Line	Project Number and Name		Encumbrances	Percent Water	Percent Wastewater	Source and Treatment	Booster Pumping	Storage	T&D	Customer	Meter	GIAA	Fire Protection	Admin	Treatment	Collection	Customer	Admin
71	PW 05-03	Santa Rita Springs Booster Pump Rehab	$100,000	100%			100%											
72	PW 05-05	"A" Series Well Transmission Line	$369,846	100%					100%									
73	PW 05-06	Water Booster Pump Station	$1,666,793	100%			100%											
74	PW 05-07	Meter Replacement Program	$854,479	100%							100%							
75	PW 05-08	Barrigada Tank Repair/Replacement	$4,795,897	100%				100%										
76	PW 05-09	Leak Detection	($0)	100%					100%									
77	PW 05-10	Potable Water System Planning	$624,000	100%		25.0%		25.0%	25.0%				25.0%					
78	PW 05-11	Implement Ground Water Rule	$981,776	100%		100%												
79	PW 05-13	Deep Well Rehabilitation	$177,786	100%		100%												
80	PW 05-14	New Deep Wells at Down Hard	$0	100%		100%												
81	PW 05-16	Master Meters	$657,187	100%		100%												
82	PW 09-01	Ugum Water Treatment Plant Intake	$783,332	100%		100%												
83	PW 09-02	Water Wells	$2,155,987	100%		100%												
84	PW 09-03	Water Distribution System	$10,542,028	100%					100%				0%					
85	PW 09-04	Pressure Zone Realignment /	$337,110	100%					100%				0%					
86	PW 09-08	Mechanical/Electrical Equipment	$421,306	100%		80.0%	20.0%											
87	PW 09-10	Water Reservoir Internal/External	$0	100%				100%										
88	PW 09-11	Water System Reservoirs 2005 Improve	$13,823,375	100%				100%										
89	PW 11-02	Ugum Water Treatment Plant Reservoir	$0	100%		100%												
90	PW 12-04	Agana Heights & Chaot Tanks	$1,330,287	100%				100%										
91	PW 12-05	Tank Major Repair Yigo#1 Mangilao#2 A	$11,604,625	100%				100%										
92	PW 12-06	Tank Major Repair Yigo#1 Mangilao#2 A	$0	100%				100%										
93	PW 12-07	Assessment of malojloj Elevated & Yigo	$485,117	100%				100%										
94	PW 14-01	Fire Hydrant Replacement Program	$0	100%									100%					
95	WW 05-04	Wastewater System Planning	$625,595		100%										50.0%	50.0%		
96	WW 09-01	Lift Station Upgrades	$538,385		100%											100.0%		
97	WW 09-06	Wastewater Collection System Repl/Reh	$650,455		100%											100.0%		
98	WW 11-03	Baza Gardens STP Replacement	$9,320,002		100%										100.0%			
99	WW 11-04	Facilities Plan/Design for Umatac-Meriz	$371,699		100%										100.0%			
100	WW 11-08	Agat/Santa Rita STP Replacement	$66,933,594		100%										100.0%			
101	WW 12-03	Agana WWTP Interim Measures	$718,076		100%										100.0%			
102	WW 12-07	Umatac Merizo Replacement	$0		100%										100.0%			
103	EE 09-01	Wastewater Pump Station Electrical Up	$99,861		100%											100.0%		
104	EE 09-02	Electrical Upgrade - Water Wells	$1,489,704	100%		100%												
105	EE 09-03	Electrical Upgrade - Water Booster	$0	100%			100%											
106	EE 09-04	Electrical Upgrade -Water Booster	$977	100%			100%											

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107	EE 09-05	Electrical Upgrade - Other Water	$60,700	100%		80.0%	20.0%												
108	EE 09-08	SCADA Improvements – Phase 3	$722,359	50%	50%	40.0%	20.0%	40.0%							50.0%	50.0%			
109	EE 09-09	SCADA Improvements – Phase 4	$0	50%	50%	40.0%	20.0%	40.0%							50.0%	50.0%			
110	MC 05-01	Laboratory Modernization	$1,170,822	50%	50%	50.0%			50.0%						100.0%				
111	MC 05-02	Land Survey	$1,053	50%	50%									100.0%					100.0%
112	MC 09-01	General Plant Improvements / Water	$3,654,116	100%										100.0%					
113																			
114	Subtotal, 2013 Bond		$138,068,329	$57,863,544	$80,204,784	$7,224,554	$1,936,407	$32,339,773	$11,697,689	$0	$854,479	$0	$156,000	$3,654,642	$78,422,169	$1,782,089	$0	$526	
115	As Percent			41.9%	58.1%	12.5%	3.3%	55.9%	20.2%	0.0%	1.5%	0.0%	0.3%	6.3%	97.8%	2.2%	0.0%	0.0%	

2014 Bond

			Total Expenditures and			Water Functionalization									Wastewater Functionalization			
Line	Project Number and Name		Encumbrances	Percent Water	Percent Wastewater	Source and Treatment	Booster Pumping	Storage	T&D	Customer	Meter	GIAA	Fire Protection	Admin	Treatment	Collection	Customer	Admin
116		Agana Treatment Plant	$11,065,512		100.0%										100%			
117		Agana Outfall	$10,127,198		100.0%										100%			
118		Northern District (Outfall)	$10,251,423		100.0%										100%			
119		Northern District WWTP Upgrade	$173,681		100.0%										100%			
120		Baza Gardens Wastewater Treatment Pl	$297,177		100.0%										100%			
121		Interim Disinfection Facilities	$3,437,311		100.0%										100%			
122		Electrical Protection	$1,512,483	50.0%	50.0%	80.0%	20.0%								100%			
123		Well Vulnerability Reduction	$185,522	100.0%		100.0%												
124		Old Agat Wastewater Collection (I/I Red	$1,931,659		100.0%											100%		
125		Chaot WW Pump Station/Collection Sys	$399,120		100.0%											100%		
126		Lift Station Upgrades	$149,895		100.0%											100%		
127		Collection Line Upgrades	$62,755		100.0%											100%		
128		"A" Well Transmission Line	$3,825,717	100.0%					100%				0%					
129		Santa Rita Springs - Booster Pump Reha	$306,841	100.0%			100.0%											
130		Fena Bypass Transmission line	$160,913	100.0%					100%				0%					
131		Storage Additions	$0	100.0%				100.0%										
132		Booster Station Upgrades	$66,734	100.0%			100.0%											
133		Mangilao Tank Repair	$397,933	100.0%				100.0%										
134		Ugum Tank Replacement	$0	100.0%				100.0%										
135		Ugum WTPlant Refurbishment ($1.724,$	$6,588,473	100.0%		100.0%												
136		Barrigada Tank Repair/Replacement	$65,019	100.0%				100.0%										
137		Water Reservoir Condition Assessment	$1,249,227	100.0%				100.0%										
138		EarthTech Well Buyout	$5,975,000	100.0%		100.0%												
139		Water Wastewater Master Plan	$4,881,308	50.0%	50.0%	33.3%	16.7%	16.7%	16.7%				16.7%		50%	50%		
140		Laboratory Modernization	$135,055	50.0%	50.0%	100.0%									100%			
141		Land Survey	$576,134	50.0%	50.0%									100.0%				100%
142		GWUDI Study	$260,430	100.0%		100.0%												

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143		Vehicles	$1,280,000	50.0%	50.0%	33.3%	16.7%	16.7%	16.7%				16.7%		33.33%	33.33%		33.33%
144		Generation Equipment	$880,000	50.0%	50.0%	80.0%	20.0%								50%	50%		
145		Leak Detection/Line Replacement	$5,988,494	100.0%					74.0%				26.0%					
146		Automated Meter Reading	$17,468,359	100.0%							100.0%							
147																		
148	Subtotal, 2014 Bond		$89,699,373	$47,171,153	$42,528,220	$15,060,830	$1,126,266	$2,225,621	$8,931,558	$0	$17,468,359	$0	$2,070,451	$288,067	$37,829,731	$4,197,089	$0	$501,400
149	As Percent			52.6%	47.4%	31.9%	2.4%	4.7%	18.9%	0.0%	37.0%	0.0%	4.4%	0.6%	89.0%	9.9%	0.0%	1.2%

2016 Bond

			Original Approved Project Cost	Percent Water	Percent Wastewater	Water Functionalization									Wastewater Functionalization			
Line	Project Number and Name					Source and Treatment	Booster Pumping	Storage	T&D	Customer	Meter	GIAA	Fire Protection	Admin	Treatment	Collection	Customer	Admin
150	PW 05-06	Water Booster Pump Station	$0	100%			100%											
151	PW 05-07	Meter Replacement Program	$1,400,000	100%							100%							
152	PW 05-08	Barrigada Tank Repair/Replacement	$0	100%				100%										
153	PW 05-09	Leak Detection	$0	100%					100%									
154	PW 05-10	Potable Water System Planning	$876,214	100%										100.0%				
155	PW 05-13	Deep Well Rehabilitation	$110,013	100%		100%												
156	PW 05-14	New Deep Wells at Down Hard	$0	100%		100%												
157	PW 05-16	Master Meters	$1,951,539	100%		100%												
158	PW 09-01	Ugum Water Treatment Plant Intake	$0	100%		100%												
159	PW 09-02	Water Wells	$209,703	100%		100%												
160	PW 09-03	Water Distribution System	$0	100%					100%				0%					
161	PW 09-04	Pressure Zone Realignment /	$1,141,000	100%					100%				0%					
162	PW 09-08	Mechanical/Electrical Equipment	$0	100%		80.00%	20.00%											
163	PW 09-10	Water Reservoir Internal/External	$800,000	100%				100%										
164	PW 09-11	Water System Reservoirs 2005 Improve	$54,006,381	100%				100%										
165	PW 11-02	Ugum Water Treatment Plant Reservoir	$0	100%				100%										
166	PW 12-01	Water Audit Program & Water Loss Con	$499,134	100%					100%									
167	PW 12-04	Agana Heights & Chaot Tanks	$1,220,000	100%				100%										
168	PW 12-05	Tank Major Repair Yigo#1 Mangilao#2 A	$1,822,133	100%				100%										
169	PW 12-06	Tank Major Repair Yigo#1 Mangilao#2 A	$7,300,000	100%				100%										
170	PW 14-01	Fire Hydrant Replacement Program	$1,196,377	100%									100%					
171	WW 05-04	Wastewater System Planning	$312,983		100%													100.0%
172	WW 09-01	Lift Station Upgrades	$1,477,152		100%											100.0%		
173	WW 09-06	Wastewater Collection System Repl/Reh	$601,459		100%											100.0%		
174	WW 11-03	Baza Gardens STP Replacement	$22,582,803		100%										100.0%			
175	WW 11-04	Facilities Plan/Design for Umatac-Meriz	$252,105		100%										100.0%			
176	WW 11-08	Agat/Santa Rita STP Replacement	$2,002,331		100%										100.0%			
177	WW 12-03	Agana WWTP Interim Measures	$0		100%										100.0%			
178	WW 12-07	Umatac Merizo Replacement	$20,929,043		100%										100.0%			
179	EE 09-01	Wastewater Pump Station Electrical Up	$0		100%											100.0%		
180	EE 09-02	Electrical Upgrade - Water Wells	$0	100%		100%												
181	EE 09-03	Electrical Upgrade - Water Booster	$0	100%			100%											
182	EE 09-08	SCADA Improvements – Phase 3	$802,003	50%	50%	40.0%	20.0%	40.0%							50.0%	50.0%		
183	EE 09-09	SCADA Improvements – Phase 4	$3,471,289	50%	50%	40.0%	20.0%	40.0%							50.0%	50.0%		
184	MC 05-01	Laboratory Modernization	$1,127,000	50%	50%	50%			50%						100.0%			
185	MC 05-02	Land Survey	$1,252,317	50%	50%									100.0%				100.0%
186	MC 09-01	General Plant Improvements / Water	$1,367,961	100%										100.0%				
187	MC 15-01	Information Technology Integration Imp	$359,498	50%	50%	33.3%	16.7%	16.7%	16.7%				16.7%		50.0%	50.0%		
188																		
189	Subtotal, 2016 Bond		$129,070,437	$77,406,508	$51,663,929	$3,467,580	$457,287	$66,033,130	$1,951,842	$0	$1,400,000	$0	$1,226,335	$2,870,334	$47,487,979	$3,236,808		$939,142
190	As Percent			60.0%	40.0%	4.5%	0.6%	85.3%	2.5%	0.0%	1.8%	0.0%	1.6%	3.7%	91.9%	6.3%		1.8%

2020A Bond

			Adjusted Project Cost	Percent Water	Percent Wastewater	Water Functionalization									Wastewater Functionalization			
Line	Project Number and Name					Source and Treatment	Booster Pumping	Storage	T&D	Customer	Meter	GIAA	Fire Protection	Admin	Treatment	Collection	Customer	Admin
191	PW 05-06	Water Booster Pump Station	$700,000	100.0%			100.0%											

Table C1
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192	PW 05-09	Leak Detection	$400,000	100.0%					100.0%							
193	PW 05-10	Potable Water System Planning	$400,000	100.0%								100.0%				
194	PW 05-13	Deep Well Rehabilitation	$350,000	100.0%		100.0%										
195	PW 05-14	New Deep Wells at Down Hard	$500,000	100.0%		100.0%										
196	PW 05-15	Rehabilitation of Asan Springs	$550,000	100.0%		100.0%										
197	PW 09-01	Ugum Water Treatment Plant Intake	$600,000	100.0%		100.0%										
198	PW 09-02	Water Wells	$500,000	100.0%		100.0%										
199	PW 09-03	Water Distribution System Pipe Replace	$2,250,000	100.0%					100%		0%					
200	PW 09-11	Water System Reservoirs 2005 Improve	$25,900,000	100.0%				100.0%								
201	PW 11-02	Ugum Water Treatment Plant Reservoir	$7,500,000	100.0%				100.0%								
202	PW 12-06	Tank Replacement Piti & Hyundai	$6,500,000	100.0%				100.0%								
203	MP-PW-BPS-01	Rehabilitate and Replace BPSs	$409,000	100.0%			100.0%									
204	MP-PW-BPS-02	Nimitz Hill Upper BPS	$48,000	100.0%			100.0%									
205	MP-PW-Pipe-04	Hyundai Well Piping	$500,000	100.0%		100.0%										
206	MP-PW-Pipe-05	Kaiser Zone Looping	$300,000	100.0%			100.0%									
207	MP-PW-Pipe-06	Mangilao Pressure Zone Realignment	$300,000	100.0%			100.0%									
208	MP-PW-Pipe-07	Mataguac BPS Suction Piping	$500,000	100.0%			100.0%									
209	MP-PW-Pipe-10	Miscellaneous Piping Projects	$200,000	100.0%					100%		0%					
210	MP-PW-Pipe-11	Miscellaneous Piping Connections	$200,000	100.0%					100%		0%					
211	MP-PW-Pipe-12	Rehabilitation and Replacement Progra	$2,000,000	100.0%					100%		0%					
212	MP-PW-Pipe-13	2-Inch Pipe Replacement Program	$3,330,000	100.0%					100%		0%					
213	MP-PW-Pipe-15	PRV Rehab and Replacement	$2,050,000	100.0%					100.0%							
214	MP-PW-Pipe-16	Valve Exercise, Repair, and Replacemen	$250,000	100.0%					100.0%							
215	MP-PW-Pipe-17	Cross Island Highway Piping	$100,000	100.0%					100%		0%					
216	MP-PW-SWTP-01	Ugum SWTP Intake Cleaning Project	$380,000	100.0%		100.0%										
217	MP-PW-SWTP-02	Ugum SWTP Intake Modifications	$1,174,000	100.0%		100.0%										
218	MP-PW-SWTP-03	Ugum SWTP Reliability Improvements	$1,150,000	100.0%		100.0%										
219	MP-PW-Tank-22	Existing Tank Inspections	$150,000	100.0%				100.0%								
220	MP-PW-Tank-23	Recurring Tank Inspections	$400,000	100.0%				100.0%								
221	MP-PW-Well-01	Well Rehabilitation Program	$3,600,000	100.0%		100.0%										
222	MP-PW-Well-03	Capacity Enhancement – Well Exploratio	$500,000	100.0%		100.0%										
223	MP-PW-Well-05	Wellhead Protection Program	$300,000	100.0%		100.0%										
224	MP-PW-Well-06	Well Repair Program	$1,200,000	100.0%		100.0%										
225	WW 09-06	Wastewater Collection System Repl/ Re	$1,400,000		100.0%									100.0%		
226	WW 05-04	Wastewater System Planning	$150,000		100.0%										100.0%	
227	MP-WW-FM-01	Force Main Rehabilitation/Replacement	$100,000		100.0%									100.0%		
228	MP-WW-FM-02	Replace Yigo Lift Station Force Main	$200,000		100.0%									100.0%		
229	MP-WW-FM-03	Route 1 Asan Force Main Rehabilitation	$2,124,000		100.0%									100.0%		
230	MP-WW-FM-04	Hagåtña WWTP Force Main Rehabilitati	$6,600,000		100.0%									100.0%		
231	MP-WW-MH-01	Manhole Rehabilitation Program	$350,000		100.0%									100.0%		
232	MP-WW-Pipe-01	Gravity Pipe Rehabilitation/Replacemen	$1,970,000		100.0%									100.0%		
233	MP-WW-Pipe-03	Route 1 Piti Pipe Rehabilitation/Replace	$940,000		100.0%									100.0%		
234	MP-WW-Pipe-04	Southern Link Pump Station Pipe Rehab	$657,000		100.0%									100.0%		
235	MP-WW-Pipe-17	Mamajanao Capacity Replacement	$814,000		100.0%								100.0%			
236	MP-WW-Pipe-26	Finile Drive Rehabilitation - Agat	$813,000		100.0%										100.0%	
237	MP-WW-Pipe-27	Septic/Cesspool System Reduction Prog	$350,000		100.0%										100.0%	
238	MP-WW-Pump-01	Lift Station Rehabilitation/Replacement	$8,320,000		100.0%									100.0%		
239	MP-WW-Pump-02	Tumon Basin - Fujita Lift Station Analysi	$9,600,000		100.0%									100.0%		
240	MP-WW-Pump-03	Replacement of Former Navy Pump Stat	$1,301,000		100.0%									100.0%		
241	MP-WW-WWTP-08	Northern District WWTP Completion	$7,500,000		100.0%								100.0%			
242	MP-WW-WWTP-09	Ocean Outfall Inspection Program	$100,000		100.0%								100.0%			
243	EE 09-02	Electrical Upgrade - Water Wells	$90,000	100.0%		100.0%										
244	EE 09-04	Electrical Upgrade -Water Booster	$150,000	100.0%			100.0%									
245	EE 09-05	Electrical Upgrade - Other Water	$100,000	100.0%								100.0%				
246	EE 09-07	SCADA Improvements – Phase 2	$45,000	50.0%	50.0%	40.0%	20.0%	40.0%					50.0%	50.0%		
247	EE 09-08	SCADA Improvements – Phase 3	$25,000	50.0%	50.0%	40.0%	20.0%	40.0%					50.0%	50.0%		
248	MP-Gen-EE-01	SCADA Implementation Phase A2 – Initi	$4,250,000	50.0%	50.0%	40.0%	20.0%	40.0%					50.0%	50.0%		
249	MP-Gen-Misc-01	GWA Systems Planning	$550,000	50.0%	50.0%							100.0%	50.0%	50.0%		
250	MP-Gen-Misc-02B	WRMP Update (Interim Update)	$200,000	50.0%	50.0%							100.0%	50.0%	50.0%		
251	MP-Gen-Misc-03	Surveying and Property Delineation	$250,000	50.0%	50.0%							100.0%	50.0%	50.0%		

Table C1
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Debt Service Supporting Calculations

252	MP-Gen-Misc-04	Information Technology Improvements	$1,650,000	50.0%	50.0%									100.0%	50.0%	50.0%			
253	MP-Gen-Misc-05	GWA Infrastructure Improvements	$2,500,000	50.0%	50.0%	33.3%	16.7%	16.7%	16.7%				16.7%		50.0%	50.0%			
254	MP-Gen-Misc-06	GPWA Fleet Maintenance Facility	$500,000	50.0%	50.0%									100.0%	50.0%	50.0%			
255	MP-Gen-Misc-07	Mobile Equipment Replacement Progra	$800,000	50.0%	50.0%									100.0%					100.0%
256	MP-Gen-Misc-08	General Plant Improvements	$1,000,000	50.0%	50.0%									100.0%					100.0%
257	MP-Gen-Misc-09	Security and Resilience Program	$200,000	50.0%	50.0%									100.0%					100.0%
258	MP-PW-Misc-01	South Guam Water Supply Study	$100,000	100.0%		100.0%													
259	MP-PW-Misc-02	Master Meter Implementation and Ong	$750,000	100.0%		100.0%													
260	MP-PW-Misc-04	OneGuam Programxx	$100,000	100.0%		100.0%													
261	MP-PW-Misc-05	Leak Detection Assistance	$150,000	100.0%					100.0%										
262	WW 09-01	Lift station upgrades	$1,050,000		100.0%											100.0%			
263	MP-WW-Misc-01B	Update Wastewater Collection System M	$50,000		100.0%											100.0%			
264	MP-WW-Misc-02	I/I and SSES Assessments	$50,000		100.0%											100.0%			
265	MP-WW-Misc-03	Miscellaneous Wastewater Improvemer	$500,000		100.0%										50.0%	50.0%			
266	MP-WW-Misc-04	Fats, Oils, and Grease Study	$50,000		100.0%										50.0%	50.0%			
267																			
268	Subtotal, 2020 Bond		$123,590,000	$72,616,000	$50,974,000	$13,624,667	$3,047,333	$41,522,333	$11,138,333	$0	$0	$0	$208,333	$3,075,000	$11,181,500	$37,479,500	$0	$2,313,000
269	As Percent			58.8%	41.2%	18.8%	4.2%	57.2%	15.3%	0.0%	0.0%	0.0%	0.3%	4.2%	21.9%	73.5%	0.0%	4.5%

Table C2
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
CIP Disaggregation and Functionalization

						Water Functionalization									Wastewater Functionalization			
Line	Project #	Project Name	FY 22-24 Expenditures and Encumbrances $000	Percent Water	Percent Wastewater	Source and Treatment	Booster Pumping	Storage	T&D	Customer	Meter	GIAA	Fire Protection	Admin	Treatment	Collection	Customer	Admin
1	PW 09-09	Water Reservoir Internal/External	0.0	100.0%				100.0%										
2	PW 05-08	Barrigada Tank Repair/Replacement	0.0	100.0%				100.0%										
3	PW 09-11	Water System Reservoirs 2005 Improvements	1,700.0	100.0%				100.0%										
4	PW 11-02	Ugum Water Treatment Plant Reservoir	0.0	100.0%				100.0%										
5	PW 12-04	Agana Heights & Chaot Tanks	0.0	100.0%				100.0%										
6	PW 12-05	Tank Major Repair Yigo #1, Mangilao #2, Astumbo #1	0.0	100.0%				100.0%										
7	PW 12-06	Tank Replacement Piti & Hyundai	0.0	100.0%				100.0%										
8	MP-PW-Tank-22	Existing Tank Inspections	0.0	100.0%				100.0%										
9	MP-PW-Tank-23	Recurring Tank Inspections	642.0	100.0%				100.0%										
10	WW 11-03	Baza Gardens STP Replacement	0.0		100.0%										100.0%			
11	WW 11-08	Agat/ Santa Rita STP Replacement	0.0		100.0%										100.0%			
12	WW 12-01	Northern District WWTP Primary Treatment Upgrades	0.0		100.0%										100.0%			
13	WW 12-07	Umatac Merizo STP Replacement	0.0		100.0%										100.0%			
14	WW 05-04	Wastewater System Planning	0.0		100.0%													100.0%
15	WW 09-01	Lift station upgrades	4,200.0		100.0%											100.0%		
16	WW 09-06	Wastewater Collection System Repl/ Rehabilitation	4,000.0		100.0%											100.0%		
17	WW 17-02	Northern District WWTP Secondary Treatment Upgrad	0.0		100.0%										100.0%			
18	MP-WW-Pipe-01	Gravity Pipe Rehabilitation/Replacement Program	18,093.0		100.0%											100.0%		
19	MP-WW-Pipe-02	Barrigada Pump Station Pipe Rehabilitation/Replacem	3,611.0		100.0%											100.0%		
20	MP-WW-Pipe-03	Route 1 Piti Pipe Rehabilitation/Replacement	0.0		100.0%											100.0%		
21	MP-WW-Pipe-04	Southern Link Pump Station Pipe Rehabilitation/Repla	0.0		100.0%											100.0%		
22	MP-WW-Pipe-05	Agana Heights Pipe Replacement	2,669.0		100.0%											100.0%		
23	MP-WW-Pipe-06	Northern District Route 1 Capacity Replacement - Pha	1,150.0		100.0%											100.0%		
24	MP-WW-Pipe-11	Route 16 Capacity Replacement	550.0		100.0%										100.0%			
25	MP-WW-Pipe-12	Barrigada Capacity Replacement	45.0		100.0%										100.0%			
26	MP-WW-Pipe-17	Mamajanao Capacity Replacement	2,600.0		100.0%										100.0%			
27	MP-WW-Pipe-21	Baza Gardens Capacity Replacement - Phase 1	292.0		100.0%										100.0%			
28	MP-WW-Pipe-24	Umatac-Merizo Capacity Replacement	200.0		100.0%										100.0%			
29	MP-WW-Pipe-25	Piping Near Bayside Lift Station	250.0		100.0%											100.0%		
30	MP-WW-Pipe-26	Finile Drive Rehabilitation - Agat	0.0		100.0%											100.0%		
31	MP-WW-MH-01	Manhole Rehabilitation Program	700.0		100.0%											100.0%		
32	MP-WW-FM-01	Force Main Rehabilitation/Replacement Program	1,578.0		100.0%											100.0%		
33	MP-WW-FM-02	Replace Yigo Lift Station Force Main	1,829.0		100.0%											100.0%		
34	MP-WW-FM-03	Route 1 Asan Force Main Rehabilitation/Replacement	0.0		100.0%											100.0%		
35	MP-WW-FM-04	Hagåtña WWTP Force Main Rehabilitation/Replaceme	0.0		100.0%											100.0%		
36	MP-WW-Pump-01	Lift Station Rehabilitation/Replacement Program	13,214.0		100.0%											100.0%		
37	MP-WW-Pump-02	Tumon Basin - Fujita Lift Station Analysis	0.0		100.0%											100.0%		
38	MP-WW-Pump-03	Replacement of Former Navy Pump Station (Donut Ho	0.0		100.0%											100.0%		
39	MP-WW-WWTP-08	Northern District WWTP Completion	5,300.0		100.0%										100.0%			
40	MP-WW-Misc-01B	Update Wastewater Collection System Model (Contin	200.0		100.0%											100.0%		
41	MP-WW-Misc-02	I/I and SSES Assessments	400.0		100.0%											100.0%		
42	DoD-01	NDWWTP Secondary Treatment Capacity 12MGD	0.0		100.0%										100.0%			
43	MP-Gen-Misc-08	General Plant Improvements	700.0		100.0%													100.0%
44	PW 05-09	Leak Detection	70.0	100.0%					100.0%									
45	PW 05-10	Potable Water System Planning	0.0	100.0%										100.0%				
46	PW 09-03	Water Distribution System Pipe Replacement and Upg	6,141.0	100.0%					100.0%									
47	PW 14-01	Fire Hydrant Replacement Program	750.0	100.0%									100.0%					
48	MP-PW-Pipe-01	Astumbo Zone Piping	4,668.0	100.0%					100.0%									
49	MP-PW-Pipe-04	Hyundai Well Piping	0.0	100.0%		100.0%												
50	MP-PW-Pipe-05	Kaiser Zone Looping	0.0	100.0%					100.0%									
51	MP-PW-Pipe-06	Mangilao Pressure Zone Realignment	0.0	100.0%			100.0%											
52	MP-PW-Pipe-07	Mataguac BPS Suction Piping	0.0	100.0%			100.0%											
53	MP-PW-Pipe-09	Yigo, Santa Rosa Zone Realignment	2,342.0	100.0%					100.0%									
54	MP-PW-Pipe-10	Miscellaneous Piping Projects	694.0	100.0%					100.0%									
55	MP-PW-Pipe-11	Miscellaneous Piping Connections	194.0	100.0%					100.0%									

Table C2
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CIP Disaggregation and Functionalization

56	MP-PW-Pipe-12	Rehabilitation and Replacement Program	14,457.0	100.0%					100.0%						
57	MP-PW-Pipe-13	2-Inch Pipe Replacement Program	0.0	100.0%					100.0%						
58	MP-PW-Pipe-14	Asbestos Cement Pipe Replacement Program	9,050.0	100.0%					100.0%						
59	MP-PW-Pipe-15	PRV Rehab and Replacement	3,778.0	100.0%					100.0%						
60	MP-PW-Pipe-16	Valve Exercise, Repair, and Replacement Program	480.0	100.0%					100.0%						
61	MP-PW-Pipe-17	Cross Island Highway Piping	1,401.0	100.0%					100.0%						
62	MP-PW-BPS-01	Rehabilitate and Replace BPSs	450.0	100.0%			100.0%								
63	MP-PW-BPS-02	Nimitz Hill Upper BPS	0.0	100.0%			100.0%								
64	MP-PW-Misc-02	Master Meter Implementation and Ongoing Meter Re	2,168.0	100.0%						100.0%					
65	MP-PW-Misc-03	Hydrant Condition Assessment and Maintenance	2,620.0	100.0%							100.0%				
66	MP-PW-Misc-05	Leak Detection Assistance	0.0	100.0%					100.0%						
67	PW 09-01	Ugum Water Treatment Plant Intake	500.0	100.0%		100.0%									
68	MP-PW-SWTP-01	Ugum SWTP River Intake Cleaning Project	0.0	100.0%		100.0%									
69	MP-PW-SWTP-02	Ugum SWTP Intake Modifications	0.0	100.0%		100.0%									
70	MP-PW-SWTP-03	Ugum SWTP Reliability Improvements	0.0	100.0%		100.0%									
71	MP-PW-SWTP-04	Ugum SWTP 7-Year Improvement Project	3,150.0	100.0%		100.0%									
72	MP-PW-Well-05	Wellhead Protection Program	660.0	100.0%		100.0%									
73	MP-PW-Well-06	Well Repair Program	3,424.0	100.0%		100.0%									
74	DoD-3	Rehabilitation and New NGLA Monitoring Wells	0.0	100.0%		100.0%									
75	MP-WW-Pipe-27	Septic/Cesspool System Reduction Program	7,350.0		100.0%									100.0%	
76	MP-WW-WWTP-04	Pago Socio WWTP Pump Station Conversion	2,700.0		100.0%								100.0%		
77	MP-WW-WWTP-09	Ocean Outfall Inspection Program	0.0		100.0%								100.0%		
78	MP-WW-Misc-03	Miscellaneous Wastewater Improvements	1,000.0		100.0%										100.0%
79	MP-WW-Misc-04	Fats, Oils, and Grease Study	0.0		100.0%								100.0%		
80	MC 05-01	Laboratory Modernization	0.0										100.0%		
81	MP-Gen-Misc-09	Security and Resilience Program	250.0	50.0%	50.0%							100.0%			100.0%
82	PW 05-13	Deep Well Rehabilitation	4,000.0	100.0%		100.0%									
83	PW 05-14	New Deep Wells at Down Hard	0.0	100.0%		100.0%									
84	PW 05-15	Rehabilitation of Asan Springs	0.0	100.0%		100.0%									
85	PW 09-02	Water Wells	2,000.0	100.0%		100.0%									
	MP-PW-Pipe-13	2-inch pipe replacement program	3,250.0	100.0%					100.0%						
86	MP-PW-Well-03	Capacity Enhancement – Well Exploration Program	1,150.0	100.0%		100.0%									
87	MP-PW-Well-04	Capacity Enhancement – Well Development and Cons	4,379.0	100.0%		100.0%									
88	WW 17-01	Wastewater Sewer System Expansion	0.0		100.0%									100.0%	
89	DoD-02	Northern Systems Wastewater System	0.0		100.0%									100.0%	
90	MC 09-01	General Plant Improvements / Water	1,400.0	100.0%								100.0%			
91	PW 05-06	Water Booster Pump Station	2,100.0	100.0%			100.0%								
92	PW 05-07	Meter Replacement Program	0.0	100.0%						100.0%					
93	PW 05-12	Brigade II (Ugum Lift) BPS Upgrade	0.0	100.0%			100.0%								
94	PW 05-16	Master Meters	0.0	100.0%						100.0%					
95	PW 09-04	Pressure Zone Realignment / Development 2005 Impr	500.0	100.0%					100.0%						
96	PW 12-01	Water Audit Program & Water Loss Control Plan	0.0	100.0%								100.0%			
97	MP-PW-Pipe-02	Route 1 Astumbo Zone Piping	3,845.0	100.0%					100.0%						
98	MP-PW-Pipe-03	Harmon Cliffline Piping to Route 1	424.0	100.0%					100.0%						
99	MP-PW-Pipe-08	Nimitz Lower BPS Piping	1,521.0	100.0%			100.0%								
100	MP-PW-BPS-03	Route 15 BPS	86.0	100.0%					100.0%						
101	MP-PW-Well-01	Well Rehabilitation Program	7,980.0	100.0%				100.0%							
102	MP-PW-Well-02	Well Equipment Overhaul Program	2,500.0	100.0%				100.0%							
103	WW 09-11	WWTP Priority 1 Upgrades	0.0		100.0%								100.0%		
104	EE 09-02	Electrical Upgrade - Water Wells	0.0	100.0%				100.0%							
105	EE 09-04	Electrical Upgrade -Water Booster	0.0	100.0%				100.0%							
106	EE 09-05	Electrical Upgrade - Other Water	0.0	100.0%				100.0%							
107	EE 09-07	SCADA Improvements – Phase 2	0.0	50.0%	50.0%	40.0%	20.0%	40.0%					50.0%	50.0%	
108	EE 09-08	SCADA Improvements – Phase 3	2,000.0	50.0%	50.0%	40.0%	20.0%	40.0%					50.0%	50.0%	
109	EE 09-09	SCADA Improvements – Phase 4	0.0	50.0%	50.0%	40.0%	20.0%	40.0%					50.0%	50.0%	
110	MP-Gen-EE-01	SCADA Implementation Phase A2 – Initial Project Com	7,995.0	50.0%	50.0%	40.0%	20.0%	40.0%					50.0%	50.0%	
111	MP-Gen-EE-02	SCADA Implementation Phase B – Additional Sites	700.0	50.0%	50.0%	40.0%	20.0%	40.0%					50.0%	50.0%	
112	MP-Gen-EE-04	SCADA System Improvement Program	200.0	50.0%	50.0%	40.0%	20.0%	40.0%					50.0%	50.0%	
113	MC 15-01	Information Technology Intergration Improvements	900.0	50.0%	50.0%							100.0%			100.0%
114	MP-Gen-Misc-01	GWA Systems Planning	750.0	50.0%	50.0%							100.0%			100.0%

Table C2
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
CIP Disaggregation and Functionalization

115	MP-Gen-Misc-04	Information Technology Improvements		350.0	50.0%	50.0%									100.0%			100.0%
116	MP-Gen-Misc-05	GWA Infrastructure Improvements		250.0	50.0%	50.0%									100.0%			100.0%
117	MP-Gen-Misc-07	Mobile Equipment Replacement Program		500.0	50.0%	50.0%									100.0%			100.0%
118	MP-PW-Misc-01	South Guam Water Supply Study		0.0	100.0%		100.0%											
119	MP-PW-Misc-04	OneGuam Program		135.0	100.0%		100.0%											
120	MP-Gen-Misc-02A	WRMP Update (Comprehensive Update)		100.0	50.0%	50.0%									100.0%			100.0%
121	MP-Gen-Misc-02B	WRMP Update (Interim Update)		0.0	50.0%	50.0%									100.0%			100.0%
122	MP-Gen-Misc-03	Surveying and Property Delineation		250.0	50.0%	50.0%									100.0%			100.0%
123	MP-Gen-Misc-06	GPWA Fleet Maintenance Facility		0.0	50.0%	50.0%									100.0%			100.0%
124		Water Loss Study		7,903.0	100.0%				100.0%									
125	Total		$, thousands	$189,388	$109,635	$79,754	$21,577	$5,161	$15,001	$59,283	$0	$2,168	$0	$3,370	$3,075	$14,411	$61,968	$0	$3,375
126	As Percent				57.9%	42.1%	19.7%	4.7%	13.7%	54.1%	0.0%	2.0%	0.0%	3.1%	2.8%	18.1%	77.7%	0.0%	4.2%
127	math check, should = $0, compares total with source data			0.0														

Table C3
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Combined O&M Expenses, Water and Wastewater

Business Unit	Account Description	FY 2021 Approved Budget	FY 2022	FY 2023 Projected	FY 2024 Projected	% Water	% Wastewater	$ Water	$ Wastewater
1000 - Company Wide Power Purchases	Power Purchases	12,985,577	15,545,238	15,719,768	15,850,992	84%	16%	$12,997,373	$2,547,865
1000 - Company Wide Water Purchases	Water Purchases	8,623,306	8,632,851	8,891,837	9,158,592	100%	0%	$8,632,851	$0
1000 - Company Wide Salaries & Wages	Salaries & Wages	310,532	0	0	0	55%	45%	$0	$0
1000 - Company Wide Medical/Dental/Life (DB)	Medical/Dental/Life (DB)	2,800,628	3,376,901	3,515,616	3,661,109	55%	45%	$1,861,091	$1,515,810
1000 - Company Wide Retiree COLA	Retiree COLA	582,552	735,117	784,867	837,984	55%	45%	$405,140	$329,976
1000 - Company Wide Bad Debt	Bad Debt	2,552,609	2,912,784	3,209,714	3,473,242	55%	45%	$1,605,305	$1,307,479
1000 - Company Wide Capitalized Materials	Capitalized Materials	0	(80,850)	0	0	58%	42%	-$46,803	-$34,047
1000 - Company Wide Depreciation Expense	Depreciation Expense	0							
1000 - Company Wide Capitalized Labor - Salaries	Capitalized Labor - Salaries	0							
1000 - Company Wide Capitalized Labor - Benefits	Capitalized Labor - Benefits	0							
Total Business Unit 1000 - Company Wide		**27,855,204**	**31,122,040**	**32,121,801**	**32,981,920**			$25,454,958	$5,667,082
Total Business Unit 1001 - CCU		**402,052**	**226,294**	**240,240**	**247,484**	55%	45%	$124,716	$101,578
Total Business Unit 1100 - General Manager		**1,276,242**	**912,435**	**930,394**	**954,163**	55%	45%	$502,865	$409,570
Total Business Unit 1101 - Asset Management		**715,761**	**656,503**	**830,407**	**848,259**	41%	59%	$271,446	$385,057
Total Business Unit 1102 - Internal Audit		**163,755**	**183,332**	**192,447**	**196,241**	55%	45%	$101,038	$82,293
Total Business Unit 1103 - Legal Counsel		**281,129**	**552,013**	**593,046**	**631,458**	55%	45%	$304,228	$247,785
Total Business Unit 1104 - Communications		**213,056**	**234,394**	**251,097**	**257,319**	55%	45%	$129,180	$105,214
1105 - Finance	Salaries & Wages	1,770,586	1,648,274	1,827,814	1,864,370			$0	$0
1105 - Finance	Holiday Pay	16,294	13,186	14,112	14,915			$0	$0
1105 - Finance	Night Differential Pay	11,639	6,593	7,311	7,457			$0	$0
1105 - Finance	Overtime Pay	69,831	38,736	44,320	45,207			$0	$0
1105 - Finance	Vacancies (Funded)	0	56,759	0	0			$0	$0
1105 - Finance	Retirement (DC)	495,764	479,503	511,788	522,024			$0	$0
1105 - Finance	Life Insurance	5,510	5,265	5,460	5,460			$0	$0
1105 - Finance	Hospital Insurance	95,700	161,460	167,440	167,440			$0	$0
1105 - Finance	Dental Insurance	7,047	9,315	9,660	9,660			$0	$0
1105 - Finance	Medicare	25,674	23,900	26,503	27,033			$0	$0
1105 - Finance	Office Supplies	14,721	10,565	10,581	11,567			$0	$0
1105 - Finance	Office Equipment	8,201	8,118	9,101	9,949			$0	$0
1105 - Finance	Electrical	12	0	0	0			$0	$0

Table C3
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Combined O&M Expenses, Water and Wastewater

Business Unit	Account Description	FY 2021 Approved Budget	FY 2022	FY 2023 Projected	FY 2024 Projected	% Water	% Wastewater	$ Water	$ Wastewater
1105 - Finance	Cleaning supplies	37	0	0	0			$0	$0
1105 - Finance	Building Rental	478,223	389,753	401,445	413,489			$0	$0
1105 - Finance	Storage Rental	18,000	16,200	16,686	17,187			$0	$0
1105 - Finance	Auto	37,840	34,342	35,372	36,434			$0	$0
1105 - Finance	General Liability	128,330	132,744	136,726	140,828			$0	$0
1105 - Finance	Crime	5,245	4,681	4,822	4,966			$0	$0
1105 - Finance	Property	703,685	626,116	644,899	664,246			$0	$0
1105 - Finance	D&O	16,265	14,210	14,636	15,075			$0	$0
1105 - Finance	Cyber	28,859	30,434	31,347	32,287			$0	$0
1105 - Finance	Toll Charges (Long Distance)	67	85	88	90			$0	$0
1105 - Finance	Workers' Compensation	5,336	0	0	0			$0	$0
1105 - Finance	Subscriptions	3,427	509	524	540			$0	$0
1105 - Finance	Merchant Fees - Online and PBP CC Fees	120,069	0	0	0			$0	$0
1105 - Finance	Coupon Charges	50,073	63,155	65,050	67,001			$0	$0
1105 - Finance	Bank Charges	2,955	4,250	4,378	4,509			$0	$0
1105 - Finance	Postage (Billing)	230,632	198,220	204,167	210,292			$0	$0
1105 - Finance	Bond Agent and Trustee Fees	76,265	88,030	90,670	93,391			$0	$0
1105 - Finance	Banking Supplies	3,560	3,655	4,640	4,779			$0	$0
1105 - Finance	Annual Dues - Professional Memberships	1,888	2,852	2,937	3,025			$0	$0
1105 - Finance	Merchant Fees - Retail CC Sales Fees	432,348	459,000	472,770	486,953			$0	$0
1105 - Finance	Bank Charges - Sweep Fees	747	612	630	649			$0	$0
1105 - Finance	Collection Fees	0	0	48,153	49,597			$0	$0
1105 - Finance	Auditing Fees	90,709	67,500	69,525	71,611			$0	$0
1105 - Finance	Financial Services	9,281	117,432	120,955	124,584			$0	$0
1105 - Finance	Training	0	11,348	8,170	8,415			$0	$0
1105 - Finance	Travel	0	4,845	9,981	10,280			$0	$0
1105 - Finance	Printing & Copying	11,459	0	0	0			$0	$0
1105 - Finance	Courier Services	19,381	11,985	11,662	12,012			$0	$0
1105 - Finance	Repair & Maintenance - Office Equipment	0	1,184	1,152	1,186			$0	$0
1105 - Finance	Rating Fee	10,547	9,000	9,270	9,548			$0	$0
1105 - Finance	Repository Fee	4,570	2,250	2,318	2,387			$0	$0
1105 - Finance	Software Maintenance - Contract Collector	1,582	1,350	1,391	1,432			$0	$0
1105 - Finance	Internships	6,792	5,589	5,757	5,929			$0	$0
Total Business Unit 1105 - Finance		**5,019,151**	**4,763,002**	**5,054,209**	**5,177,805**	55%	45%	$2,625,005	$2,137,997
Total Business Unit 1200 - Administrative Services - AGMAS		**0**	**189,869**	**199,375**	**203,279**	55%	45%	$104,641	$85,228
Total Business Unit 1210 - Procurement & Supply		**967,484**	**992,320**	**1,047,625**	**1,069,306**	55%	45%	$546,891	$445,429

Table C3
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Combined O&M Expenses, Water and Wastewater

Business Unit	Account Description	FY 2021 Approved Budget	FY 2022	FY 2023 Projected	FY 2024 Projected	% Water	% Wastewater	$ Water	$ Wastewater
Total Business Unit 1220 - Customer Care		1,760,829	371,661	389,604	397,048	55%	45%	$204,831	$166,829
Total Business Unit 1221 - Customer Service		963,190	1,391,732	1,459,935	1,487,526	59%	41%	$818,929	$572,803
Total Business Unit 1222 - Collections		147,012	428,136	447,988	456,974	59%	41%	$251,926	$176,210
Total Business Unit 1223 - Field Support/Meter Installation		245,384	727,223	883,248	906,188	100%	0%	$727,223	$0
Total Business Unit 1224 - Meters - Reading Unit		319,220	396,177	430,762	440,910	100%	0%	$396,177	$0
Total Business Unit 1225 - Meter Test Facility		317,852	242,251	253,591	258,368	100%	0%	$242,251	$0
Total Business Unit 1230 - Information Technology		2,410,719	2,970,252	3,144,439	3,228,874	55%	45%	$1,636,977	$1,333,275
Total Business Unit 1240 - Human Resources		1,155,358	815,826	858,195	948,469	55%	45%	$449,622	$366,205
Total Business Unit 1300 - Compliance - AGM-CS		938,541	772,370	852,361	872,113	55%	45%	$425,672	$346,698
Total Business Unit 1301 - Lab		1,167,561	1,521,743	1,703,311	1,914,414	55%	45%	$838,669	$683,074
Total Business Unit 1302 - Safety & Inspections		0	350,889	423,724	437,730	55%	45%	$193,383	$157,505
Total Business Unit 1500 - Operations Administration - AGMO & SCC/Dispatch		774,766	1,350,848	1,578,427	1,609,125	52%	48%	$707,425	$643,424
Total Business Unit 1510 - Production		692,669	324,820	353,404	361,810	100%	0%	$324,820	$0
Total Business Unit 1511 - Deepwells		1,108,098	1,654,937	1,319,583	1,982,691	100%		$1,654,937	$0
Total Business Unit 1512 - Surface & Springs		86,529	1,113,786	1,162,680	1,211,026	100%		$1,113,786	$0
Total Business Unit 1514 - Disinfection		1,718,570	1,399,590	1,608,096	1,639,860	100%		$1,399,590	$0

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Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Combined O&M Expenses, Water and Wastewater

Business Unit	Account Description	FY 2021 Approved Budget	FY 2022	FY 2023 Projected	FY 2024 Projected	% Water	% Wastewater	$ Water	$ Wastewater
Total Business Unit 1520 - W - Distribution		165,854	186,774	204,808	209,266	100%		$186,774	$0
Total Business Unit 1521 - Leak Detection		151,449	187,851	204,492	211,018	100%		$187,851	$0
Total Business Unit 1522 - Pressure Line Unit		2,867,714	2,772,992	3,151,821	3,282,998	100%		$2,772,992	$0
Total Business Unit 1523 - Reservoirs		0	36,991	143,975	148,294	100%		$36,991	$0
Total Business Unit 1524 - Water Pump Stations		1,183,790	1,333,524	1,467,767	1,511,227	100%		$1,333,524	$0
Total Business Unit 1530 - WW Collection		150,914	221,605	256,680	263,149		100%	$0	$221,605
Total Business Unit 1531 - Gravity Lines		0	0	0	0		100%	$0	$0
Total Business Unit 1532 - WW Pump Stations		4,442,378	4,151,121	4,377,653	4,490,850		100%	$0	$4,151,121
Total Business Unit 1533 - CCTV/Hot Spots		673,689	742,007	800,407	819,567		100%	$0	$742,007
Total Business Unit 1540 - Treatment		3,044,404	1,791,350	1,548,150	1,580,261		100%	$0	$1,791,350
Total Business Unit 1542 - Central		606,412	579,385	657,606	672,673		100%	$0	$579,385
Total Business Unit 1541 - Northern		643,963	919,579	1,014,063	1,035,437		100%	$0	$919,579
Total Business Unit 1543 - Southern		551,916	730,594	758,578	774,933		100%	$0	$730,594
Total Business Unit 1551 - Construction		0	562,751	1,148,218	1,208,475	58%	42%	$325,770	$236,981
Total Business Unit 1553 - Fleet Maintenance		2,010,070	2,041,538	2,261,054	2,324,379	64%	36%	$1,306,585	$734,954
Total Business Unit 1554 - Instrumentation & Electrical		1,232,480	1,425,485	1,633,718	1,689,071	55%	45%	$785,619	$639,866

Table C3
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Combined O&M Expenses, Water and Wastewater

Business Unit	Account Description	FY 2021 Approved Budget	FY 2022	FY 2023 Projected	FY 2024 Projected	% Water	% Wastewater	$ Water	$ Wastewater
Total Business Unit 1400 - Engineering		2,338,760	2,333,261	2,615,657	2,667,256	59%	41%	$1,372,948	$960,314
Total Business Unit 1404 - Planning/Special Projects		1,194,660	1,217,635	1,277,576	1,302,418	55%	45%	$671,068	$546,567
Incremental O&M, Affordability Program			5,250,000	5,170,600	5,325,718	55%	45%	$2,893,401	$2,356,599
Incremental O&M, Water Loss Program (Reduction in Purchased Water $)			(2,161,721)	(2,784,921)	(3,191,637)	100%		-$2,161,721	
Incremental O&M, Septic Tank Study, BU 1404			248,230	208,997	83,047		100%		$248,230
Total FY 22 Projected O&M		71,958,585	80,235,396	84,446,887	87,128,763				

Table W O&M
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Projected Water O&M Expenses

Line	Business Unit	FY21	FY22	FY23	FY24
1	1000 - Company Wide Power Purchases	10,857,241	12,997,373	13,143,298	13,253,015
2	1000 - Company Wide Water Purchases	8,623,306	8,632,851	8,891,837	9,158,592
3	1000 - Company Wide Salaries & Wages	171,142	0	0	0
4	1000 - Company Wide Medical/Dental/Life (DB)	1,543,493	1,861,091	1,937,541	2,017,725
5	1000 - Company Wide Retiree COLA	321,058	405,140	432,559	461,833
6	1000 - Company Wide Bad Debt	1,406,804	1,605,305	1,768,950	1,914,187
7	1000 - Company Wide Capitalized Materials	0	(46,803)	0	0
8	1000 - Company Wide Depreciation Expense	0	0	0	0
9	1000 - Company Wide Capitalized Labor - Salaries	0	0	0	0
10	1000 - Company Wide Capitalized Labor - Benefits	0	0	0	0
11	**Total Business Unit 1000 - Company Wide**	**22,923,044**	**25,454,958**	**26,174,184**	**26,805,352**
12					
21	**Total Business Unit 1001 - CCU**	**221,581**	**124,716**	**132,402**	**136,395**
22					
47	**Total Business Unit 1100 - General Manager**	**703,368**	**502,865**	**512,762**	**525,862**
48					
61	**Total Business Unit 1101 - Asset Management**	**295,947**	**271,446**	**343,350**	**350,731**
62					
73	**Total Business Unit 1102 - Internal Audit**	**90,249**	**101,038**	**106,062**	**108,153**
74					
90	**Total Business Unit 1103 - Legal Counsel**	**154,937**	**304,228**	**326,842**	**348,012**
91					
108	**Total Business Unit 1104 - Communications**	**117,420**	**129,180**	**138,386**	**141,815**
109					
156	**Total Business Unit 1105 - Finance**	**2,766,175**	**2,625,005**	**2,785,496**	**2,853,613**
157					
158	**Total Business Unit 1200 - Administrative Services - AGMAS**	**0**	**104,641**	**109,880**	**112,032**
159					
176	**Total Business Unit 1210 - Procurement & Supply**	**533,204**	**546,891**	**577,371**	**589,320**
177					
196	**Total Business Unit 1220 - Customer Care**	**970,435**	**204,831**	**214,720**	**218,823**
197					
208	**Total Business Unit 1221 - Customer Service**	**566,764**	**818,929**	**859,061**	**875,297**
209					
220	**Total Business Unit 1222 - Collections**	**86,505**	**251,926**	**263,607**	**268,895**
221					
232	**Total Business Unit 1223 - Field Support/Meter Installation**	**245,384**	**727,223**	**883,248**	**906,188**
233					

Table W O&M
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Projected Water O&M Expenses

Line	Business Unit	FY21	FY22	FY23	FY24
244	Total Business Unit 1224 - Meters - Reading Unit	319,220	396,177	430,762	440,910
245					
257	Total Business Unit 1225 - Meter Test Facility	317,852	242,251	253,591	258,368
258					
296	Total Business Unit 1230 - Information Technology	1,328,605	1,636,977	1,732,976	1,779,510
297					
317	Total Business Unit 1240 - Human Resources	636,746	449,622	472,972	522,724
318					
338	Total Business Unit 1300 - Compliance - AGM-CS	517,252	425,672	469,757	480,643
339					
360	Total Business Unit 1301 - Lab	643,471	838,669	938,735	1,055,080
361					
362	Total Business Unit 1302 - Safety & Inspections	0	193,383	233,525	241,243
363					
364	Total Business Unit 1500 - Operations Administration - AGMO & SCC/Dispatch	405,737	707,425	826,605	842,681
365					
375	Total Business Unit 1510 - Production	692,669	324,820	353,404	361,810
376					
398	Total Business Unit 1511 - Deepwells	1,108,098	1,654,937	1,319,583	1,982,691
399					
406	Total Business Unit 1512 - Surface & Springs	86,529	1,113,786	1,162,680	1,211,026
407					
420	Total Business Unit 1514 - Disinfection	1,718,570	1,399,590	1,608,096	1,639,860
421					
428	Total Business Unit 1520 - W - Distribution	165,854	186,774	204,808	209,266
429					
440	Total Business Unit 1521 - Leak Detection	151,449	187,851	204,492	211,018

Table W O&M
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Projected Water O&M Expenses

Line	Business Unit	FY21	FY22	FY23	FY24
441					
442	Total Business Unit 1522 - Pressure Line Unit	2,867,714	2,772,992	3,151,821	3,282,998
443					
444	Total Business Unit 1523 - Reservoirs	0	36,991	143,975	148,294
445					
465	Total Business Unit 1524 - Water Pump Stations	1,183,790	1,333,524	1,467,767	1,511,227
466					
474	Total Business Unit 1530 - WW Collection	0	0	0	0
475					
478	Total Business Unit 1531 - Gravity Lines	0	0	0	0
479					
480	Total Business Unit 1532 - WW Pump Stations	0	0	0	0
481					
496	Total Business Unit 1533 - CCTV/Hot Spots	0	0	0	0
497					
508	Total Business Unit 1540 - Treatment	0	0	0	0
509					
532	Total Business Unit 1542 - Central	0	0	0	0
533					
549	Total Business Unit 1541 - Northern	0	0	0	0
550					
566	Total Business Unit 1543- Southern	0	0	0	0
567					
568	Total Business Unit 1551 - Construction	0	325,770	664,690	699,572
569					
610	Total Business Unit 1553 - Fleet Maintenance	1,286,445	1,306,585	1,447,074	1,487,603
611					
629	Total Business Unit 1554 - Instrumentation & Electrical	679,249	785,619	900,381	930,888
630					
651	Total Business Unit 1400 - Engineering	1,376,183	1,372,948	1,539,116	1,569,478
652					
665	Total Business Unit 1404 - Planning/Special Projects	658,406	671,068	704,103	717,794
666					
667	Total, GWA Budgeted Expenses	45,818,853	50,531,307	53,658,284	55,825,172
668	Table Excludes Incremental O&M, which are addressed in Table COS-4				

Table COS-1
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water System Cost of Service Analysis, FY 2022 Test Year - Functionalization Factors

Line No.	Functionalization Factors		Total	Source and Treatment	Booster Pumping	Storage	T&D	Customer	Meter	GIAA Water System	Fire Protection	Admin	Notes
1	Direct: Source and Treatment		100.0%	100%							0%		
2	Direct: Booster Pumping		100.0%		100.0%								
3	Direct: Storage		100.0%			100.0%							
4	Direct: T&D w/ FP		100.0%				100.0%				0%		
5	Direct: T&D		100.0%				100%						
6	Direct: Customer		100.0%					100%					
7	Direct: Meter		100.0%						100%				
8	Direct: Fire Protection		100.0%								100.0%		
9	Direct: GIAA		100.0%							100%			
10	Direct: Admin		100.0%									100%	
11													
12	Net Plant: Amount		$224,812,968	84,069,484	$3,167,567	$33,549,025	$72,675,521	$183,655	$21,352,605	$0	$3,449,742	$6,365,369	
13	Net Plant: %		100.0%	37.4%	1.4%	14.9%	32.3%	0.1%	9.5%	0.0%	1.5%	2.8%	
14													
15	Total O&M		100.0%	46.8%	6.2%	0.5%	8.1%	3.3%	2.9%	0.4%	0.3%	31.3%	
16													
17	Power Purchased: %		100.0%	88.6%	11.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
18													
22	O&M: Business Units 6600-6851, 6853: Amount		$21,151,957	$6,069,360	$1,957,177	$85,848	$3,780,419	$1,070,855	$1,372,431	$221,497	$147,744	$6,446,628	
23	O&M: Business Units 6600-6851, 6853: Amount		100.0%	28.7%	9.3%	0.4%	17.9%	5.1%	6.5%	1.0%	0.7%	30.5%	
24													
25	CIP		100%	19.7%	4.7%	13.7%	54.1%	0.0%	2.0%	0.0%	3.1%	2.8%	
26	Water Laboratory		100%	50%			50%						
27	Finance Business Unit		100%	7%	0%	3%	6%	18%	2%	0%	0%	64%	
28	BU 1500 - Operations Admin	as BU 1500s and 1400s	100%	36%	12%	1%	24%	0%	0%	2%	1%	25%	
29	Business Unit 6853 - Electrical	per GWA phone call, 12/2	100%	66.67%	33.33%								
30	Source/Treatment and Booster Pumping		100%	50%	50%								
31	Business Unit 1511 - Deepwells	Table COS9	100%	87.3%						12.7%			
32	Business Unit 1522 - Pressure Line Unit	Old BU6831 Isolates FP$	100%				95.3%				4.7%		
33	Series 2013 and Series 2020B		100%	12.5%	3.3%	55.9%	20.2%	0.0%	1.5%	0.0%	0.3%	6.3%	
34	Series 2014		100%	31.9%	2.4%	4.7%	18.9%	0.0%	37.0%	0.0%	4.4%	0.6%	
35	Series 2016		100%	4.5%	0.6%	85.3%	2.5%	0.0%	1.8%	0.0%	1.6%	3.7%	
36	Series 2017		100%	16.0%	2.4%	33.8%	10.2%	0.0%	21.4%	0.0%	0.1%	16.1%	
37	Series 2020A		100%	18.8%	4.2%	57.2%	15.3%	0.0%	0.0%	0.0%	0.3%	4.2%	
38	Capitalized Interest (weighted average of all previous debt svc)		100%	13.4%	2.2%	56.1%	11.4%	0.0%	9.2%	0.0%	1.1%	6.6%	

Table COS-2
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water System Cost of Service Analysis, FY 2022 Test Year - Functionalization of Water System Plant

Line No.		GL NO	FY 2020 Net Book Value	Functionalized Amount: Source and Treatment	Booster Pumping	Storage	T&D	Customer	Meter	GIAA Water System	Fire Protection	Admin	T COS-1 Line No. Reference
1	Land & Land Rights SSPP	520.30302	$52,300	52,300	0	0	0	0	0	0	0	0	1
2	Land & Land Rights WTP	520.30303	1,137,188	1,137,188	0	0	0	0	0	0	0	0	1
3	Structure and Imp-SSPP	520.30402	55,242,761	55,242,761	0	0	0	0	0	0	0	0	1
4	Structure and Imp-GP	520.30405	8,808,104	4,404,052	0	0	4,404,052	0	0	0	0	0	26
5	Lake, river	520.30602	206,483	206,483	0	0	0	0	0	0	0	0	1
6	Wells and Springs	520.30702	10,075,277	10,075,277	0	0	0	0	0	0	0	0	1
7	Supply Mains	520.30902	501,963	501,963	0	0	0	0	0	0	0	0	1
8	Power Gen. Equipt.	520.31002	1,313,184	1,313,184	0	0	0	0	0	0	0	0	1
9	Pumping Equipt.	520.31102	5,345,341	2,672,670	2,672,670	0	0	0	0	0	0	0	30
10	Pumping Equipt. WTP	520.31103	439,232	439,232	0	0	0	0	0	0	0	0	1
11	Pumping Equipt. TD	520.31104	989,794	494,897	494,897	0	0	0	0	0	0	0	30
12	Water Treatment	520.32003	7,502,202	7,502,202	0	0	0	0	0	0	0	0	1
13	Dist. Res. & Standpipe	520.33004	33,549,025	0	0	33,549,025	0	0	0	0	0	0	3
14	TD mains	520.33104	68,244,194	0	0	0	68,244,194	0	0	0	0	0	5
15	Services TD	520.33304	5,912,147	0	0	0	0	0	5,912,147	0	0	0	7
16	Meter and Inst	520.33404	15,440,458	0	0	0	0	0	15,440,458	0	0	0	7
17	Hydrants and TD	520.33504	3,449,742	0	0	0	0	0	0	0	3,449,742	0	8
18	Other Plant & Equip GP	520.33904	183,655	0	0	0	0	183,655	0	0	0	0	6
19	Office Furn	520.34005	2,342,188	0	0	0	0	0	0	0	0	2,342,188	10
20	Transport and Euipment	520.34105	1,513,944	0	0	0	0	0	0	0	0	1,513,944	10
21	Stores Equipt.	520.34205	24,421	0	0	0	0	0	0	0	0	24,421	10
22	Tools Shop & Garage	520.34305	9,715	0	0	0	0	0	0	0	0	9,715	10
23	laboratory equipt.	520.34405	54,551	27,275	0	0	27,275	0	0	0	0	0	26
24	Power Equipt.	520.34505	193,411	0	0	0	0	0	0	0	0	193,411	10
25	Communication Equipt.	520.34605	9,883	0	0	0	0	0	0	0	0	9,883	10
26	Misc. Equipt.	520.34705	2,271,807	0	0	0	0	0	0	0	0	2,271,807	10
27	Total Plant (Utility and General Use)		$224,812,969	$84,069,484	$3,167,567	$33,549,025	$72,675,521	$183,655	$21,352,605	$0	$3,449,742	$6,365,369	
28	Percent of Total		100%	37%	1.4%	14.9%	32.3%	0.1%	9.5%	0.0%	1.5%	2.8%	

Table COS-4
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water System Cost of Service Analysis, FY 2022 Test Year - Functionalization of Water System Revenue Requirement

Line No.	Business Unit	Account Description	FY 2022 Total $	Functionalized Amount, $									T COS-1 Line No. Reference
				Source and Treatment	Booster Pumping	Storage	T&D	Customer	Meter	GIAA Water System	Fire Protection	Admin	
1	1000 - Company Wide Power Purchases	Power Purchases	12,997,373	11,511,737	1,485,636	0	0	0	0	0	0	0	17
2	1000 - Company Wide Water Purchases	Water Purchases	8,632,851	8,632,851	0	0	0	0	0	0	0	0	1
3	1000 - Company Wide Salaries & Wages	Salaries & Wages	0	0	0	0	0	0	0	0	0	0	10
4	1000 - Company Wide Medical/Dental/Life (DB)	Medical/Dental/Life (DB)	1,861,091	0	0	0	0	0	0	0	0	1,861,091	10
5	1000 - Company Wide Retiree COLA	Retiree COLA	405,140	0	0	0	0	0	0	0	0	405,141	10
6	1000 - Company Wide Bad Debt	Bad Debt	1,605,305	0	0	0	0	0	0	0	0	1,605,305	10
7	1000 - Company Wide Capitalized Materials	Capitalized Materials	(46,803)	(9,211)	(2,203)	(6,404)	(25,308)	0	(926)	0	(1,439)	(1,313)	25
10													
11	Total Business Unit 1001 - CCU		124,716	0	0	0	0	0	0	0	0	124,716	10
12	Total Business Unit 1100 - General Manager		502,865	0	0	0	0	0	0	0	0	502,865	10
13	Total Business Unit 1101 - Asset Management		271,446	101,508	3,825	40,508	87,751	222	25,782	0	4,165	7,686	13
14	Total Business Unit 1102 - Internal Audit		101,038	0	0	0	0	0	0	0	0	101,038	10
15	Total Business Unit 1103 - Legal Counsel		304,228	0	0	0	0	0	0	0	0	304,228	10
16	Total Business Unit 1104 - Communications		129,180	0	0	0	0	129,180	0	0	0	0	6
17	Total Business Unit 1105 - Finance		2,625,005	180,218	6,790	71,918	155,793	481,437	45,773	0	7,395	1,675,679	27
18	Total Business Unit 1200 - Administrative Services - AGMAS		104,641	0	0	0	0	0	0	0	0	104,641	10
19	Total Business Unit 1210 - Procurement & Supply		546,891	204,512	7,706	81,613	176,794	447	51,943	0	8,392	15,485	13
20	Total Business Unit 1220 - Customer Care		204,831	0	0	0	0	0	0	0	0	204,831	10
21	Total Business Unit 1221 - Customer Service		818,929	0	0	0	0	818,929	0	0	0	0	6
22	Total Business Unit 1222 - Collections		251,926	0	0	0	0	251,926	0	0	0	0	6
23	Total Business Unit 1223 - Field Support/Meter Installation		727,223	0	0	0	0	0	727,223	0	0	0	7
24	Total Business Unit 1224 - Meters - Reading Unit		396,177	0	0	0	0	0	396,177	0	0	0	7
25	Total Business Unit 1225 - Meter Test Facility		242,251	0	0	0	0	0	242,251	0	0	0	7
26	Total Business Unit 1230 - Information Technology		1,636,977	0	0	0	0	0	0	0	0	1,636,977	10
27	Total Business Unit 1240 - Human Resources		449,622	0	0	0	0	0	0	0	0	449,622	10
28	Total Business Unit 1300 - Compliance - AGM-CS		425,672	0	0	0	0	0	0	0	0	425,672	10
29	Total Business Unit 1301 - Lab		838,669	419,334	0	0	419,334	0	0	0	0	0	26
30	Total Business Unit 1302 - Safety & Inspections		193,383	0	0	0	0	0	0	0	0	193,383	10
31	Total Business Unit 1500 - Operations Administration - AGMO & SCC/Dispatch		707,425	255,732	84,573	4,283	167,673	0	338	11,050	7,370	176,406	28
32	Total Business Unit 1510 - Production		324,820	324,820	0	0	0	0	0	0	0	0	1
33	Total Business Unit 1511 - Deepwells		1,654,937	1,444,490	0	0	0	0	0	210,447	0	0	31
34	Total Business Unit 1512 - Surface & Springs		1,113,786	1,113,786	0	0	0	0	0	0	0	0	1
35	Total Business Unit 1514 - Disinfection		1,399,590	1,399,590	0	0	0	0	0	0	0	0	1
36	Total Business Unit 1520 - W - Distribution		186,774	0	0	0	186,774	0	0	0	0	0	5
37	Total Business Unit 1521 - Leak Detection		187,851	0	0	0	187,851	0	0	0	0	0	5
38	Total Business Unit 1522 - Pressure Line Unit		2,772,992	0	0	0	2,642,632	0	0	0	130,360	0	32
39	Total Business Unit 1523 - Reservoirs		36,991	0	0	36,991	0	0	0	0	0	0	3
40	Total Business Unit 1524 - Water Pump Stations		1,333,524	0	1,333,524	0	0	0	0	0	0	0	2
41	Total Business Unit 1551 - Construction		325,770	64,114	15,334	44,574	176,155	0	6,442	0	10,014	9,137	25
42	Total Business Unit 1553 - Fleet Maintenance		1,306,585	0	0	0	0	0	0	0	0	1,306,585	10
43	Total Business Unit 1554 - Instrumentation & Electrical		785,619	523,746	261,873	0	0	0	0	0	0	0	29
44	Total Business Unit 1400 - Engineering		1,372,948	0	0	0	0	0	0	0	0	1,372,948	10
45	Total Business Unit 1404 - Planning/Special Projects		671,068	0	0	0	0	0	0	0	0	671,068	10
46	Incremental O&M, Affordability Program		2,893,401	0	0	0	0	0	0	0	0	2,893,401	10

47	Incremental O&M, Water Loss Program (Reduction in Purchased Water $)	(2,161,721)	(2,161,721)	0	0	0	0	0	0	0	0	1
48	Subtotal - O&M	51,262,987	24,005,508	3,197,057	273,484	4,175,449	1,682,141	1,495,004	221,497	166,258	16,046,591	
49	As a percentage		46.8%	6.2%	0.5%	8.1%	3.3%	2.9%	0.4%	0.3%	31.3%	
50												
51	Debt Service											
52	2013 Series Revenue Bond	1,780,032	222,246	59,569	994,855	359,851	0	26,286	0	4,799	112,426	33
53	2014 Bond Refunding (2005 Bond)	1,990,721	635,598	47,531	93,926	376,930	0	737,201	0	87,377	12,157	34
54	2016 Revenue Bond	6,600,851	295,698	38,995	5,630,985	166,444	0	119,385	0	104,576	244,768	35
55	2017 Refunding Bond (2010 Bond)	4,191,901	670,694	98,790	1,417,801	429,669	0	896,750	0	4,635	673,563	36
56	2020A Revenue Bonds	2,807,927	350,584	93,967	1,569,342	567,650	0	41,465	0	7,570	177,348	33
57	2020B Refunding Bonds	2,468,803	463,212	103,603	1,411,678	378,682	0	0	0	7,083	104,544	37
58	CP Interest and Fees	1,400,076	275,547	65,902	191,569	757,068	0	27,686	0	43,036	39,269	25
59	Capitalized Interest	(2,837,363)	(380,311)	(63,688)	(1,590,702)	(323,588)	0	(259,719)	0	(30,904)	(188,452)	38
60	Placeholder	0	0	0	0	0	0	0	0	0	0	25
61	Placeholder	0	0	0	0	0	0	0	0	0	0	25
62	Placeholder	0	0	0	0	0	0	0	0	0	0	25
63	Subtotal - Debt Service	$18,402,947	$2,533,269	$444,669	$9,719,454	$2,712,705	$0	$1,589,055	$0	$228,172	$1,175,623	
64												
65	Transfers (from) to Reserves	(4,445,849)	(874,981)	(209,266)	(608,314)	(2,404,018)	0	(87,916)	0	(136,659)	(124,696)	25
66												
67	Internally Funded CIP	4,631,107	911,441	217,986	633,662	2,504,192	0	91,579	0	142,353	129,892	25
68												
69	Non-Rate Revenues and Revenue Adjustments											
70	Other Non-Rate Revenues	(312,324)	0	0	0	0	0	0	0	0	(312,324)	10
71	System Development Charges (No data provided as of 3/26/21)	0	0	0	0	0	0	0	0	0	0	25
72	Interest Income	(4,409)	0	0	0	0	0	0	0	0	(4,409)	10
73	Revenue Adjustments	657,971	0	0	0	0	0	0	0	0	657,971	10
74	Surcharge Revenues	0	0	0	0	0	0	0	0	0	0	10
75	Grants	0	0	0	0	0	0	0	0	0	0	25
76	Subtotal - Non-Rate Revenues	341,238	0	0	0	0	0	0	0	0	341,238	
77												
78	**Total Rate Revenue Requirement**	$70,192,430	$26,575,237	$3,650,446	$10,018,286	$6,988,329	$1,682,141	$3,087,723	$221,497	$400,125	$17,568,647	
79	Percent of Total	100.00%	38%	5%	14%	10%	2%	4%	0%	1%	25%	

Table COS 5
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost-of-Service Analysis - Allocation Factors

Line			Extra Capacity		Customer			Fire	
No.	Allocation Method	Base	Max Day	Max Hour	Customer	Meter	GIAA	Protection	Admin
1	Direct: Base	100%							
2	Direct: Max Day		100%						
3	Direct: Max Hour			100%					
4	Direct: Customer				100%				
5	Direct: Meters & Services					100%			
6	Direct: GIAA						100%		
7	Direct: Fire Protection							100%	
8	Direct: Admin								100%
9	Storage	69.5%	12.9%					17.6%	
10	Transmission and Distribution	60.34%	7.84%	21.82%	10%			0%	
11	Base and Max Day (kgal/day)	39,284	5,107						
12	Base and Max Day: %	88.50%	11.50%						
13									
14	Base and Max Hour (kgal/day)	39,284		14,205					
15	Base and Max Hour: %	73.44%		26.56%					
16									
17	Base, Max Day, Max Hour (kgal/day)	39,284	5,107	14,205					
18	Base, Max Day, Max Hour: %	67.04%	8.72%	24.24%					
19									
20	Electricity and Water Purchase	85.66%			3.96%				10.38%

Table COS 6
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost-of-Service Analysis - Allocation of Rate Revenue Requirement

Line No.		FY 2022 Test Year	Base	Extra Capacity Max Day	Extra Capacity Max Hour	Customer Customer	Customer Meter	GIAA Water System	Fire Protection	Admin	T COS-5 Line No. Reference
1	**O&M Expenses**										
2	Source and Treatment										
3	Power Purchases	$11,511,737	$9,860,485	$0	$0	$456,381	$0	$0	$0	$1,194,872	20
4	Water Purchases	6,471,131	5,542,906	0	0	256,547	0	0	0	671,677	20
5	All Other	6,022,640	5,329,770	692,870	0	0	0	0	0	0	12
6	Booster Pumping										
7	Power Purchases	1,485,636	1,272,535	0	0	58,898	0	0	0	154,203	20
8	All Other	1,711,421	1,514,532	196,889	0	0	0	0	0	0	12
9	Storage	273,484	190,071	35,279	0	0	0	0	48,133	0	9
10	T&D	4,175,449	2,519,378	327,519	911,007	417,545	0	0	0	0	10
11	Customer	1,682,141	0	0	0	1,682,141	0	0	0	0	4
12	Meter	1,495,004	0	0	0	0	1,495,004	0	0	0	5
13	GIAA	221,497	0	0	0	0	0	221,497	0	0	6
14	Fire Protection	166,258	0	0	0	0	0	0	166,258	0	7
15	Admin	16,046,591	0	0	0	0	0	0	0	16,046,591	8
16	Reallocation of Admin	0	10,960,888	1,437,042	1,045,186	2,408,941	1,715,198	254,120	245,968	(18,067,343)	
17	**Total**	$51,262,987	$37,190,565	$2,689,600	$1,956,193	$5,280,452	$3,210,202	$475,617	$460,359	$0	
18	Percent of Total	100%	73%	5%	4%	10%	6%	1%	1%	0%	
19											
20	**Debt Service**										
21	Source and Treatment	$2,533,269	$2,241,831	$291,438	$0	$0	$0	$0	$0	$0	12
22	Booster Pumping	444,669	393,512	51,157	0	0	0	0	0	0	12
23	Storage	9,719,454	6,755,021	1,253,810	0	0	0	0	1,710,624	0	9
24	T&D	2,712,705	1,636,789	212,783	591,863	271,271	0	0	0	0	10
25	Customer	0	0	0	0	0	0	0	0	0	4
26	Meter	1,589,055	0	0	0	0	1,589,055	0	0	0	5
27	GIAA	0	0	0	0	0	0	0	0	0	6
28	Fire Protection	228,172	0	0	0	0	0	0	228,172	0	7
29	Admin	1,175,623	0	0	0	0	0	0	0	1,175,623	8
30	Reallocation of Admin	(0)	752,512	123,462	40,390	18,512	108,440	0	132,307	(1,175,623)	
31	**Total**	$18,402,947	$11,779,665	$1,932,649	$632,253	$289,782	$1,697,495	$0	$2,071,103	$0	
32	Percent of Total	100%	64%	11%	3%	2%	9%	0%	11%	0%	
33											
34	**Transfers**										
35	Source and Treatment	($874,981)	($774,319)	($100,662)	$0	$0	$0	$0	$0	$0	12
36	Booster Pumping	(209,266)	(185,191)	(24,075)	0	0	0	0	0	0	12
37	Storage	(608,314)	(422,778)	(78,472)	0	0	0	0	(107,063)	0	9
38	T&D	(2,404,018)	(1,450,533)	(188,569)	(524,513)	(240,402)	0	0	0	0	10
39	Customer	0	0	0	0	0	0	0	0	0	4
40	Meter	(87,916)	0	0	0	0	(87,916)	0	0	0	5

41	GIAA	0	0	0	0	0	0	0	0	0	6
42	Fire Protection	(136,659)	0	0	0	0	0	0	(136,659)	0	7
43	Admin	(124,696)	0	0	0	0	0	0	0	(124,696)	8
44	Reallocation of Admin	0	(81,747)	(11,306)	(15,136)	(6,937)	(2,537)	0	(7,033)	124,696	
45	**Total**	($4,445,849)	($2,914,569)	($403,084)	($539,649)	($247,339)	($90,453)	$0	($250,755)	$0	
46	Percent of Total	100%	66%	9%	12%	6%	2%	0%	6%	0%	
47											
48	**Internally Funded CIP**										
49	Source and Treatment	$911,441	$806,585	$104,856	$0	$0	$0	$0	$0	$0	12
50	Booster Pumping	217,986	192,908	25,078	0	0	0	0	0	0	12
51	Storage	633,662	440,395	81,742	0	0	0	0	111,525	0	9
52	T&D	2,504,192	1,510,977	196,427	546,369	250,419	0	0	0	0	10
53	Customer	0	0	0	0	0	0	0	0	0	4
54	Meter	91,579	0	0	0	0	91,579	0	0	0	5
55	GIAA	0	0	0	0	0	0	0	0	0	6
56	Fire Protection	142,353	0	0	0	0	0	0	142,353	0	7
57	Admin	129,892	0	0	0	0	0	0	0	129,892	8
58	Reallocation of Admin	0	85,153	11,777	15,767	7,226	2,643	0	7,326	(129,892)	
59	**Total**	$4,631,107	$3,036,019	$419,880	$562,136	$257,646	$94,222	$0	$261,204	$0	
60	Percent of Total	100%	66%	9%	12%	6%	2%	0%	6%	0%	
61											
62	**Non-Rate Revenues**										
63	Source and Treatment	$0	$0	$0	$0	$0	$0	$0	$0	$0	12
64	Booster Pumping	0	0	0	0	0	0	0	0	0	12
65	Storage	0	0	0	0	0	0	0	0	0	9
66	T&D	0	0	0	0	0	0	0	0	0	10
67	Customer	0	0	0	0	0	0	0	0	0	4
68	Meter	0	0	0	0	0	0	0	0	0	5
69	GIAA	0	0	0	0	0	0	0	0	0	6
70	Fire Protection	0	0	0	0	0	0	0	0	0	7
71	Admin	341,238	0	0	0	0	0	0	0	341,238	8
72	Reallocation of Admin	0	207,715	27,673	19,251	43,046	32,339	4,506	6,708	(341,238)	
73	**Total**	$341,238	$207,715	$27,673	$19,251	$43,046	$32,339	$4,506	$6,708	$0	
74	Percent of Total	100%	61%	8%	6%	13%	9%	1%	2%	0%	
75											
76											
77	Total Rate Revenue Requirement	$70,192,430	$49,299,395	$4,666,718	$2,630,183	$5,623,587	$4,943,805	$480,123	$2,548,619	$0	
78	Percent of Total	100%	70%	7%	4%	8%	7%	1%	4%	0%	
79	Math Check, compare with Table COS-4. Should = $0			$0							

Table COS 7a
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost-of-Service Analysis - Distribution of Costs with FY22 Billing Determinants

Line No.	Item	Total	Base	Extra Capacity		Customer		GIAA Water System	Reallocation of Public Fire Protection	Private Fire Protection
				Max Day	Max Hour	Customer	Meter			
1	**Total System**									
2	Cost of Service	$70,192,430	$49,299,395	$4,666,718	$2,630,183	$5,623,587	$4,943,805	$480,123	$2,543,298	$5,321
3	Units of Service		5,510,827	1,192,541	3,317,099	520,812	627,500	1	618,348	1,294
4	Units		kgal	kgal	kgal	bills per year	equiv. meters per year	direct assign	equiv. meters/ yr less Ag, Irrigation, GIAA	equiv. fire connections/year
5	Unit Cost of Service		$8.95	$3.91	$0.79	$10.80	$7.88	$480,123	$4.11	$4.11
6										
7										
8	**Residential**									
9	Units of service		3,503,932	758,250	2,109,101	479,652	494,636		494,636	
10	Distributed Cost of Service	$47,096,089	$31,345,880	$2,967,225	$1,672,341	$5,179,152	$3,897,026		$2,034,464	
11										
12	**Commercial 1+**									
13	Units of service		593,049	128,336	356,971	28,032	69,560		69,560	
14	Distributed Cost of Service	$7,227,445	$5,305,367	$502,210	$283,048	$302,682	$548,034		$286,104	
15										
16	**Commercial 2-**									
17	Units of service		75,727	16,387	45,582	216	3,352		3,352	
18	Distributed Cost of Service	$820,249	$677,450	$64,128	$36,143	$2,332	$26,409		$13,787	
19										
20	**Commercial 3**									
21	Units of service		131,674	28,494	79,258	3,576	9,716		9,716	
22	Distributed Cost of Service	$1,507,422	$1,177,948	$111,505	$62,845	$38,613	$76,548		$39,962	
23										
24	**Hotels**									
25	Units of service		702,882	152,103	423,082	660	14,992		14,992	
26	Distributed Cost of Service	$7,405,518	$6,287,924	$595,220	$335,469	$7,127	$118,116		$61,663	
27										

28	**Government**								
29	Units of service		411,706	89,093	247,816	4,020	26,092		26,092	
30	Distributed Cost of Service	$4,584,524	$3,683,090	$348,644	$196,497	$43,407	$205,568		$107,318	
31										
32	**GIAA Water System**									
33	Units of service					408	3,088	1		
34	Distributed Cost of Service	$508,858				$4,405	$24,329	$480,123		
35										
36	**Agriculture**									
37	Units of service		83,511	18,072	50,267	3,912	5,292			
38	Distributed Cost of Service	$941,596	$747,084	$70,720	$39,858	$42,241	$41,693			
39										
40	**Irrigation**									
41	Units of service		8,345	1,806	5,023	336	772			
42	Distributed Cost of Service	$95,410	$74,651	$7,066	$3,983	$3,628	$6,082			
43										
44	**Private Fire Protection**									
45	Units of service									1,294
46	Distributed Cost of Service	$5,321								$5,321
47										
48	**Total:**									
49	Units of service		5,510,827	1,192,541	3,317,099	520,812	627,500	1	618,348	1,294
50	Distributed Cost of Service	$70,192,430	$49,299,395	$4,666,718	$2,630,183	$5,623,587	$4,943,805	$480,123	$2,543,298	$5,321

(1) The Fire Protection cost of service is calculated based on the combined number of fire protection equivalents and public fire protectio
equivalents (i.e. hydrants). A portion of the Fire Protection cost of service related to private fire protection accounts would be recovered from a Fire Protection rate. The majority of the
Fire Protection cost of service is associated with public fire protection (hydrants), and is recovered from water rate payers according to meter equivalents. Refer to page 166, AWWA M1 Manua
(7th Edition). When recovering the cost of public fire protection services, GIAA Water System, irrigation, agriculture meter equivalents, and private fire protection accounts are not included

Table COS 7b
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Distribution of Costs with FY23 Billing Determinants

Explanation of this table:

a. This COSA is prepared using a FY 2022 test year. The output of this COSA is, for FY 2022, revenue requirements for each customer class

b. The COSA is also being used to support rate design calculations. The rate design calculations require revenue requirements to be calculated for FY 2023 and FY 2024

c. The Revenue Requirement analysis notes that systemwide (combining water and wastewater), rate revenues must increase by 10.1656% from FY22 to FY23, anc increase an additional 8.2072% from FY23 to FY24.

d. Between FY 2022 and FY2024, the water use and wastewater flow characteristics of various customer classes changes. Examples of water use, in gal/yea

	FY 2022	FY 2023	FY 2024	% Change, FY22-FY24
Residential	3,503,931,822	3,295,881,935	3,099,827,087	-11.53%
Hotels	702,882,115	785,875,635	870,956,980	23.91%

e. In this COSA, the revenue requirement for each customer class in FY23 and FY24 (while keeping a FY22 test year for cost allocation calculations) is calculated by repeating the distribution step of the COSA for FY2023 and again repeating the distrubtion step of the COSA for FY2024

f. The distribution table for FY 2023 is Table 7b. The allocated cost of service (line 3) is increased by 10.1656% for each System Characteristic. The units of service (lines 9, 13, 17, etc. are those projected in the Analytical Studies for FY2023.

Line No.	Item	Total	Base	Extra Capacity Max Day	Extra Capacity Max Hour	Customer Customer	Customer Meter	GIAA Water System	Reallocation of Public Fire Protection	Private Fire Protection
1	**Total System**									
2	Allocated System Cost of Service per System Characteristic: FY2023 = FY2022 plus % change in rate revenue requirement from COS Input Template								10.1656%	
3	Cost of Service	$77,327,891	$54,310,959	$5,141,117	$2,897,556	$6,195,257	$5,446,371	$528,930	$2,801,862	$5,838
4	Units of Service		5,395,041	1,173,836	3,265,071	524,052	630,092	1	620,876	1,294
5	Units		kgal	kgal	kgal	bills per year	equiv. meters per year	direct assign	equiv. meters/ yr less Ag, Irrigation, GIAA	equiv. fire connections/year
6	Unit Cost of Service		$10.07	$4.38	$0.89	$11.82	$8.64	$528,930	$4.51	$4.51
7										
8	**Residential**									
9	Units of service		3,295,882	717,108	1,994,663	482,832	497,876		497,876	
10	Distributed Cost of Service	$50,348,261	$33,179,080	$3,140,757	$1,770,145	$5,707,961	$4,303,526		$2,246,793	
11										
12	**Commercial 1+**									
13	Units of service		594,432	129,335	359,749	28,020	69,540		69,540	
14	Distributed Cost of Service	$8,115,907	$5,984,044	$566,454	$319,256	$331,248	$601,088		$313,817	
15										
16	**Commercial 2-**									
17	Units of service		83,267	18,117	50,393	216	3,352		3,352	
18	Distributed Cost of Service	$1,008,956	$838,233	$79,348	$44,721	$2,554	$28,974		$15,127	
19										
20	**Commercial 3**									
21	Units of service		151,116	32,879	91,455	3,684	10,128		10,128	
22	Distributed Cost of Service	$1,923,230	$1,521,264	$144,004	$81,161	$43,552	$87,544		$45,705	

23									
24	**Hotels**								
25	Units of service		785,876	170,988	475,611	648	14,792		14,792	
26	Distributed Cost of Service	$9,284,511	$7,911,276	$748,887	$422,076	$7,661	$127,859		$66,753	
27										
28	**Government**									
29	Units of service		393,986	85,722	238,440	3,984	25,188		25,188	
30	Distributed Cost of Service	$4,931,716	$3,966,187	$375,442	$211,601	$47,098	$217,719		$113,667	
31										
32	**GIAA Water System**									
33	Units of service					408	3,088	1		
34	Distributed Cost of Service	$560,446				$4,823	$26,692	$528,930		
35										
36	**Agriculture**									
37	Units of service		82,301	17,907	49,808	3,924	5,356			
38	Distributed Cost of Service	$1,043,820	$828,506	$78,427	$44,202	$46,389	$46,296			
39										
40	**Irrigation**									
41	Units of service		8,182	1,780	4,952	336	772			
42	Distributed Cost of Service	$105,206	$82,369	$7,797	$4,394	$3,972	$6,673			
43										
44	**Private Fire Protection**									
45	Units of service									1,294
46	Distributed Cost of Service	$5,838								$5,838
47										
48	**Total:**									
49	Units of service		5,395,041	1,173,836	3,265,071	524,052	630,092	1	620,876	1,294
50	Distributed Cost of Service	$77,327,891	$54,310,959	$5,141,117	$2,897,556	$6,195,257	$5,446,371	$528,930	$2,801,862	$5,838

(1) The Fire Protection cost of service is calculated based on the combined number of fire protection equivalents and public fire protectio
equivalents (i.e. hydrants). A portion of the Fire Protection cost of service related to private fire protection accounts would be recovered from a Fire Protection rate. The majority of the
Fire Protection cost of service is associated with public fire protection (hydrants), and is recovered from water rate payers according to meter equivalents. Refer to page 166, AWWA M1 Manua
(7th Edition). When recovering the cost of public fire protection services, GIAA Water System, irrigation, agriculture meter equivalents, and private fire protection accounts are not includec

Table COS 7c
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost-of-Service Analysis - Distribution of Costs with FY24 Billing Determinants

Line No.	Item	Total	Base	Extra Capacity Max Day	Extra Capacity Max Hour	Customer Customer	Customer Meter	GIAA Water System	Reallocation of Public Fire Protection	Private Fire Protection
1	**Total System**									
2	Allocated System Cost of Service per System Characteristic: FY2023 = FY2022 plus % change in rate revenue requirement from COS Input Template								8.2072%	
3	Cost of Service	$83,674,380	$58,768,392	$5,563,061	$3,135,366	$6,703,716	$5,893,368	$572,341	$3,031,856	$6,280
4	Units of Service		5,298,986	1,158,242	3,183,947	527,328	633,784	1	624,596	1,294
5	Units		kgal	kgal	kgal	bills per year	equiv. meters per year	direct assign	equiv. meters/ yr less Ag, Irrigation, GIAA	equiv. fire connections/year
6	Unit Cost of Service		$11.09	$4.80	$0.98	$12.71	$9.30	$572,341	$4.85	$4.85
7										
8	**Residential**									
9	Units of service		3,099,827	677,554	1,862,561	486,036	501,220		501,220	
10	Distributed Cost of Service	$52,739,532	$34,378,626	$3,254,307	$1,834,142	$6,178,787	$4,660,695		$2,432,975	
11										
12	**Commercial 1+**									
13	Units of service		598,418	130,801	359,565	27,996	69,616		69,616	
14	Distributed Cost of Service	$8,960,232	$6,636,750	$628,240	$354,079	$355,902	$647,338		$337,923	
15										
16	**Commercial 2-**									
17	Units of service		91,049	19,901	54,707	204	3,332		3,332	
18	Distributed Cost of Service	$1,208,983	$1,009,774	$95,586	$53,873	$2,593	$30,983		$16,174	
19										
20	**Commercial 3**									
21	Units of service		170,902	37,355	102,688	3,780	10,428		10,428	
22	Distributed Cost of Service	$2,371,566	$1,895,387	$179,419	$101,121	$48,054	$96,967		$50,619	
23										
24	**Hotels**									
25	Units of service		870,957	190,372	523,323	660	14,812		14,812	
26	Distributed Cost of Service	$11,307,067	$9,659,347	$914,361	$515,338	$8,390	$137,732		$71,899	
27										
28	**Government**									
29	Units of service		378,301	82,688	227,306	3,984	25,188		25,188	
30	Distributed Cost of Service	$5,223,669	$4,195,549	$397,154	$223,838	$50,647	$234,216		$122,265	
31										
32	**GIAA Water System**									
33	Units of service					408	3,088	1		
34	Distributed Cost of Service	$606,242				$5,187	$28,714	$572,341		
35										

36	**Agriculture**									
37	Units of service		81,474	17,808	48,954	3,936	5,368			
38	Distributed Cost of Service	$1,137,279	$903,586	$85,534	$48,207	$50,037	$49,915			
39										
40	**Irrigation**									
41	Units of service		8,059	1,761	4,842	324	732			
42	Distributed Cost of Service	$113,528	$89,374	$8,460	$4,768	$4,119	$6,807			
43										
44	**Private Fire Protection**									
45	Units of service									1,294
46	Distributed Cost of Service	$6,280								$6,280
47										
48	**Total:**									
49	Units of service		5,298,986	1,158,242	3,183,947	527,328	633,784	1	624,596	1,294
50	Distributed Cost of Service	$83,674,380	$58,768,392	$5,563,061	$3,135,366	$6,703,716	$5,893,368	$572,341	$3,031,856	$6,280

(1) The Fire Protection cost of service is calculated based on the combined number of fire protection equivalents and public fire protectio
equivalents (i.e. hydrants). A portion of the Fire Protection cost of service related to private fire protection accounts would be recovered from a Fire Protection rate. The majority of the
Fire Protection cost of service is associated with public fire protection (hydrants), and is recovered from water rate payers according to meter equivalents. Refer to page 166, AWWA M1 Manua
(7th Edition). When recovering the cost of public fire protection services, GIAA Water System, irrigation, agriculture meter equivalents, and private fire protection accounts are not includec

Table COS-8
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Comparison of Rate Revenue Requirement with Revenues for Each Customer Class

Line No.	Customer Class	FY 22 Test Year Cost of Service	Projected FY 22 Revenues (Proposed FY 22 Rates)	Difference Dollars	Difference Percent
1	Residential	$47,096,089	40,506,875	($6,589,214)	-16%
2	Commercial 1+	7,227,445	10,983,420	$3,755,975	34%
3	Commercial 2-	820,249	1,288,007	$467,758	36%
4	Commercial 3	1,507,422	2,338,108	$830,686	36%
5	Hotels	7,405,518	11,792,936	$4,387,418	37%
6	Government	4,584,524	7,129,961	$2,545,437	36%
7	GIAA Water System	508,858	748,625	$239,767	32%
8	Agriculture	941,596	539,362	($402,234)	-75%
9	Irrigation	95,410	59,081	($36,329)	-61%
10	Private Fire Protection	5,321		($5,321)	
11	Total	$70,192,430	$75,386,375	$5,193,945	6.8898%

Comparison of Rate Revenue Requirement with Adjusted Revenues for Each Customer Class

Line No.	Customer Class	FY 22 Test Year Cost of Service	Projected FY 22 Revenues (Proposed FY 22 Rates less 6.8898%)	Difference Dollars	Difference Percent
12	Residential	$47,096,089	37,716,046	($9,380,043)	-25%
13	Commercial 1+	7,227,445	10,226,688	$2,999,243	29%
14	Commercial 2-	820,249	1,199,266	$379,018	32%
15	Commercial 3	1,507,422	2,177,018	$669,596	31%
16	Hotels	7,405,518	10,980,430	$3,574,913	33%
17	Government	4,584,524	6,638,723	$2,054,200	31%
18	GIAA Water System	508,858	697,046	$188,189	27%
19	Agriculture	941,596	502,201	($439,394)	-87%
20	Irrigation	95,410	55,010	($40,400)	-73%
21	Private Fire Protection	5,321	0	($5,321)	#DIV/0!
22	Total	$70,192,430	$70,192,430	$0	0%

Adjustment: change rate revenues across the board by the percentage required for the revenues from existing rates (as increased) equal the cost of service. This provides a better comparison of inter-class subsidies.
Adjustment is not a decision by GWA to propose or implement an across-the-board rate increase
Negative percent difference means the cost of service is higher than the rate revenue actually collected

Table COS-9
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Supporting Calculations

Calculations Used to Define Billing Determinants

Non-Revenue Water Estimate

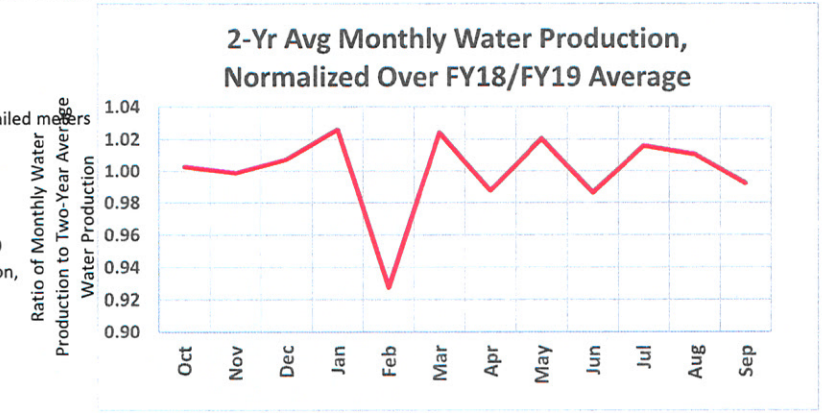
FY 19/20 data, adapted from source: "GWA Water Audit with WSO Recommendation Jan_2021.xls", emailed from GWA via Brown and Caldwell, 1/15/21.

Total Water Supplied, kgal	14,440,345	100%	
Billed Metered Consumption, kgal	5,612,510	39%	
Unbilled Metered Consumption, kgal	1,498,850	10%	GWA, Hydrant Mtrs, Fire Dept.
Other Unbilled Consumption, kgal	1,604,134	11%	Primarily unbilled metered vol. of failed meters
Water Losses	5,724,850	40%	

Monthly Production Data, FY18 and FY19
Source: GM Reports at GWA/CCU Work Sessions

	kgal/mo	Normalized Over 2-Yr Avg
Oct-17	1,181,981	0.996
Nov-17	1,204,936	1.015
Dec-17	1,170,987	0.986
Jan-18	1,206,585	1.016
Feb-18	1,101,750	0.928
Mar-18	1,223,925	1.031
Apr-18	1,158,999	0.976
May-18	1,184,507	0.998
Jun-18	1,153,144	0.971
Jul-18	1,183,615	0.997
Aug-18	1,153,745	0.972
Sep-18	1,152,725	0.971
Oct-18	1,199,543	1.010
Nov-18	1,167,065	0.983
Dec-18	1,221,097	1.028
Jan-19	1,230,247	1.036
Feb-19	1,101,156	0.927
Mar-19	1,208,533	1.018
Apr-19	1,186,014	0.999
May-19	1,238,980	1.044
Jun-19	1,188,695	1.001
Jul-19	1,228,484	1.035
Aug-19	1,245,420	1.049
Sep-19	1,203,058	1.013

	Avg FY18 and FY19 Monthly Production, Normalized Over 2-Yr Avg
Oct	1.003
Nov	0.999
Dec	1.007
Jan	1.026
Feb	0.928
Mar	1.024
Apr	0.988
May	1.021
Jun	0.986
Jul	1.016
Aug	1.010
Sep	0.992



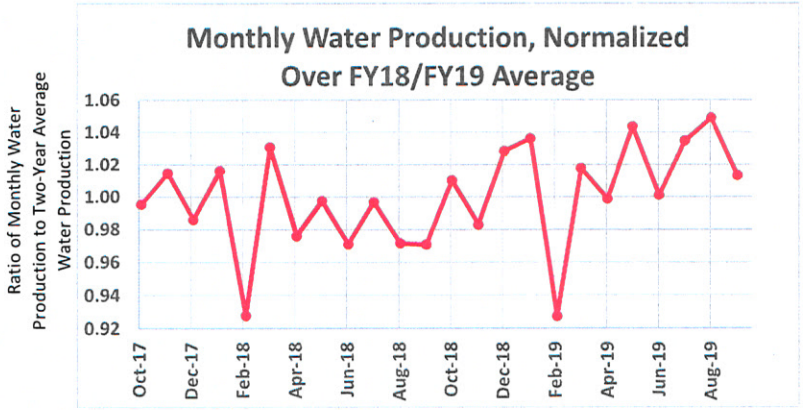


Table COS-9
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Supporting Calculations

Peaking Factor Data and Calculations, FY22 Billing Determinants

	Average Demand TY 22 kgal/day (1)	Max Month/ Avg Month (2)	Projected Max Month kgal/day (3)	Max Month % of System Total Less Water Losses (4)	Max Day/ Avg Day (4)	Projected Max Day kgal/day (4)	Max Day % of System Total Less Water Losses (4)	Max Hour/ Max Day (5)	Projected Max Hour kgal/day (5)	Max Day Extra Capacity kgal/day (6)	Max Hour Extra Capacity kgal/day (6)
Residential	9,600	1.00	9,600	40.68%	1.2164	11,677	40.68%	1.4948	17,456	2,077	5,778
Commercial 1+	1,625	1.00	1,625	6.88%	1.2164	1,976	6.88%	1.4948	2,954	352	978
Commercial 2-	207	1.00	207	0.88%	1.2164	252	0.88%	1.4948	377	45	125
Commercial 3	361	1.00	361	1.53%	1.2164	439	1.53%	1.4948	656	78	217
Hotels	1,926	1.00	1,926	8.16%	1.2164	2,342	8.16%	1.4948	3,502	417	1,159
Government	1,128	1.00	1,128	4.78%	1.2164	1,372	4.78%	1.4948	2,051	244	679
GIAA Water System (not included)											
Agriculture	229	1.00	229	0.97%	1.2164	278	0.97%	1.4948	416	50	138
Irrigation	23	1.00	23	0.10%	1.2164	28	0.10%	1.4948	42	5	14
Non-Revenue Water											
Metered Non-Revenue	8,501	1.00	8,501	36.02%	1.2164	10,341	36.02%	1.4948	15,458	1,840	5,117
Water Losses	15,685	1.00	15,685		1.0000	15,685		1.0000	15,685	0	0
Total	39,284		39,284		1.1300	44,391		1.3200	58,596	5,107	14,205

(1) Projected Test Year of GWA FY 22, per Demand Forecast Analytical Study, for all revenue-generating water use which excludes non-revenue water and excludes GIAA Water System.
Non-revenue water use estimates are based on FY 20 data provided by GWA, see calculation above.
GIAA Water System is not included because GWA does not provide water supply to the GIAA Water System.
(2) Projected Test Year of GWA FY 22, per Demand Forecast Analytical Study, for all revenue-generating water use which excludes non-revenue water.
Metered non-revenue water use is projected to peak at the same ratio as the systemwide aggregate of all revenue-generating water use.
Water losses are not projected to peak, meaning that water losses are constant over the course of the day and the year.
(3) For all customer classes except water losses, the max month is the product of the average demand and the max month/average month peaking factor.
(4) Projected max day/average day peaking factors and max day demands are estimated as follows:

a. The total systemwide max day/average day peaking factor of 1.13 is calculated from data appearing in the Water Resources Master Plan
Max Day Demand Factor is calculated from the data in the 2018 Water Resources Master Plan, page 3-8.
The most recent data is for 2012 - 2016.

	2012	2013	2014	2015	2016
ADD	39.87	37.45	38.72	38.42	38.65
MDD	45.89	41.80	44.77	42.66	43.06
MDD/ADD	1.1510	1.1162	1.1563	1.1104	1.1141
Five-Year Average	1.1296	rounds to:	1.13		

Table COS-9
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Supporting Calculations

b. The max day demand for water losses does not peak, and equals the average day water losses.
c. For each remaining customer class, the max day demand is calculated so that the % of system total max day demand (net of water losses) equals the respective % of system total max month demand (net of water losses).
d. The max day/average day peaking factor for each customer class is calculated by dividing the max day demand for each customer class by the system total

(5) Projected max hour demands and max hour/max day peaking factors are calculated as follows:
a. Max hour peaking factors obtained from Table 4-4 of the Water Resources Master Plan (Volume 2), showing the diurnal pattern of water use over a 24-hour period.
b. Max hour peaking factors in this calculation are the ratio of max hour demand to max day demand.
c. The highest diurnal pattern peaking factor is 1.32 (11 AM), which means that hourly water use during that hour was 32% higher than hourly use during that day.
d. The 1.32 peaking factor was applied to the system total max day demand to estimate the system total max hour demand.
e. Water losses were assumed not to peak and were assigned a max hour peaking factor of 1.0.
f. The max hour peaking factor for all other customer classes are calculated so that they produce the systemwide total of 1.32 and a water loss peaking factor of 1.0.
g. Estimated max hour demands are the max day demand times the max hour/max day peaking factor

(6) GIAA Water System excluded because its water is not provided by GWA water sources and is not included in GWA source production data.

Peaking Factor Data and Calculations, FY23 Billing Determinants

	Average Demand FY 23 kgal/day (1)	Max Month/ Avg Month (2)	Projected Max Month kgal/day (3)	Max Month % of System Total Less Water Losses (4)	Max Day/ Avg Day (4)	Projected Max Day kgal/day (4)	Max Day % of System Total Less Water Losses (4)	Max Hour/ Max Day (4)	Projected Max Hour kgal/day (4)	Max Day Extra Capacity kgal/day (4)	Max Hour Extra Capacity kgal/day (4)
Residential	9,030	1.00	9,030	38.78%	1.2176	10,994	38.78%	1.4971	16,459	1,965	5,465
Commercial 1+	1,629	1.00	1,629	6.99%	1.2176	1,983	6.99%	1.4971	2,969	354	986
Commercial 2-	228	1.00	228	0.98%	1.2176	278	0.98%	1.4971	416	50	138
Commercial 3	414	1.00	414	1.78%	1.2176	504	1.78%	1.4971	755	90	251
Hotels	2,153	1.00	2,153	9.25%	1.2176	2,622	9.25%	1.4971	3,925	468	1,303
Government	1,079	1.00	1,079	4.64%	1.2176	1,314	4.64%	1.4971	1,968	235	653
GIAA Water System (not included)											
Agriculture	225	1.00	225	0.97%	1.2176	275	0.97%	1.4971	411	49	136
Irrigation	22	1.00	22	0.10%	1.2176	27	0.10%	1.4971	41	5	14
Non-Revenue Water											
Metered Non-Revenue	8,501	1.00	8,501	36.51%	1.2176	10,351	36.51%	1.4971	15,496	1,850	5,145
Water Losses	15,685	1.00	15,685		1.0000	15,685		1.0000	15,685	0	0
Total	38,967		38,967		1.1300	44,032		1.3200	58,123	5,066	14,090

Notes:
(1) For all billed water use, average demand is from the COS input template. Metered non-revenue water and water losses for FY23 are projected to be the same as FY22 for the purposes of this analysis
(2) Ratio same as for FY22, described above.
(3) For all customer classes except water losses, the max month is the product of the average demand and the max month/average month peaking factor
(4) See above FY22 table for notes

Table COS-9
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Supporting Calculations

Peaking Factor Data and Calculations, FY24 Billing Determinants

	Average Demand FY 23 kgal/day (1)	Max Month/ Avg Month (2)	Projected Max Month kgal/day (3)	Max Month % of System Total Less Water Losses (4)	Max Day/ Avg Day (4)	Projected Max Day kgal/day (4)	Max Day % of System Total Less Water Losses (4)	Max Hour/ Max Day (4)	Projected Max Hour kgal/day (4)	Max Day Extra Capacity kgal/day (4)	Max Hour Extra Capacity kgal/day (4)
Residential	8,493	1.00	8,493	36.89%	1.2186	10,349	36.89%	1.4931	15,452	1,856	5,103
Commercial 1+	1,640	1.00	1,640	7.12%	1.2186	1,998	7.12%	1.4931	2,983	358	985
Commercial 2-	249	1.00	249	1.08%	1.2186	304	1.08%	1.4931	454	55	150
Commercial 3	468	1.00	468	2.03%	1.2186	571	2.03%	1.4931	852	102	281
Hotels	2,386	1.00	2,386	10.37%	1.2186	2,908	10.37%	1.4931	4,342	522	1,434
Government	1,036	1.00	1,036	4.50%	1.2186	1,263	4.50%	1.4931	1,886	227	623
GIAA Water System (not included)											
Agriculture	223	1.00	223	0.97%	1.2186	272	0.97%	1.4931	406	49	134
Irrigation	22	1.00	22	0.10%	1.2186	27	0.10%	1.4931	40	5	13
Non-Revenue Water											
Metered Non-Revenue	8,501	1.00	8,501	36.93%	1.2315	10,469	36.93%	1.4931	15,632	1,968	5,162
Water Losses	15,685	1.00	15,685		1.0000	15,685		1.0000	15,685	0	0
Total	38,704		38,704		1.1300	43,735		1.3200	57,730	5,141	13,885

Notes:
(1) For all billed water use, average demand is from the COS input template. Metered non-revenue water and water losses for FY24 are projected to be the same as FY22 for the purposes of this analysis
(2) Ratio same as for FY22, described above.
(3) For all customer classes except water losses, the max month is the product of the average demand and the max month/average month peaking factor
(4) See above FY22 table for notes

Population served by GWA
Population served by GWA in 2015, the most recent data available in the Water Resources Master Plan (Volume 2, Section 4.2.3, page 4-3) was 164,882.

Table COS-9
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Supporting Calculations

150 Projected Meter Equivalents FY 2022

151			Equivalents											
152		Meter Capacity	Relative to	Projected Equivalent 3/4" Meters										
153	Meter Size	(gpm) (2)	3/4" Meter	Residential	Comm 1+	Comm 2-	Commercial 3	Hotel	Government	GIAA	Agriculture	Irrigation	Total
154	3/4"	30	1.00	39,480	1,533	0	179	1	116	10	258	14	41,591
155	1"	50	1.67	545	475	3	57	2	58	3	62	8	1,213
156	1 1/2"	100	3.33	340	960	10	143	7	233	13	73	10	1,790
157	2"	160	5.33	149	720	21	133	37	203	53	48	32	1,397
158	3"	320	10.67	85	245	21	64	43	331	11	0	0	800
159	4"	500	16.67	267	683	50	133	317	433	67	0	0	1,950
160	6"	1,000	33.33	300	867	67	100	500	433	100	0	0	2,367
161	8"	1,600	53.33	53	160	107	0	267	213	0	0	0	800
162	10"	2,300	76.67	0	153	0	0	77	153	0	0	0	383
163	12"	4,300	143.33	0	0	0	0	0	0	0	0	0	0
164	Total			41,220	5,797	279	810	1,249	2,174	257	441	64	52,292

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166 Projected Meter Equivalents FY 2023

167			Equivalents											
168		Meter Capacity	Relative to	Projected Equivalent 3/4" Meters										
169	Meter Size	(gpm) (2)	3/4" Meter	Residential	Comm 1+	Comm 2-	Commercial 3	Hotel	Government	GIAA	Agriculture	Irrigation	Total
170	3/4"	30	1.00	39,740	1,533	0	183	1	116	10	258	14	41,855
171	1"	50	1.67	552	473	3	58	2	58	3	62	8	1,220
172	1 1/2"	100	3.33	343	960	10	150	7	233	13	73	10	1,800
173	2"	160	5.33	149	720	21	139	37	197	53	53	32	1,403
174	3"	320	10.67	85	245	21	64	43	331	11	0	0	800
175	4"	500	16.67	267	683	50	150	300	417	67	0	0	1,933
176	6"	1,000	33.33	300	867	67	100	500	433	100	0	0	2,367
177	8"	1,600	53.33	53	160	107	0	267	160	0	0	0	747
178	10"	2,300	76.67	0	153	0	0	77	153	0	0	0	383
179	12"	4,300	143.33	0	0	0	0	0	0	0	0	0	0
180	Total			41,490	5,795	279	844	1,233	2,099	257	446	64	52,508

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Table COS-9
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Supporting Calculations

182 Projected Meter Equivalents FY 2024

				Projected Equivalent 3/4" Meters									
183			Equivalents										
184		Meter Capacity	Relative to										
185	Meter Size	(gpm) (2)	3/4" Meter	Residential	Comm 1+	Comm 2-	Commercial 3	Hotel	Government	GIAA	Agriculture	Irrigation	Total
186	3/4"	30	1.00	40,000	1,533	0	187	1	116	10	259	14	42,120
187	1"	50	1.67	558	472	2	60	3	58	3	62	8	1,227
188	1 1/2"	100	3.33	350	957	10	153	7	233	13	73	7	1,803
189	2"	160	5.33	155	715	21	144	37	197	53	53	32	1,408
190	3"	320	10.67	85	245	21	75	43	331	11	0	0	811
191	4"	500	16.67	267	700	50	150	300	417	67	0	0	1,950
192	6"	1,000	33.33	300	867	67	100	500	433	100	0	0	2,367
193	8"	1,600	53.33	53	160	107	0	267	160	0	0	0	747
194	10"	2,300	76.67	0	153	0	0	77	153	0	0	0	383
195	12"	4,300	143.33	0	0	0	0	0	0	0	0	0	0
196	Total			41,768	5,801	278	869	1,234	2,099	257	447	61	52,815

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Table COS-9
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Supporting Calculations

Estimated Fire Protection Customer Data												
		Number of Connections								Number of Equivalent Fire Protection Connections		
		Projected FY 2020	Projected FY 2020 No. of Private Fire Service Connections (c)									
Connection Size (in)	Demand Factor (a)	No. of Public Connections (b)	Incl as Res	Incl as C1+	Incl as C2-	Incl as C3	Incl as Hotels	Incl As Govt	Total Connections	Public	Private	Total
0.75	1.00	0	2	13	0	0	1	3	19	0	19	19
1	1.00	0	0	0	0	0	0	0	0	0	0	0
1.5	2.90	0	0	3	0	0	0	0	3	0	9	9
2	6.19	0	0	2	0	0	0	0	2	0	12	12
3	17.98	0	0	0	0	0	0	0	0	0	0	0
4	38.32	0	0	4	0	1	4	3	12	0	460	460
6	111.31	3,800	0	2	1	1	1	0	3,805	422,982	557	423,538
8	237.21	0	0	0	0	0	1	0	1	0	237	237
10	426.58	0	0	0	0	0	0	0	0	0	0	0
12	689.04	0	0	0	0	0	0	0	0	0	0	0
Total		3,800	2	24	1	2	7	6	3,842	422,982	1,294	424,275

(a) AWWA M1, page 152 (5th edition page 224; demand factor = diameter ^ 2.63; exponent based on Hazen-Williams equation for flow through pressure conduits.
(b) Per Water Resources Master Plan, Volume 2, Section 10.
(c) Private fire protection numbers as provided by GWA, Jan/Feb 2021. Per other Analytical Studies 4/27/21, these accounts are not included in GWA billing data

Compilation of GIAA Water System O&M Expenses (Based on old Business Unit numbers)

BU 1511 - Deepwells	2.1	$117,352	Is Cost Included	
	No. FTEs GIAA	$/Year	in FY 21 Budget?	Note
Former BU 6810 - Production	0.1		Yes	1
Former BU 6815 - Ground Maui	1.0	$117,352	Yes	1
Former BU 6812 - Ground Deepwell	0.5		Yes	1
Former BU 6811 - Surface	0.5		Yes	1
Former BU 6813 - GIAA Expenses (not labor)		$11,919	Yes	1
Additional Employees		$58,676	No	2
GAC, Non-Recurring in Past		$22,500	No	3
Total		$210,447		

(1) Source of labor costs, including benefits: GWA email 4/7/21. Costs merged for all existing employees.
(2) Per email from GWA, 50% increase in staff expected to provide additional maintenance services.
(3) Per discussion with GWA staff, add $22,500 for GAC each year, representing replacing GAC every two years at $45K per replacement.

Table COS-9
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Supporting Calculations

Disaggregating Water and Wastewater Expenses

Debt Service

Issue	FY 22 $ Debt Svc Pmt	% Water	% Wastewater	$ Water	$ Wastewater		
Series 2013 - Unrefunded Portion	$4,247,338	41.91%	58.09%	$1,780,032	$2,467,306	$0	100.00%
Series 2014	$3,785,500	52.59%	47.41%	$1,990,721	$1,794,779	$0	
Series 2016	$11,006,500	59.97%	40.03%	$6,600,851	$4,405,649	$0	
Series 2017	$7,411,250	56.56%	43.44%	$4,191,901	$3,219,349	$0	
Series 2020A	$6,700,000	41.91%	58.09%	$2,807,927	$3,892,073	$0	
Series 2020B	$5,890,815	41.91%	58.09%	$2,468,803	$3,422,012	$0	
Capitalized Interest	($5,583,333)	50.82%	49.18%	($2,837,363)	($2,745,970)	$0	

% water and wastewater from Table H1 DebtCOS. Capitalized Interest is for FY22 only (source: GRG, 4/20/21) and GRG notes that it is based on "All Bonds". Therefore, it will be disaggregated based on a weighted average of all prior bonds.

Four Factor Allocation Used for Water/Wastewater Split of Certain Administrative O&M Expenses

	Water	Wastewater	Water %	Wastewater %	
No. of Customers, FY 22	43,401	30,357	58.84%	41.16%	Includes 3,128 MF units billed individually and separately for WW service only.
Net Plant, $M	$224,812,969	$318,906,796	41.35%	58.65%	
CIP	$109,634,500	$79,753,500	57.89%	42.11%	
Non-Administration FTE	121	73	62.37%	37.63%	Citizen Centric Annual Report, FY 2019
Average			55.11%	44.89%	

Table COS-9
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Supporting Calculations

295 Additional Revenues and Expenses Provided in the COS Input Template

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297	Type of Revenue/Expense	Where it Goes	FY	Amount	Water %	Wastewater %	Water $	Wastewater $	How $ Was Disaggregated
298	Septic Tank Study	O&M BU 1404	2022	$248,230	0%	100%	$0	$248,230	Direct Assign
299	Septic Tank Study	O&M BU 1404	2023	$208,997	0%	100%	$0	$208,997	Direct Assign
300	Septic Tank Study	O&M BU 1404	2024	$83,047	0%	100%	$0	$83,047	Direct Assign
301	Affordability Program	Administrative	2022	5,250,000	55.11%	44.89%	$2,893,401	$2,356,599	4-Factor
302	Affordability Program	Administrative	2023	5,170,600	55.11%	44.89%	$2,849,642	$2,320,958	4-Factor
303	Affordability Program	Administrative	2024	5,325,718	55.11%	44.89%	$2,935,131	$2,390,587	4-Factor
304	Water Loss Study	O&M, Purchased Water	2022	(2,161,721)	100%	0%	($2,161,721)	$0	Direct Assign
305	Water Loss Study	O&M, Purchased Water	2023	(2,784,921)	100%	0%	($2,784,921)	$0	Direct Assign
306	Water Loss Study	O&M, Purchased Water	2024	(3,191,637)	100%	0%	($3,191,637)	$0	Direct Assign
307	CP Fees and Interest	Debt Service	2022	2,418,560	57.89%	42.11%	$1,400,076	$1,018,484	CIP
308	CP Fees and Interest	Debt Service	2023	2,497,201	57.89%	42.11%	$1,445,600	$1,051,600	CIP
309	CP Fees and Interest	Debt Service	2024	2,634,642	57.89%	42.11%	$1,525,164	$1,109,479	CIP
310	Septage (Existing Rates)	Non-Rate Revenues	2022	51,000	0%	100%	$0	$51,000	Direct Assign
311	Septage (Existing Rates)	Non-Rate Revenues	2023	52,020	0%	100%	$0	$52,020	Direct Assign
312	Septage (Existing Rates)	Non-Rate Revenues	2024	53,060	0%	100%	$0	$53,060	Direct Assign
313	Other Non-Rate Revenues	Non-Rate Revenues	2022	337,008	92.68%	7.32%	$312,324	$24,684	Direct Assign
314	Other Non-Rate Revenues	Non-Rate Revenues	2023	343,748	92.68%	7.32%	$318,570	$25,178	Direct Assign
315	Other Non-Rate Revenues	Non-Rate Revenues	2024	350,623	92.68%	7.32%	$324,942	$25,681	Direct Assign
316	Interest Income	Non-Rate Revenues	2022	8,000	55.11%	44.89%	$4,409	$3,591	4-Factor
317	Interest Income	Non-Rate Revenues	2023	8,000	55.11%	44.89%	$4,409	$3,591	4-Factor
318	Interest Income	Non-Rate Revenues	2024	8,000	55.11%	44.89%	$4,409	$3,591	4-Factor
319	Rate Rev, Septic Conversions	Non-Rate Revenues	2022	26,438	0%	100%	$0	$26,438	Direct Assign
320	Rate Rev, Septic Conversions	Non-Rate Revenues	2023	58,164	0%	100%	$0	$58,164	Direct Assign
321	Rate Rev, Septic Conversions	Non-Rate Revenues	2024	63,687	0%	100%	$0	$63,687	Direct Assign
322	Revenue Adjustments Net of	Non-Rate Revenues	2022	(1,193,871)	55.11%	44.89%	($657,971)	($535,900)	4-Factor
323	Revenue Adjustments Net of	Non-Rate Revenues	2023	(1,315,277)	55.11%	44.89%	($724,881)	($590,396)	4-Factor
324	Revenue Adjustments Net of	Non-Rate Revenues	2024	(1,423,258)	55.11%	44.89%	($784,392)	($638,866)	4-Factor
325	Surcharge Revenues	Non-Rate Revenues	2022	-	55.11%	44.89%	$0	$0	Retiree Medical/Dental/Life
326	Surcharge Revenues	Non-Rate Revenues	2023	-	55.11%	44.89%	$0	$0	Retiree Medical/Dental/Life
327	Surcharge Revenues	Non-Rate Revenues	2024	-	55.11%	44.89%	$0	$0	Retiree Medical/Dental/Life
328	Internally Funded CIP	IFCIP	2022	8,000,000	57.89%	42.11%	$4,631,107	$3,368,893	CIP
329	Internally Funded CIP	IFCIP	2023	8,500,000	57.89%	42.11%	$4,920,551	$3,579,449	CIP
330	Internally Funded CIP	IFCIP	2024	8,000,000	57.89%	42.11%	$4,631,107	$3,368,893	CIP
331	Transfers from (to) Reserves	Reserves	2022	7,679,977	57.89%	42.11%	$4,445,849	$3,234,128	CIP
332	Transfers from (to) Reserves	Reserves	2023	6,212,071	57.89%	42.11%	$3,596,095	$2,615,976	CIP
333	Transfers from (to) Reserves	Reserves	2024	(1,969,271)	57.89%	42.11%	($1,139,988)	($829,283)	CIP

Table COS-9
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Supporting Calculations

Functionalization of Water Expenses

Electricity Expenses

	FY 2020 Cost	Distribute Admin to Each Function According to % of Each Respective Function	Adjusted FY 2020 Cost After Distribution of Admin Costs	Percent of Wastewater Expenses	Percent of Water Expenses	
Administration	$301,334	($301,334)	$0			
Wastewater Collection	$1,336,777	$28,984	$1,365,761	58.7%		
Wastewater Treatment	$941,392	$20,412	$961,804	41.3%		
Water Distribution	$1,328,139	$28,797	$1,356,936		11.4%	(Booster Pumping)
Water Production	$10,291,339	$223,141	$10,514,480		88.6%	(Source and Treatment)
	$14,198,981	$0	$14,198,981	100.0%	100.0%	

16.39% wastewater 83.61% percent water

Source: GPA Power Purchases Details FY20 Updated 111320.xls, provided by GWA staff 12/1/2020
Tab: GPA2020Power

GIAA Water System Expenses

Projected Maintenance Expenses $210,447 Distributed among several business units

For the purposes of clarity in the cost of service analysis, the GIAA water system expenses are assumed to all fall within Business Unit 1511, Deepwells

	Projected FY22$	Percent	
Total FY 22 Business Unit 1511 expenses	$1,654,937	100.0%	
GIAA Water System Expenses	$210,447	12.7%	Functionalized as GIAA
Balance	$1,444,490	87.3%	Functionalized as Source

Table COS-9
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Supporting Calculations

Allocation of Water Expenses

Electrical Expenses

	FY 2020 Billed Demand	FY 2020 Demand Charges $	% of Cost	
Administration	18,165	$153,128	50.82%	
Wastewater Collection	32,272	$272,054	20.35%	
Wastewater Treatment	5,706	$48,104	5.11%	
Water Distribution	26,228	$221,101	16.65%	Round to 17%
Water Production	110,727	$933,429	9.07%	Round to 9%
	193,098	$1,627,817	11.46%	

Demand charge = $8.43 per kW billed demand, per GPA Rate Schedule K, Small Governmental Service, three phase service
http://guampowerauthority.com/gpa_authority/rates/documents/20151001-BaseRateTariffFY2016FullSet.pdf
For the GWA electric accounts with billable demand, the most common GPA rate classification is K, Small Governmental Service

Allocation of Storage

Total Storage Volume	56.59	Million Gallons. Source: 1/13/21 email from Brown and Caldwell
Fire Storage	9.96	Million Gallons. Source: 1/13/21 email from Brown and Caldwell
Equalization Storage	7.30	Million Gallons. 15 percent of max day demand (criteria source: page 6-1 of Water Resources Master Plan, Volume 2) max day demand = 1.13 times Average Day Demand, using 2016 data in Water Resources Master Plan
Emergency Storage	38.65	Million Gallons. 100 percent of average day demand (criteria source: page 6-1 of Water Resources Master Plan, Volume 2) average day demand per 2016 data from Water Resources Master Plan, Volume 2
% Fire Service	17.60%	
% Max Day Extra Capacity	12.90%	
% Base	69.50%	

Table COS-9
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Water Cost of Service Analysis - Supporting Calculations

405 Allocation of Electricity and Water Purchase Expenses
406 Water purchases and power related to water losses is 50% base and 50% customer, using rationale similar to allocation of certain I/I related expenses (See Table WW COS 19)
407 Water purchases and power related to unbilled metered water allocated to admin (GWA use)
408 Water purchases and power related to metered consumption is allocated to base
409 Water purchases and power related to metered consumption from failed meters is allocated to base
410

411		% of Demand	% Base	% Customer	% Admin
412	Water Losses	40%	90%	10%	
413	Unbilled Metered	10%			100%
414	Failed Meters	11%	100%		
415	Billed Metered	39%	100%		
416	Weighted Average	100%	85.66%	3.96%	10.38%

Table WW O&M
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Projected Wastewater O&M Expenses

Line	Business Unit	FY21	FY22	FY23	FY24	FY25
1	1000 - Company Wide Power Purchases	2,128,336.07	2,547,864.51	2,576,469.90	2,597,977.65	0.00
2	1000 - Company Wide Water Purchases	0.00	0.00	0.00	0.00	0.00
3	1000 - Company Wide Salaries & Wages	139,390.36	0.00	0.00	0.00	0.00
4	1000 - Company Wide Medical/Dental/Life (DB)	1,257,134.63	1,515,809.75	1,578,075.63	1,643,384.10	0.00
5	1000 - Company Wide Retiree COLA	261,493.60	329,976.25	352,307.97	376,151.04	0.00
6	1000 - Company Wide Bad Debt	1,145,804.86	1,307,478.55	1,440,763.51	1,559,054.91	#VALUE!
7	1000 - Company Wide Capitalized Materials	0.00	(34,047.01)	0.00	0.00	0.00
8	1000 - Company Wide Depreciation Expense	0.00	0.00	0.00	0.00	0.00
9	1000 - Company Wide Capitalized Labor - Salaries	0.00	0.00	0.00	0.00	0.00
10	1000 - Company Wide Capitalized Labor - Benefits	0.00	0.00	0.00	0.00	0.00
11	**Total Business Unit 1000 - Company Wide**	**4,932,159.51**	**5,667,082.06**	**5,947,617.02**	**6,176,567.70**	**#VALUE!**
12						
21	**Total Business Unit 1001 - CCU**	**180,471.48**	**101,577.91**	**107,837.93**	**111,089.84**	**0.00**
22						
47	**Total Business Unit 1100 - General Manager**	**572,874.38**	**409,570.21**	**417,631.30**	**428,300.67**	**0.00**
48						
61	**Total Business Unit 1101 - Asset Management**	**419,813.78**	**385,057.45**	**487,056.85**	**497,527.54**	**0.00**
62						
73	**Total Business Unit 1102 - Internal Audit**	**73,505.69**	**82,293.13**	**86,384.64**	**88,087.70**	**0.00**
74						
90	**Total Business Unit 1103 - Legal Counsel**	**126,192.05**	**247,785.46**	**266,203.91**	**283,446.32**	**0.00**
91						
108	**Total Business Unit 1104 - Communications**	**95,635.72**	**105,213.67**	**112,711.54**	**115,504.48**	**0.00**
109						
156	**Total Business Unit 1105 - Finance**	**2,252,976.31**	**2,137,997.18**	**2,268,713.18**	**2,324,192.40**	**0.00**
157						
158	**Total Business Unit 1200 - Administrative Services - AGMAS**	**0.00**	**85,227.53**	**89,494.70**	**91,247.06**	**0.00**
159						
176	**Total Business Unit 1210 - Procurement & Supply**	**434,280.33**	**445,428.70**	**470,253.70**	**479,985.94**	**0.00**
177						
196	**Total Business Unit 1220 - Customer Care**	**790,393.84**	**166,829.47**	**174,884.08**	**178,225.53**	**0.00**
197						
208	**Total Business Unit 1221 - Customer Service**	**396,425.59**	**572,803.01**	**600,873.92**	**612,229.59**	**0.00**
209						
220	**Total Business Unit 1222 - Collections**	**60,506.57**	**176,210.47**	**184,381.03**	**188,079.41**	**0.00**
221						
232	**Total Business Unit 1223 - Field Support/Meter Installation**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
233						

Table WW O&M
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Projected Wastewater O&M Expenses

Line	Business Unit	FY21	FY22	FY23	FY24	FY25
244	Total Business Unit 1224 - Meters - Reading Unit	0.00	0.00	0.00	0.00	0.00
245						
257	Total Business Unit 1225 - Meter Test Facility	0.00	0.00	0.00	0.00	0.00
258						
296	Total Business Unit 1230 - Information Technology	1,082,113.85	1,333,274.58	1,411,463.24	1,449,363.98	0.00
297						
316	Total Business Unit 1240 - Human Resources	518,612.45	366,204.91	385,223.02	425,744.85	0.00
317						
337	Total Business Unit 1300 - Compliance - AGM-CS	421,288.51	346,698.37	382,604.50	391,470.76	0.00
338						
359	Total Business Unit 1301 - Lab	524,090.09	683,073.70	764,575.20	859,334.46	0.00
360						
361	Total Business Unit 1302 - Safety & Inspections	0.00	157,505.42	190,199.71	196,486.42	0.00
362						
363	Total Business Unit 1500 - Operations Administration - AGMO & SCC/Dispatch	369,029.41	643,423.63	751,821.84	766,443.66	0.00
364						
374	Total Business Unit 1510 - Production	0.00	0.00	0.00	0.00	0.00
375						
397	Total Business Unit 1511 - Deepwells	0.00	0.00	0.00	0.00	0.00
398						
405	Total Business Unit 1512 - Surface & Springs	0.00	0.00	0.00	0.00	0.00
406						
419	Total Business Unit 1514 - Disinfection	0.00	0.00	0.00	0.00	0.00
420						
427	Total Business Unit 1520 - Distribution	0.00	0.00	0.00	0.00	0.00
428						
439	Total Business Unit 1521 - Leak Detection	0.00	0.00	0.00	0.00	0.00
440						
441	Total Business Unit 1522 - Pressure Line Unit	0.00	0.00	0.00	0.00	0.00
442						
443	Total Business Unit 1523 - Reservoirs	0.00	0.00	0.00	0.00	0.00
444						
464	Total Business Unit 1524 - Water Pump Stations	0.00	0.00	0.00	0.00	0.00
465						
473	Total Business Unit 1530 - WW Collection	150,914.00	221,605.19	256,680.03	263,149.33	0.00
474						

Table WW O&M
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Projected Wastewater O&M Expenses

Line	Business Unit	FY21	FY22	FY23	FY24	FY25
477	Total Business Unit 1531 - Gravity Lines	0.00	0.00	0.00	0.00	0.00
478						
479	Total Business Unit 1532 - WW Pump Stations	4,442,378.00	4,151,121.08	4,377,652.55	4,490,850.19	0.00
480						
495	Total Business Unit 1533 - CCTV/Hot Spots	673,689.00	742,007.24	800,406.99	819,566.57	0.00
496						
507	Total Business Unit 1540 - Treatment	3,044,404.00	1,791,349.57	1,548,149.60	1,580,260.96	0.00
508						
531	Total Business Unit 1542 - Central	606,412.00	579,384.85	657,605.61	672,672.89	0.00
532						
548	Total Business Unit 1541 - Northern	643,963.00	919,579.03	1,014,062.83	1,035,437.11	0.00
549						
565	Total Business Unit 1543- Southern	551,916.00	730,594.14	758,578.26	774,933.42	0.00
566						
567	Total Business Unit 1551 - Construction	0.00	236,981.04	483,528.20	508,903.14	0.00
568						
609	Total Business Unit 1553 - Fleet Maintenance	723,625.20	734,953.82	813,979.40	836,776.59	0.00
610						
628	Total Business Unit 1554 - Instrumentation & Electrical	553,230.66	639,866.19	733,336.68	758,183.54	0.00
629						
650	Total Business Unit 1400 - Engineering	962,576.77	960,313.72	1,076,540.80	1,097,777.60	0.00
651						
664	Total Business Unit 1404 - Planning/Special Projects	536,254.18	546,567.06	573,473.33	584,624.07	0.00
666	Total, GWA Budgeted Expenses	26,139,732	26,367,580	28,193,926	29,086,464	#VALUE!
667						
668	Table Excludes Incremental O&M, which are addressed in Table COS-14					

Table COS 11
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater System Cost of Service Analysis - Functionalization Factors

Line No.	Functionalization Factor		Total	Treatment	Collection	Customer	Admin
1	Direct: Treatment		100%	100%			
2	Direct: Collection		100%		100%		
3	Direct: Customer		100%			100%	
4	Direct: Admin		100%				100%
5	Direct: Customer/Admin		100%			50%	50%
6	Structure: Treatment/Collection (1)		100%	75%	25%		
7	Power: Treatment/Collection		100%	41%	59%		
8							
9	Total Net Plant: Amount		$318,906,797	$152,386,170	$164,616,305	$1,845,331	$58,991
10	Total Net Plant: %		100.0%	47.8%	51.6%	0.6%	0.0%
11							
13	Power Purchased: %		100.0%	41.3%	58.7%	0.0%	0.0%
14							
15	O&M: $		$28,972,409	$6,951,720	$8,501,158	$1,248,296	$12,271,234
16	O&M: %		100.0%	24.0%	29.3%	4.3%	42.4%
17							
18	BU 1500 - Operations Admin	as BU 15xx, 14xx	100.0%	38.5%	50.6%	0.0%	10.9%
19	CIP		100.0%	18.1%	77.7%	0.0%	4.2%
20	Finance Business Unit		100.0%	8.8%	9.5%	18.4%	63.3%
21	Electrical Business Unit - 6853		100.0%	75.0%	25.0%		
22	Plant Flow Meter 530.36402		100.0%	50.0%	50.0%		
23	Plant Pumping Equipment 530.37103		100.0%	40.0%	60.0%		
24	Plant Transport Equipment 530.39107		100.0%	25.0%	75.0%		
25							
26	Series 2013 and Series 2020B		100.0%	97.8%	2.2%	0.0%	0.0%
27	Series 2014		100.0%	89.0%	9.9%	0.0%	1.2%
28	Series 2016		100.0%	91.9%	6.3%	0.0%	1.8%
29	Series 2017		100.0%	86.3%	8.4%	0.0%	5.3%
30	Series 2020A		100.0%	21.9%	73.5%	0.0%	4.5%
31	Capitalized Interest		100.0%	78.3%	19.4%	0.0%	2.3%

Table COS 12
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Functionalization of Wastewater System Plant

Line No.		GL NO	FY 2020 Net Book Value	Functionalized Amount				T COS-11 Line No. Reference	Functionalization Factor
				Treatment	Collection	Customer	Admin		
1	Land & Land Rights SPP	530.35303	$2,571,517	2,571,517	0	0	0	1	Direct: Treatment
2	Land & Land Rights TD	530.35304	153,810	153,810	0	0	0	1	Direct: Treatment
3	Structure and Improve	530.35402	147,833,121	110,874,841	36,958,280	0	0	6	Structure: Treatment/Collection (1)
4	S & I spp	530.35403	224,526	168,394	56,131	0	0	6	Structure: Treatment/Collection (1)
5	S & I td	530.35404	27,834,752	20,876,064	6,958,688	0	0	6	Structure: Treatment/Collection (1)
6	Power Gen Equipt. Equip CP	530.35502	660,105	0	660,105	0	0	2	Direct: Collection
7	Power Gen Equipt. SPP	530.35503	7,263	7,263	0	0	0	1	Direct: Treatment
8	Collection Sewer Force	530.36002	2,637,548	0	2,637,548	0	0	2	Direct: Collection
9	Collection Sewer Gravity	530.36102	106,271,288	0	106,271,288	0	0	2	Direct: Collection
10	Service to cust.	530.36302	1,845,331	0	0	1,845,331	0	3	Direct: Customer
11	Flow Meter	530.36402	222,103	111,052	111,052	0	0	22	Plant Flow Meter 530.36402
12	Pumping equipt.	530.37103	15,516,426	6,206,570	9,309,856	0	0	23	Plant Pumping Equipment 530.37103
13	Pumping Equipment RWTP	530.37105	10,182	10,182	0	0	0	1	Direct: Treatment
14	TD Equipt.	530.38004	6,429,679	6,429,679	0	0	0	1	Direct: Treatment
15	Outfall Sewer	530.38204	4,592,869	4,592,869	0	0	0	1	Direct: Treatment
16	Office furn gp	530.39007	56,067	0	0	0	56,067	4	Direct: Admin
17	transport equipt. Gp	530.39107	1,532,316	383,079	1,149,237	0	0	24	Plant Transport Equipment 530.39107
18	Tools Shop & Garage	530.39307	2,924	0	0	0	2,924	4	Direct: Admin
19	power operated equip	530.39507	850	850	0	0	0	1	Direct: Treatment
20	Misc. Equipt.	530.39707	504,120	0	504,120	0	0	2	Direct: Collection
21	Total Utility and General Use Plant		318,906,796	$152,386,170	$164,616,305	$1,845,331	$58,991		
22	Percent of Total			47.8%	51.6%	0.6%	0.0%		

Table COS 14
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Functionalization of Rate Revenue Requirement (Wastewater)

Line No.	Business Unit	Account Description	FY 2022 Total	Functionalized Amount: Treatment	Collection	Customer	Admin	T COS 11 Line No. Reference	Functionalization Factor
1	1000 - Company Wide Power Purchases	Power Purchases	2,547,865	1,052,837	1,495,028	0	0	7	Power: Treatment/Collection
2	1000 - Company Wide Water Purchases	Water Purchases	0						
3	1000 - Company Wide Salaries & Wages	Salaries & Wages	0	0	0	0	0	4	Direct: Admin
4	1000 - Company Wide Medical/Dental/Life (DB)	Medical/Dental/Life (D	1,515,810	0	0	0	1,515,810	4	Direct: Admin
5	1000 - Company Wide Retiree COLA	Retiree COLA	329,976	0	0	0	329,976	4	Direct: Admin
6	1000 - Company Wide Bad Debt	Bad Debt	1,307,479	0	0	0	1,307,479	4	Direct: Admin
7	1000 - Company Wide Capitalized Materials	Capitalized Materials	(34,047)	(6,152)	(26,454)	0	(1,441)	19	CIP
7	1000 - Company Wide Depreciation Expense	Depreciation Expense	0						
8	1000 - Company Wide Capitalized Labor - Salaries	Capitalized Labor - Sala	0	0	0	0	0	19	CIP
9	1000 - Company Wide Capitalized Labor - Benefits	Capitalized Labor - Ben	0	0	0	0	0	19	CIP
10									
11	Total Business Unit 1001 - CCU		101,578	0	0	0	101,578	4	Direct: Admin
12	Total Business Unit 1100 - General Manager		409,570	0	0	0	409,570	4	Direct: Admin
13	Total Business Unit 1101 - Asset Management		385,057	69,576	299,186	0	16,295	19	CIP
14	Total Business Unit 1102 - Internal Audit		82,293	0	0	0	82,293	4	Direct: Admin
15	Total Business Unit 1103 - Legal Counsel		247,785	0	0	0	247,785	4	Direct: Admin
16	Total Business Unit 1104 - Communications		105,214	0	0	105,214	0	3	Direct: Customer
17	Total Business Unit 1105 - Finance		2,137,997	187,560	202,613	394,069	1,353,755	20	Finance Business Unit
18	Total Business Unit 1200 - Administrative Services - AGMAS		85,228	0	0	0	85,228	4	Direct: Admin
19	Total Business Unit 1210 - Procurement & Supply		445,429	0	0	0	445,429	4	Direct: Admin
20	Total Business Unit 1220 - Customer Care		166,829	0	0	0	166,829	4	Direct: Admin
21	Total Business Unit 1221 - Customer Service		572,803	0	0	572,803	0	3	Direct: Customer
22	Total Business Unit 1222 - Collections		176,210	0	0	176,210	0	3	Direct: Customer
23	Total Business Unit 1230 - Information Technology		1,333,275	0	0	0	1,333,275	4	Direct: Admin
24	Total Business Unit 1240 - Human Resources		366,205	0	0	0	366,205	4	Direct: Admin
25	Total Business Unit 1300 - Compliance - AGM-CS		346,698	0	0	0	346,698	4	Direct: Admin
26	Total Business Unit 1301 - Lab		683,074	683,074	0	0	0	1	Direct: Treatment
27	Total Business Unit 1302 - Safety & Inspections		157,505	0	0	0	157,505	4	Direct: Admin
28	Total Business Unit 1500 - Operations Administration - AGMO & SCC/D		643,424	247,678	325,798	0	69,948	18	BU 1500 - Operations Admin
29	Total Business Unit 1530 - WW Collection		221,605	0	221,605	0	0	2	Direct: Collection
30	Total Business Unit 1531 - Gravity Lines		0	0	0	0	0	2	Direct: Collection
31	Total Business Unit 1532 - WW Pump Stations		4,151,121	0	4,151,121	0	0	2	Direct: Collection
32	Total Business Unit 1533 - CCTV/Hot Spots		742,007	0	742,007	0	0	2	Direct: Collection
33	Total Business Unit 1540 - Treatment		1,791,350	1,791,350	0	0	0	1	Direct: Treatment
34	Total Business Unit 1541 - Northern		919,579	919,579	0	0	0	1	Direct: Treatment
35	Total Business Unit 1542 - Central		579,385	579,385	0	0	0	1	Direct: Treatment
36	Total Business Unit 1543- Southern		730,594	730,594	0	0	0	1	Direct: Treatment
37	Total Business Unit 1551 - Construction		236,981	42,820	184,132	0	10,029	19	CIP
38	Total Business Unit 1553 - Fleet Maintenance		734,954	0	0	0	734,954	4	Direct: Admin
39	Total Business Unit 1554 - Instrumentation & Electrical		639,866	479,900	159,967	0	0	21	Electrical Business Unit - 6853
40	Total Business Unit 1400 - Engineering		960,314	173,520	746,155	0	40,638	19	CIP
41	Total Business Unit 1404 - Planning/Special Projects		546,567	0	0	0	546,567	4	Direct: Admin
42	Incremental O&M, Septic Tank Study, BU 1404		248,230	0	0	0	248,230	4	Direct: Admin

Line No.	Business Unit	Account Description	FY 2022 Total	Functionalized Amount: Treatment	Collection	Customer	Admin	T COS 11 Line No. Reference	Functionalization Factor
43	Incremental O&M, Affordability Program		2,356,599	0	0	0	2,356,599	4	Direct: Admin
44	Subtotal - O&M		28,972,409	6,951,720	8,501,158	1,248,296	12,271,234		
45									
46	Debt Service								
47	2013 Series Revenue Bond		$2,467,306	2,412,468	54,822	0	16	26	Series 2013 and Series 2020B
48	2014 Bond Refunding (2005 Bond)		$1,794,779	1,596,493	177,126	0	21,160	27	Series 2014
49	2016 Revenue Bond		$4,405,649	4,049,544	276,019	0	80,085	28	Series 2016
50	2017 Refunding Bond (2010 Bond)		$3,219,349	2,778,274	270,138	0	170,937	29	Series 2017
51	2020A Revenue Bonds		$3,892,073	3,805,569	86,479	0	26	26	Series 2013 and Series 2020B
52	2020B Refunding Bonds		$3,422,012	750,642	2,516,093	0	155,277	30	Series 2020A
53	CP Interest and Fees		$1,018,484	184,031	791,353	0	43,100	19	CIP
54	Capitalized Interest (weighted avg of all other debt issuances)		($2,745,970)	(2,150,377)	(531,406)	0	(64,187)	31	Capitalized Interest
55	Placeholder		$0	0	0	0	0	19	CIP
56	Placeholder		$0	0	0	0	0	19	CIP
57	Placeholder		$0	0	0	0	0	19	CIP
58	Subtotal - Debt Service		17,473,683	13,426,645	3,640,623	0	406,415		
59									
60	Transfers (from) to Reserves		($3,234,128)	(584,378)	(2,512,888)	0	(136,861)	19	CIP
61									
62	Internally Funded CIP		$3,368,893	$608,729	$2,617,600	$0	$142,564	19	CIP
63									
64	Less Non-Rate Revenues								
65	Septage Revenues		$0	0	0	0	0	1	Direct: Treatment
66	System Development Charges (No data provided as of 3/26/21)		$0	0	0	0	0	19	CIP
67	Rate Revenues from Septic Conversions		($26,438)	0	0	0	(26,438)	4	Direct: Admin
68	Revenue Adjustments Ex Leachate Revenues		$535,900	0	0	0	535,900	4	Direct: Admin
69	Surcharge Revenues		$0	0	0	0	0	4	Direct: Admin
70	Interest Income		($3,591)	(649)	(2,790)	0	(152)	19	CIP
71	Other Non-Rate Revenue		($24,684)	(4,460)	(19,179)	0	(1,045)	19	CIP
72	Total		$481,186	($5,109)	($21,969)	$0	$508,265		
73									
74	**Total Rate Revenue Requirement**		47,062,043	$20,397,607	$12,224,524	$1,248,296	$13,191,617		
75	Percent of Total		100.0%	43.3%	26.0%	2.7%	28.0%		
76	Math Check:		($0)						

Table COS 15
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater System Cost of Service Analysis - Allocation Factors

Line No.	Allocation Method	Allocation Percentage Treatment Flow	Collection Flow	Treatment Flow Less Navy	Collection Flow Less Navy	BOD	BOD Less Navy	TSS	TSS Less Navy	Customer	Admin
1	Treatment	33.3%	0.0%	0.0%	0.0%	33.3%		33.3%			
2	Collection	0.0%	90.0%	0.0%	0.0%	0.0%				10.0%	
3	Customer	0.0%	0.0%	0.0%	0.0%	0.0%				100.0%	
4	Administrative										100.0%
5	Sludge Disposal					50.0%		50.0%			
6	Capacity Increasing Treatment Debt Service			33.3%			33.3%		33.3%		
7	Treatment Plant Power Purchases	46.7%				24.1%		18.1%		2.1%	9.0%
8	Collection Power Purchases		80.8%							3.7%	15.5%
9	Collection System O&M		98.8%		1.2%						

Table COS 16
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater System Cost of Service Analysis - Allocation of Rate Revenue Requirement

Line No.		FY 2022 Total	Treatment Flow	Collection Flow	Treatment Flow Less Navy	Collection Flow Less Navy	BOD	BOD Less Navy	TSS	TSS Less Navy	Customer	Admin	T COS15 Line No. Reference
1	**Operating Expenses**												
2	Treatment												
3	Power Purchases	$1,052,837	$491,530	$0	$0	$0	$254,177	$0	$190,362	$0	$22,423	$94,344	7
4	Sludge Disposal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	5
5	All Other	$5,898,884	$1,966,295	$0	$0	$0	$1,966,295	$0	$1,966,295	$0	$0	$0	1
6	Collection												
7	Power Purchases	1,495,028	$0	$1,208,047	$0	$0	$0	$0	$0	$0	$55,109	$231,872	8
8	All Other	7,006,130	$0	$6,921,644	$0	$84,487	$0	$0	$0	$0	$0	$0	9
9	Customer	1,248,296	$0	$0	$0	$0	$0	$0	$0	$0	$1,248,296	$0	3
10	Administrative	12,271,234	$0	$0	$0	$0	$0	$0	$0	$0	$0	$12,271,234	4
11	Reallocation of Admin	0	1,750,142	6,160,754	0	75,199	1,750,142	0	1,750,142	0	1,111,072	(12,597,450)	
12	**Total**	$28,972,409	$4,207,967	$14,290,445	$0	$159,686	$3,970,613	$0	$3,906,799	$0	$2,436,900	$0	
13	Percent of Total	100%	15%	49%	0%	1%	14%	0%	13%	0%	8%	0%	
14													
15	**Debt Service**												
16	Treatment												
17	Capacity Increasing	$1,201,227	$0	$0	$400,409	$0	$0	$400,409	$0	$400,409	$0	$0	6
18	Not Capacity Increasing	$12,225,418	$4,075,139	$0	$0	$0	$4,075,139	$0	$4,075,139	$0	$0	$0	1
19	Collection	3,640,623	$0	$3,276,561	$0	$0	$0	$0	$0	$0	$364,062	$0	2
20	Customer	0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	3
21	Administrative	406,415	$0	$0	$0	$0	$0	$0	$0	$0	$0	$406,415	4
22	Reallocation of Admin	0	97,039	78,023	9,535	0	97,039	9,535	97,039	9,535	8,669	(406,415)	
23	**Total**	$17,473,683	$4,172,179	$3,354,584	$409,944	$0	$4,172,179	$409,944	$4,172,179	$409,944	$372,732	$0	
24	Percent of Total	100%	24%	19%	2%	0%	24%	2%	24%	2%	2%	0%	
25													
26	**Transfers**												
27	Treatment	($584,378)	($194,793)	$0	$0	$0	($194,793)	$0	($194,793)	$0	$0	$0	1
28	Collection	(2,512,888)	$0	($2,261,599)	$0	$0	$0	$0	$0	$0	($251,289)	$0	2
29	Customer	0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	3
30	Administrative	(136,861)	$0	$0	$0	$0	$0	$0	$0	$0	$0	($136,861)	4
31	Reallocation of Admin	(0)	(8,607)	(99,935)	0	0	(8,607)	0	(8,607)	0	(11,104)	136,861	
32	**Total**	($3,234,128)	($203,400)	($2,361,535)	$0	$0	($203,400)	$0	($203,400)	$0	($262,393)	$0	
33	Percent of Total	100%	6%	73%	0%	0%	6%	0%	6%	0%	8%	0%	
34													
35	**Internally Funded CIP**												
36	Treatment	$608,729	$202,910	$0	$0	$0	$202,910	$0	$202,910	$0	$0	$0	1
37	Collection	2,617,600	$0	$2,355,840	$0	$0	$0	$0	$0	$0	$261,760	$0	2
38	Customer	0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	3
39	Administrative	142,564	$0	$0	$0	$0	$0	$0	$0	$0	$0	$142,564	4
40	Reallocation of Admin	0	8,966	104,099	0	0	8,966	0	8,966	0	11,567	(142,564)	
41	**Total**	$3,368,893	$211,876	$2,459,939	$0	$0	$211,876	$0	$211,876	$0	$273,327	$0	
42	Percent of Total	100%	6%	73%	0%	0%	6%	0%	6%	0%	8%	0%	
43													
44	**Less Non-Rate Revenues**												
45	Treatment	($5,109)	($1,703)	$0	$0	$0	($1,703)	$0	($1,703)	$0	$0	$0	1

46	Collection	(21,969)	$0	($19,772)	$0	$0	$0	$0	$0	$0	($2,197)	$0	2
47	Customer	0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	3
48	Administrative	508,265	$0	$0	$0	$0	$0	$0	$0	$0	$0	$508,265	4
49	Reallocation of Admin	(0)	31,966	371,131	0	0	31,966	0	31,966	0	41,237	(508,265)	
50	**Total**	$481,186	$30,263	$351,359	$0	$0	$30,263	$0	$30,263	$0	$39,040	$0	
51	Percent of Total	100%	6%	73%	0%	0%	6%	0%	6%	0%	8%	0%	
52													
53	**Total Rate Revenue Requirement**	$47,062,043	$8,418,884	$18,094,792	$409,944	$159,686	$8,181,530	$409,944	$8,117,716	$409,944	$2,859,605	$0	
54	Percent of Total	100%	18%	38%	1%	0%	17%	1%	17%	1%	6%	0%	
55	Math Check, compare with Table COS-14. Should = $0			($0)									

Table COS 17a
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater System Cost of Service - Distribution of Costs with FY2022 Billing Determinants

No.	Item	Total	Treatment Flow	Collection Flow	Treatment Flow Less Navy	Collection Flow Less Navy	BOD	BOD Less Navy	TSS	TSS Less Navy	Customer
1	**Total System:**										
2	Cost of Service	$47,062,043	$8,418,884	$18,094,792	$409,944	$159,686	$8,181,530	$409,944	$8,117,716	$409,944	$2,859,605
3	Units of Service		3,673,237	3,668,521	3,108,344	3,103,628	3,752,092	2,997,905	4,575,728	3,925,242	326,748
4	Unit Cost		$2.29	$4.93	$0.13	$0.05	$2.18	$0.14	$1.77	$0.10	$8.75
5	Units		per kgal	per kgal	per kgal	per kgal	per lb	per lb	per lb	per lb	per bill
6											
7	**Residential**										
8	Units of service		1,737,247	1,737,247	1,737,247	1,737,247	1,449,621	1,449,621	1,449,621	1,449,621	297,264
9	Distributed Cost of Service	$21,552,945	3,981,688	8,568,884	229,117	89,384	3,160,935	198,226	2,571,746	151,395	2,601,569
10											
11	**Commercial 1+**										
12	Units of service		379,727	379,727	379,727	379,727	285,172	285,172	285,172	285,172	21,924
13	Distributed Cost of Service	$4,201,316	870,317	1,872,986	50,080	19,537	621,825	38,995	505,919	29,783	191,873
14											
15	**Commercial 2-**										
16	Units of service		60,565	60,565	60,565	60,565	58,118	58,118	116,236	116,236	204
17	Distributed Cost of Service	$803,463	138,812	298,734	7,988	3,116	126,728	7,947	206,213	12,139	1,785
18											
19	**Commercial 3**										
20	Units of service		103,028	103,028	103,028	103,028	283,701	283,701	395,461	395,461	3,468
21	Distributed Cost of Service	$2,193,845	236,134	508,178	13,588	5,301	618,616	38,794	701,581	41,301	30,351
22											
23	**Hotels**										
24	Units of service		457,687	457,687	457,687	457,687	439,197	439,197	878,393	878,393	624
25	Distributed Cost of Service	$6,063,698	1,048,996	2,257,516	60,362	23,549	957,679	60,057	1,558,341	91,737	5,461
26											
27	**Government**										
28	Units of service		303,939	303,939	303,939	303,939	228,256	228,256	228,256	228,256	2,916
29	Distributed Cost of Service	$3,234,734	696,614	1,499,164	40,085	15,638	497,718	31,212	404,944	23,839	25,520
30											

31	**GIAA Water System**										
32	Units of service		32,298	32,298	32,298	32,298	30,993	30,993	61,987	61,987	348
33	Distributed Cost of Service	$430,564	74,026	159,309	4,260	1,662	67,582	4,238	109,969	6,474	3,046
34											
35	**Navy**										
36	Units of service		564,893	564,893			754,187		650,486		0
37	Distributed Cost of Service	$6,879,550	1,294,707	2,786,304			1,644,523		1,154,015		0
38											
39	**Septage**										
40	Units of service		4,716		4,716		212,149	212,149	508,171	508,171	
41	Distributed Cost of Service	$1,457,645	10,808		622		462,597	29,010	901,536	53,072	
42											
43	**Leachate**										
44	Units of service		29,137	29,137	29,137	29,137	10,698	10,698	1,945	1,945	0
45	Distributed Cost of Service	$244,285	66,781	143,718	3,843	1,499	23,327	1,463	3,451	203	0
46											
47	**Total:**										
48	Units of service		3,673,237	3,668,521	3,108,344	3,103,628	3,752,092	2,997,905	4,575,728	3,925,242	326,748
49	Distributed Cost of Service	$47,062,043	$8,418,884	$18,094,792	$409,944	$159,686	$8,181,530	$409,944	$8,117,716	$409,944	$2,859,605
50											

Table COS 17b
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater System Cost of Service - Distribution of Costs with FY2023 Billing Determinants

Explanation of this table:

a. This COSA is prepared using a FY 2022 test year. The output of this COSA is, for FY 2022, revenue requirements for each customer class.

b. The COSA is also being used to support rate design calculations. The rate design calculations require revenue requirements to be calculated for FY 2023 and FY 2024.

c. The Revenue Requirement analysis notes that systemwide (combining water and wastewater), rate revenues must increase by 10.1656% from FY22 to FY23, and increase an additional 8.2072% from FY23 to FY24.

d. Between FY 2022 and FY2024, the water use and wastewater flow characteristics of various customer classes changes. Examples of wastewater flow, in gal/year

	FY 2022	FY 2023	FY 2024	% Change, FY22-FY24
Residential	1,737,247,486	1,640,765,323	1,549,217,091	-10.82%
Hotels	457,686,598	511,728,409	567,129,720	23.91%

e. In this COSA, the revenue requirement for each customer class in FY23 and FY24 (while keeping a FY22 test year for cost allocation calculations) is calculated by repeating the distribution step of the COSA for FY2023 and again repeating the distrubtion step of the COSA for FY2024.

f. The distribution table for FY 2023 is Table 17b. The allocated cost of service (line 3) is increased by 10.1656% for each System Characteristic. The units of service (lines 9, 13, 17, etc.) are those projected in the Analytical Studies for FY2023.

No.	Item	Total	Treatment Flow	Collection Flow	Treatment Flow Less Navy	Collection Flow Less Navy	BOD	BOD Less Navy	TSS	TSS Less Navy	Customer
1	**Total System:**										
2	Allocated System Cost of Service per System Characteristic: FY2023 = FY2022 plus % change in rate revenue requirement from COS Input Template:								10.1656%		
3	Cost of Service	$51,846,168	$9,274,711	$19,934,230	$451,617	$175,919	$9,013,229	$451,617	$8,942,928	$451,617	$3,150,300
4	Units of Service		3,639,502	3,634,787	3,074,609	3,069,894	3,761,632	3,007,445	4,659,089	4,008,603	329,988
5	Unit Cost		$2.55	$5.48	$0.15	$0.06	$2.40	$0.15	$1.92	$0.11	$9.55
6	Units		per kgal	per kgal	per kgal	per kgal	per lb	per lb	per lb	per lb	per bill
7											
8	**Residential**										
9	Units of service		1,640,765	1,640,765	1,640,765	1,640,765	1,369,113	1,369,113	1,369,113	1,369,113	300,456
10	Distributed Cost of Service	$22,651,392	4,181,238	8,998,436	241,005	94,023	3,280,526	205,595	2,627,956	154,247	2,868,367
11											
12	**Commercial 1+**										
13	Units of service		380,613	380,613	380,613	380,613	285,837	285,837	285,837	285,837	21,900
14	Distributed Cost of Service	$4,652,787	969,933	2,087,392	55,907	21,811	684,893	42,923	548,653	32,203	209,073
15											
16	**Commercial 2-**										
17	Units of service		66,595	66,595	66,595	66,595	63,905	63,905	127,809	127,809	204
18	Distributed Cost of Service	$972,920	169,707	365,226	9,782	3,816	153,122	9,596	245,324	14,399	1,948
19											
20	**Commercial 3**										
21	Units of service		118,240	118,240	118,240	118,240	325,590	325,590	453,852	453,852	3,576
22	Distributed Cost of Service	$2,759,380	301,316	648,462	17,368	6,776	780,144	48,893	871,151	51,132	34,139
23											
24	**Hotels**										
25	Units of service		511,728	511,728	511,728	511,728	491,055	491,055	982,110	982,110	612
26	Distributed Cost of Service	$7,466,983	1,304,061	2,806,468	75,166	29,324	1,176,615	73,740	1,885,120	110,646	5,843
27											

28	**Government**										
29	Units of service		290,857	290,857	290,857	290,857	218,431	218,431	218,431	218,431	2,892
30	Distributed Cost of Service	$3,423,410	741,204	1,595,145	42,723	16,667	523,382	32,801	419,270	24,609	27,609
31											
32	**GIAA Water System**										
33	Units of service		31,958	31,958	31,958	31,958	30,667	30,667	61,334	61,334	348
34	Distributed Cost of Service	$469,281	81,441	175,268	4,694	1,831	73,481	4,605	117,728	6,910	3,322
35											
36	**Navy**										
37	Units of service		564,893	564,893			754,187		650,486		0
38	Distributed Cost of Service	$7,593,263	1,439,542	3,098,037			1,807,103		1,248,581		0
39											
40	**Septage**										
41	Units of service		4,716		4,716		212,149	212,149	508,171	508,171	
42	Distributed Cost of Service	$1,585,561	12,017		693		508,330	31,858	975,412	57,251	
43											
44	**Leachate**										
45	Units of service		29,137	29,137	29,137	29,137	10,698	10,698	1,945	1,945	0
46	Distributed Cost of Service	$271,191	74,252	159,797	4,280	1,670	25,633	1,606	3,733	219	0
47											
48	**Total:**										
49	Units of service		3,639,502	3,634,787	3,074,609	3,069,894	3,761,632	3,007,445	4,659,089	4,008,603	329,988
50	Distributed Cost of Service	$51,846,168	$9,274,711	$19,934,230	$451,617	$175,919	$9,013,229	$451,617	$8,942,928	$451,617	$3,150,300

Table COS 17c
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater System Cost of Service - Distribution of Costs with FY2024 Billing Determinants

Explanation of this table:

a. please see explanation under Table 17b.

b. The distribution table for FY 2023 is Table 17b. The allocated cost of service (line 3) is increased by 8.2072% from the FY23 value for each System Characteristic. The units of service (lines 9, 13, 17, etc.) are those projected in the Analytical Studies for FY2023.

No.	Item	Total	Treatment Flow	Collection Flow	Treatment Flow Less Navy	Collection Flow Less Navy	BOD	BOD Less Navy	TSS	TSS Less Navy	Customer
1	**Total System:**										
2	Allocated System Cost of Service per System Characteristic: FY2024 = FY2023 plus % change in rate revenue requirement from COS Input Template:								8.2072%		
3	Cost of Service	$56,101,310	$10,035,909	$21,570,282	$488,682	$190,357	$9,752,967	$488,682	$9,676,895	$488,682	$3,408,853
4	Units of Service		3,615,840	3,611,124	3,050,947	3,046,232	3,780,040	3,025,854	4,753,241	4,102,755	333,228
5	Unit Cost		$2.78	$5.97	$0.16	$0.06	$2.58	$0.16	$2.04	$0.12	$10.23
6	Units		per kgal	per kgal	per kgal	per kgal	per lb	per lb	per lb	per lb	per bill
7											
8	**Residential**										
9	Units of service		1,549,217	1,549,217	1,549,217	1,549,217	1,292,722	1,292,722	1,292,722	1,292,722	303,636
10	Distributed Cost of Service	$23,334,845	4,299,914	9,253,918	248,144	96,810	3,335,381	208,778	2,631,791	153,977	3,106,133
11											
12	**Commercial 1+**										
13	Units of service		383,165	383,165	383,165	383,165	287,754	287,754	287,754	287,754	21,888
14	Distributed Cost of Service	$5,070,481	1,063,489	2,288,754	61,373	23,944	742,440	46,473	585,824	34,275	223,910
15											
16	**Commercial 2-**										
17	Units of service		72,819	72,819	72,819	72,819	69,877	69,877	139,754	139,754	192
18	Distributed Cost of Service	$1,147,995	202,111	434,966	11,664	4,550	180,291	11,285	284,518	16,646	1,964
19											
20	**Commercial 3**										
21	Units of service		133,721	133,721	133,721	133,721	368,219	368,219	513,274	513,274	3,672
22	Distributed Cost of Service	$3,352,843	371,147	798,753	21,419	8,356	950,049	59,468	1,044,951	61,137	37,564
23											
24	**Hotels**										
25	Units of service		567,130	567,130	567,130	567,130	544,218	544,218	1,088,436	1,088,436	624
26	Distributed Cost of Service	$8,931,964	1,574,091	3,387,629	90,839	35,440	1,404,150	87,892	2,215,896	129,645	6,383
27											
28	**Government**										
29	Units of service		279,278	279,278	279,278	279,278	209,736	209,736	209,736	209,736	2,868
30	Distributed Cost of Service	$3,561,868	775,147	1,668,208	44,733	17,452	541,143	33,873	426,991	24,982	29,339
31											
32	**GIAA Water System**										
33	Units of service		31,765	31,765	31,765	31,765	30,482	30,482	60,964	60,964	348
34	Distributed Cost of Service	$503,485	88,165	189,742	5,088	1,985	78,647	4,923	124,113	7,261	3,560
35											

36	**Navy**										
37	Units of service		564,893	564,893			754,187		650,486		0
38	Distributed Cost of Service	$8,212,336	1,567,883	3,374,266			1,945,894		1,324,293		0
39											
40	**Septage**										
41	Units of service		4,716		4,716		212,149	212,149	508,171	508,171	
42	Distributed Cost of Service	$1,690,566	13,088		755		547,371	34,263	1,034,560	60,529	
43											
44	**Leachate**										
45	Units of service		29,137	29,137	29,137	29,137	10,698	10,698	1,945	1,945	0
46	Distributed Cost of Service	$294,926	80,872	174,045	4,667	1,821	27,602	1,728	3,960	232	0
47											
48	**Total:**										
49	Units of service		3,615,840	3,611,124	3,050,947	3,046,232	3,780,040	3,025,854	4,753,241	4,102,755	333,228
50	Distributed Cost of Service	$56,101,310	$10,035,909	$21,570,282	$488,682	$190,357	$9,752,967	$488,682	$9,676,895	$488,682	$3,408,853

Table COS-18
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Comparison of Rate Revenue Requirement with Revenues for Each Customer Class

Line No.	Customer Class	FY 22 Test Year Cost of Service	Projected FY 22 Revenues (Proposed FY 22 Rates)	Difference Dollars	Difference Percent
1	Residential	$21,552,945	$10,659,438	($10,893,507)	-102%
2	Commercial 1+	$4,201,316	$3,464,220	($737,096)	-21%
3	Commercial 2-	$803,463	$1,285,013	$481,550	37%
4	Commercial 3	$2,193,845	$3,063,155	$869,310	28%
5	Hotels	$6,063,698	$9,697,451	$3,633,753	37%
6	Government	$3,234,734	$4,028,860	$794,126	20%
7	GIAA Water System	$430,564	$428,133	($2,431)	-1%
8	Navy	$6,879,550	$7,498,160	$618,610	8%
9	Septage	$1,457,645	$125,000	($1,332,645)	-1066%
10	Leachate	$244,285	$647,452	$403,167	62%
11	Total	$47,062,043	$40,896,882	($6,165,161)	-15.075%

Comparison of Rate Revenue Requirement with Adjusted Revenues for Each Customer Class

Line No.	Customer Class	FY 22 Test Year Cost of Service	Projected FY 22 Revenues (Proposed FY 22 Rates + 15.075%)	Difference Dollars	Difference Percent
12	Residential	$21,552,945	$12,266,337	($9,286,608)	-76%
13	Commercial 1+	$4,201,316	$3,986,447	($214,868)	-5%
14	Commercial 2-	$803,463	$1,478,727	$675,265	46%
15	Commercial 3	$2,193,845	$3,524,922	$1,331,078	38%
16	Hotels	$6,063,698	$11,159,331	$5,095,634	46%
17	Government	$3,234,734	$4,636,206	$1,401,473	30%
18	GIAA Water System	$430,564	$492,674	$62,109	13%
19	Navy	$6,879,550	$8,628,500	$1,748,950	20%
20	Septage	$1,457,645	$143,844	($1,313,801)	-913%
21	Leachate	$244,285	$745,055	$500,770	67%
22	Total	$47,062,043	$47,062,043	$0	0%

Adjustment: increase rate revenues across the board by the percentage required for the revenues from existing rates (as increased) equal the cost of service. This provides a better comparison of inter-class subsidies.

Negative percent difference means the cost of service is higher than the rate revenue actually collected.

Table COS-19
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater Cost-of-Service Analysis - Supporting Calculations

Calculations Used to Define Billing Determinants

Calculation of FY 20 WWTP Flow

Source: "Layon Ordot Leachate Totals Sept 2013 to present totalizer readings 2.xls", provided by GWA 1/12/21 except Injaran, where flow obtained from GWA website, and BOD and TSS which are not measured, based on an average of other plant data.
This is the source for flow, BOD, and TSS data from GWA's WWTPs.

	FY 20 Influent Flow, mgd					
	Agana WWTP	Agat WWTP	NDWWTP	Umatac	Injaran	Total
Jul-19	4.69	1.03	6.04	0.39	0.10	12.25
Aug-19	5.57	2.59	6.53	0.39	0.10	15.18
Sep-19	5.30	2.80	6.41	0.39	0.10	15.00
Oct-19	4.83	2.93	5.81	0.39	0.10	14.06
Nov-19	4.88	2.13	5.86	0.58	0.10	13.55
Dec-19	4.52	1.43	5.66	0.41	0.10	12.12
Jan-20	4.44	1.10	5.76	0.24	0.10	11.64
Feb-20	4.45	1.06	5.66	0.26	0.10	11.53
Mar-20	4.23	0.85	4.95	0.22	0.10	10.35
Apr-20	3.94	0.97	4.61	0.20	0.10	9.82
May-20	3.94	1.05	4.68	0.20	0.10	9.97
Jun-20	3.94	1.16	4.32	0.20	0.10	9.72
Jul-20	4.39	0.99	4.30	0.19	0.10	9.97
Aug-20	4.56	1.67	4.50	0.40	0.10	11.23
Sep-20	4.63	2.67	4.63	0.72	0.10	12.75
FY 20 Influent flow, MG						4,169.11

Table COS-19
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater Cost-of-Service Analysis - Supporting Calculations

28 Calculation of FY 20 WWTP Influent TSS, mg/L

	Influent TSS, mg/L					
	Agana WWTP	Agat WWTP	NDWWTP	Umatac	Injaran	Average
Jul-19	147.00	46.00	34.00	45.00	68.00	68.00
Aug-19	132.00	77.00	142.00	13.00	91.00	91.00
Sep-19	152.00	137.00	147.00	39.00	118.75	118.75
Oct-19	148.00	88.00	150.00	62.00	112.00	112.00
Nov-19	153.00	24.00	121.00	47.00	86.25	86.25
Dec-19	132.00	36.00	103.00	29.00	75.00	75.00
Jan-20	168.00	62.00	119.00	66.00	103.75	103.75
Feb-20	112.00	52.00	168.00	46.00	94.50	94.50
Mar-20	94.00	69.00	68.00	108.00	84.75	84.75
Apr-20	110.00	72.00	136.00	54.00	93.00	93.00
May-20	94.00	278.00	154.00	52.00	144.50	144.50
Jun-20	132.00	190.00	166.00	46.00	133.50	133.50
Jul-20	112.00	246.00	194.00	70.00	155.50	155.50
Aug-20	109.00	92.00	138.00	46.00	96.25	96.25
Sep-20	175.00	127.00	135.00	39.00	119.00	119.00

Calculation of FY 20 WWTP Influent BOD, mg/L

	Influent BOD, mg/L					
	Agana WWTP	Agat WWTP	NDWWTP	Umatac	Injaran	Average
Jul-19	110.00	89.00	140.00	74.00	103.25	103.25
Aug-19	116.00	47.00	181.00	12.00	89.00	89.00
Sep-19	141.00	79.00	207.00	25.00	113.00	113.00
Oct-19	152.00	44.00	160.00	23.00	94.75	94.75
Nov-19	154.00	43.00	157.00	49.00	100.75	100.75
Dec-19	151.00	44.00	151.00	38.00	96.00	96.00
Jan-20	128.00	44.00	165.00	60.00	99.25	99.25
Feb-20	109.00	56.00	172.00	51.00	97.00	97.00
Mar-20	94.00	65.00	147.00	85.00	97.75	97.75
Apr-20	98.00	66.00	165.00	71.00	100.00	100.00
May-20	108.00	99.00	166.00	73.00	111.50	111.50
Jun-20	133.00	124.00	220.00	74.00	137.75	137.75
Jul-20	111.00	144.00	210.00	84.00	137.25	137.25
Aug-20	118.00	99.00	178.00	85.00	120.00	120.00
Sep-20	108.00	62.00	203.00	49.00	105.50	105.50

Calculation of FY 20 WWTP Influent TSS, lb/year

Influent TSS, lb/month

Table COS-19
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater Cost-of-Service Analysis - Supporting Calculations

		Agana WWTP	Agat WWTP	NDWWTP	Umatac	Injaran	Total
68							
69	Oct-19	184,960	66,714	225,495	6,256	2,898	483,426
70	Nov-19	193,188	13,227	183,465	7,053	2,232	396,933
71	Dec-19	154,377	13,320	150,842	3,076	1,941	321,615
72	Jan-20	193,002	17,646	177,353	4,098	2,684	392,100
73	Feb-20	128,958	14,262	246,034	3,095	2,445	392,348
74	Mar-20	102,882	15,175	87,093	6,148	2,193	211,298
75	Apr-20	112,139	18,071	162,222	2,794	2,406	295,226
76	May-20	95,828	75,527	186,482	2,691	3,739	360,528
77	Jun-20	134,567	57,027	185,550	2,380	3,454	379,525
78	Jul-20	127,219	63,014	215,844	3,441	4,023	409,518
79	Aug-20	128,606	39,753	160,680	4,761	2,490	333,800
80	Sep-20	209,647	87,737	161,728	7,266	3,079	466,377
81	FY 20 Influent TSS Loading, lb/year						4,442,694
82							
83							
84	Calculation of FY 20 WWTP Influent BOD, lb/year						
85				Influent BOD, lb/month			
86		Agana WWTP	Agat WWTP	NDWWTP	Umatac	Injaran	Total
87	Oct-19	189,959	33,357	240,528	2,321	2,452	466,165
88	Nov-19	194,451	23,698	238,049	7,353	2,607	463,552
89	Dec-19	176,598	16,280	221,138	4,031	2,484	418,047
90	Jan-20	147,049	12,523	245,910	3,726	2,568	409,208
91	Feb-20	125,503	15,359	251,892	3,431	2,510	396,185
92	Mar-20	102,882	14,296	188,275	4,839	2,529	310,290
93	Apr-20	99,906	16,565	196,813	3,674	2,587	316,958
94	May-20	110,100	26,896	201,013	3,778	2,885	341,787
95	Jun-20	135,587	37,218	245,910	3,829	3,564	422,543
96	Jul-20	126,083	36,886	233,645	4,130	3,551	400,744
97	Aug-20	139,225	42,778	207,253	8,797	3,105	398,053
98	Sep-20	129,382	42,832	243,190	9,128	2,730	424,533
99	FY 20 Influent BOD Loading, lb/year						4,768,066
100							

Table COS-19
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater Cost-of-Service Analysis - Supporting Calculations

FY2020 Septage Volume

FY2020 Septage Volume	4,715,623

Source: Compiled by FG Solutions from FY2020 Septage Invoices provided by GWA on 4/6/2021

FY2020 Leachate Flow

	gal/year	% of total	
Ordot	25,949,893	89%	
Layon	3,187,400	11%	Discharges to Inarajan WWTP
Total	29,137,293	100%	

Source: GWA spreadsheet received "Layon Ordot Leachate Totals Sept 2013 to present totalizer readings 2.xls"
Data is not included in GWA billing data, so it is added to the billing determinants contained in the billing data.

Leachate BOD and TSS Data

		BOD, mg/L	TSS, mg/L	Notes
Layon	Average of 6 readings from June - August 2020	223.17	3.08	1
Ordot	Average of 17 readings from 2015 - 2020	22.12	8.99	2
Flow Weighted Average, rounded to nearest 1.0 mg/L		44.00	8.00	

(1) Source: 38th Inarajan Quarterly Report Jun-Aug 2020, provided by GWA, January 2021
(2) Source: LCRS 2020 Q2 Report, provided by GWA December 2020

Table COS-19
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater Cost-of-Service Analysis - Supporting Calculations

126 Estimated BOD and TSS Concentration, mg/L; Estimated Return Factor

		2011 Memo	2021	2011 Memo	2021	2021
127						
128	Customer Class	BOD, mg/L	COS Study	TSS, mg/L	COS Study	COS Study
129	Residential	100	100	100	100	80%
130	Commercial I+	90	90	90	90	80%
131	Commercial II & Hotel	115	N/A	230	N/A	N/A
132	Commercial II-		115		230	80%
133	Hotel		115		230	80%
134	Commercial III	330	330	460	460	80%
135	Agriculture		0		0	0%
136	Irrigation		0		0	0%
137	Government: Navy and Airfoı	160	N/A	138	N/A	N/A
138	Government: Government	90	N/A	90	N/A	N/A
139	Government		90		90	80%
140	Navy		160		138	80%
141	Federal		90		90	80%
142	Septage		5391.5		12914.5	100%
143	Leachate		44		8	100%
144	Airport		115		230	80%

145

146 Notes:
147 (1) Guam Waterworks Authority Cost of Service Evaluation, June 14, 2011, prepared by CDM, Table 8
148 This memo notes that the sewage strengths "are calculated from the mass balance based on typical sewage strengths by classification"
149 and that Navy and Airforce data is from the Yigo Manhole, where Yigo sampling of airforce sewage was from five separate composite samples
150 taken between 11/8/10 and 11/13/10.
151 (2) Septage BOD and TSS is the average of two sets of septage BOD and TSS measurements:
152 a. Septage from GWA 1/25/21, based on eight-hour composite sample from septage receiving station (eight grab samples one hour apart).
153 b. Septage from NDWWTP wastewater characterization study, 2/5/2018, Table 2.
154
155 (3) Leachate: see above data from landfill monitoring reports.
156 (4) Agriculture and Irrigation customers are assigned 0 BOD and TSS. Based on a review of GWA customer data, there are no GWA water Agriculture
157 Irrigation customers that receive wastewater service from GWA.
158
159

Table COS-19
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater Cost-of-Service Analysis - Supporting Calculations

160	FY 2020 Sewer Flow for Residential Customer Class, For Mass Balance		
161	Metered Water Consumption, GWA Residential Water Customers	3,612,741,784	FY 20, gallons/year
162	Number of Accounts	39,439	FY 20
163	gal/month/account	7,634	
164	gal/month/account sewer flow with 80% return factor	6,106.92	
165	gpd per capita with household size of 3.8 (3.8 per BC staff, Jan 2021)	52.99	53 gpd per capita....
166	Sewer flow for entire residential wastewater customer class, gal/year	2094497860	multiplied by no. of residential wastewater accounts
167			
168	FY 22 sewer flow for entire residential wastewater customer class, gal/year	1737247486	Source: COS Input Template, excludes 3,128 MF units
169	Number of Accounts, projected FY22	24,772	Source: COS Input Template
170	gal/month/account	5,844.12	differs from FY20 above. Water use changed between FY 20 and FY 22
171			
172	FY 2020 BOD, lb/year	1,747,724	at 100 mg/L with unit conversions
173	FY 2020 TSS, lb/year	1,747,724	at 100 mg/L with unit conversions
174			
175			
176			
177			
178	Projected Residential Billed Wastewater Flow, BOD, and TSS		
179			

180		FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
181	Sewer Flow, Residential Customers, Source: COS Input Template	no data provided	1,737,247,486	1,640,765,323	1,549,217,091	1,457,663,815
182	Number of Residential Sewer Accounts		24,772	25,038	25,303	25,569
183	gal/month/account (FY21 only use FY22)	5,844	5,844	5,461	5,102	4,751
184						
185	Number of Residential Wastewater Accounts					
186	Billed as Residenial	24,506	24,772	25,038	25,303	25,569
187	Multi-family Residential Billed Individually	0	0	0	0	0
188	Total	24,506	24,772	25,038	25,303	25,569
189	Sewer flow for entire residential wastewater customer class, gal/year	1718593044	1737247486	1640765323	1549217091	1457663815
190	BOD, lb/year	1,434,055	1,449,621	1,369,113	1,292,722	1,216,327
191	TSS, lb/year	1,434,055	1,449,621	1,369,113	1,292,722	1,216,327
192						
193						

Table COS-19
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater Cost-of-Service Analysis - Supporting Calculations

Estimated BOD Loadings, lb/year

	Historical Data (Flow Data Reference: HistoricaDemand_Flows, GRG 12/2020)			Projected Data (Flow Data Reference: Demand& Flows, GRG, 4/20/2021)				
	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
Wastewater BOD by Class (lbs/year)								
Residential	N/A	N/A	1,747,724	1,434,055	1,449,621	1,369,113	1,292,722	1,216,327
Commercial 1+	319,535	313,159	294,519	284,428	285,172	285,837	287,754	289,625
Commercial 2-	80,911	76,812	62,959	52,194	58,118	63,905	69,877	75,771
Commercial 3	367,685	381,239	288,654	240,848	283,701	325,590	368,219	410,297
Hotels	623,308	657,532	470,131	386,126	439,197	491,055	544,218	596,689
Government	207,463	230,480	241,156	238,239	228,256	218,431	209,736	201,131
Airport	15,197	17,213	20,347	31,319	30,993	30,667	30,482	30,297
Navy	N/A	N/A	742,170	754,187	754,187	754,187	754,187	754,187
Septage	N/A	N/A	212,149	212,149	212,149	212,149	212,149	212,149
Leachate	N/A	N/A	10,698	10,698	10,698	10,698	10,698	10,698
System Subtotal	N/A	N/A	3,867,659	3,421,397	3,529,244	3,538,785	3,557,193	3,574,322

Estimated TSS Loadings, lb/year

	Historical Data (Flow Data Reference: HistoricaDemand_Flows, GRG 12/2020)			Projected Data (Flow Data Reference: Demand& Flows, GRG, 4/20/2021)				
	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
Wastewater BOD by Class (lbs/year)								
Residential	N/A	N/A	1,747,724	1,434,055	1,449,621	1,369,113	1,292,722	1,216,327
Commercial 1+	319,535	313,159	294,519	284,428	285,172	285,837	287,754	289,625
Commercial 2-	161,822	153,623	125,918	104,389	116,236	127,809	139,754	151,541
Commercial 3	512,530	531,423	402,366	335,728	395,461	453,852	513,274	571,929
Hotels	1,246,617	1,315,063	940,262	772,251	878,393	982,110	1,088,436	1,193,377
Government	207,463	230,480	241,156	238,239	228,256	218,431	209,736	201,131
Airport	30,395	34,426	40,693	62,639	61,987	61,334	60,964	60,593
Agriculture								
Irrigation								
Navy	N/A	N/A	640,121	650,486	650,486	650,486	650,486	650,486
Septage	N/A	N/A	508,171	508,171	508,171	508,171	508,171	508,171
Leachate	N/A	N/A	1,945	1,945	1,945	1,945	1,945	1,945
System Subtotal	N/A	N/A	4,432,760	3,882,215	4,065,613	4,148,973	4,243,125	4,335,009

Table COS-19
Guam Waterworks Authority
Water and Wastewater Cost of Service Study
Fiscal Year 2022 Test Year
Wastewater Cost-of-Service Analysis - Supporting Calculations

231 Mass Balance: Comparing Calculated Treatment Plant Influent BOD and TSS with Estimated BOD and TSS from Customers

	BOD and TSS Measured at WWTPs Times WWTP Flow	Calculated Using Customer Data	% Difference	Plus Billed Metered Volume of Failed Meters at 80% Return Factor and 100 mg/L BOD and TSS	Calculated Using Customer Data and Metered Volume of Failed Meters	% Difference
BOD, lb/year	4,768,066	3,867,659	19%	539,554	4,407,214	8%
TSS, lb/year	4,442,694	4,432,760	0%	539,554	4,972,314	-12%

Includes septage as septage holding tank (per Master Plan Volume 3, pages 7-46 and 7-49) is before the influent sampler.

Calculation of Estimated BOD and TSS Load from Billed Metered Volume of Failed Meters

Billed Metered Volume of Failed Meters	1,363,155,659	this is for all water accounts
Billed Metered Volume of Failed Meters	808,262,571	(multiply preceding line by ratio of wastewater to water accts)
80% Return Factor	646,610,057	
BOD, lb/year	539,554	
TSS, lb/year	539,554	

Conclusion: calculated BOD and TSS data is reasonable, given addition of loadings from Metered Volume of Failed Meters. Are approximately +/- 10%.

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Compilation of Service Lateral Expenses Using Old Business Unit Numbers

	FY22 Estimated BU Total $	Percent Laterals	FY22 Estimated Lateral $	Note
In-house CCTV Cleaning, in BU 6917	$784,614	7.5%	$58,846	1
In-house CCTV Inspections, in BU 6918	$0	7.5%	$0	1
In-house Repairs, in BU 6911	$0	10.0%	$0	2
Vendor CCTV inspections/repairs				
Recorded in BU 6914	$69,348	15.0%	$10,402	3
Recorded in BU 6915	$101,590	15.0%	$15,239	3
Recorded in BU 6916	$0	15.0%	$0	3
Total			$84,487	

(1) % estimated is midpoint of 5% to 10% range estimated by GWA staff during 1/14/21 virtual meeting
These busines units are the ones involved when lateral inspections and cleaning is done in-house.
(2) Based on review of GWA's SSO data from July 2020 through Feb 8, 2021, based on the number of
% of reported incidents that are related to private cleanouts and private laterals.
(3) Percent of expenses identifed as "Combo Pumper" in these Business Units. Percentage identifed
by GWA staff in 1/14/21 virtual meeting.

Estimated Debt Service Associated with Capacity Increasing Capital Projects

There are two capacity increasing wastewater treatment plant costs:
1. Expansion of Agat-Santa Rita WWTP with incorporation of flows from Baza Gardens, and
2. Expansion and upgrades to Umatac-Merizo WWTP

Agat-Santa Rita: previous combined wastewater design flow was 1.2 mgd. Capacity
after the project was complete was 1.6 mgd, for an increase of 0.4 mgd.
Source: 2/17/21 email from BC
Therefore, 25% of the project was capacity increasing

$66.93	million, cost of Agat-Santa Rita (source: debt service table)
25%	capacity increasing (25% = 0.4/1.6)
$16.73	million, cost of capacity increasing improvements
$138.07	million, total cost of 2013 bond
12.12%	% of 2013 bond devoted to capacity increasing projects, entirely treatment
$4,247,338	$ amount of 2013 Bond annual debt service
$514,763	$ amount of capacity increasing treatment debt service from 2013 Bonds

Umatac-Merizo: previous capacity was 0.39 mgd. Expanded capacity 0.6 mgd, for an

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increase of 0.21 mgd.
Source: 2/17/21 email from BC

$23	million, cost of Umatac-Merizo (source: BC phone conversation, Feb 2021)
35%	capacity increasing (25% = 0.21/0.6)
$8.05	million, cost of capacity increasing improvements
$129	million, total cost of 2016 bond
6.24%	% of 2013 bond devoted to capacity increasing projects, entirely treatment
$11,006,500	$ amount of 2016 Bond annual debt service
$686,465	$ amount of capacity increasing treatment debt service from 2016 Bonds

Total annual debt service for capacity increasing projects $1,201,227

Allocation of I/I

WEF Manual 27, page 132
The most common approaches have been to use contributed wastewater flow, the number of connections (or customers), or a combination of the two to allocate I/I related costs. Contributed flows are often used because of the correlation between flow volume and pipe size. Further, volume recognize the potential for greater runoff from large properties than smaller properties, and it is assumed that large-volume useres have larger properties than smaller users.

The number of connections in the wastewater system reflects the size of the collection system, the greater potential for infiltration through poor joints and cracked pipes, and potential for inflow through roof, floor, and foundation drains.

Amount of I/I

	MG/year	As %	
Billable Wastewater Flow from Customers	1,986	48%	From Historical Billing Determinant Data plus Leachate, Sepatage
Billable Wastewater Flow from Failed Meters	647	16%	data from above
Amount of I/I	1,537	37%	
WWTP Flow	4,169	100%	

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Proposed Allocation of Collection System Electricity Related Costs and I/I Reduction Costs

38% of flow is from I/I. For certain expenses, this will be allocated 90% to flow and 10% to customer.
which is an allowance for low density of development's impact on on the collection system's total cost
(M27, page 103-104)
47% of flow is from contributed wastewater. This is entirely allocated to flow.
Estimated billable wastewater flow from failed meters is allocated to administration

Flow	80.80%
Customer	3.69%
Admin	15.51%
Total	100.00%

Allocation of WWTP Electricity Expenses

Before I/I Consideration	Amount	Flow	BOD	TSS	Description
UMATAC-MERIZO WASTEWATER TREATMENT PLANT, UM	$155,533	50%	50%		Aerated lagoons w/o solids trtmnt (2)
PAGO SOCIO PUMP STATION, CHALAN PAGO	$185	100%			
PUMP STATION #13, MERIZO	$7,310	100%			influent pump station (1)
PUMP STATION #20, MERIZO	$23,907	100%			treated effluent recirculation (1)
AGAT GAAN #1 STP, AGAT	$78,407	100%			
AGAT SANTA RITA WWTP, AGAT	$8,355	100%			
TIPALAO #2 SPS, SANTA RITA	$398,259	100%			treated effluent pump station (1)
AGAT TREATMENT PLANT, AGAT	$4,788	50%	50%		Secondary treatment and pumping. Solids hauled to Hagatna plant. (2)
NORTHERN TP, TAMUNING	$126,799	33.33%	33.33%	33.33%	Chemically enhanced primary trtmnt (2)
NORTH DISTRICT TP, TAMUNING	$19,503	33.33%	33.33%	33.33%	Chemically enhanced primary trtmnt (2)
AGANA TREATMENT PLANT, HAGATNA	$92,544	33.33%	33.33%	33.33%	Ox. ditches, aerobic digestion, UV (2)
AGAT TREATMENT PLANT, AGAT	$251	50%	50%		
INARAJAN TREATMENT PLANT, INARAJAN	$25,551	50%	50%		Aerated lagoons w/o solids trtmnt (2)
Plus Increase in Power from Northern TP after startup	$593,984	33.33%	33.33%	33.33%	$ per GWA, 2/7/21.
Total Allocated Amount Before I/I Consideration	$1,535,376	$887,094	$370,672	$277,610	
As Percent		57.78%	24.14%	18.08%	

(1) Source: email from Brown and Caldwell, 1/11/2021
(2) As described in the 2018 Water Resources Master Plan, Volume 3, Chapter 7.

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368 After I/I Consideration
369 As described above for collection system power expenses, a portion of the treatment plant electricity expenses are due to I/I.
370 Of the flow related electricity costs, 80.80% is allocated to flow, and 3.69% is allocated to customer
371 and 15.51% is allocated to admin
372

	Flow	BOD	TSS	Customer	Admin
373 Total Allocated Amount After I/I Consideration	46.69%	24.14%	18.08%	2.13%	8.96%

374
375

EXHIBIT D

Calculation of FY 2024 Leachate Rate

			Remarks
FY 2022 rate revenue requirement from COS study (water):	$	47,062,043	
FY 2022 rate revenue requirement from COS study (wastewater):	$	70,192,430	
Total FY 2022 rate revenue requirement (COS):	$	117,254,473	
FY 2024 rate revenue requirements from True-Up:			
without revenue adjustments (option 1)	$	142,205,354	FY24 Leachate cost allocation is 0.23% of this revenue
net of revenue adjustments (option 2)	$	138,139,797	FY24 Leachate cost allocation is 0.24% of this revenue
FY 2022 Leachate cost of service	**$**	**244,285**	From Table 3-24 of final Cost of Service study, page 3-20
FY 2023 Leachate cost allocation	$	257,721	Applies 5.5% actual rate increase approved by PUC
FY 2024 Leachate cost allocation	$	327,305	Applies 27% rate increase proposed by GWA
Estimated billing determinants after fix (BOTH FACILITIES)		22,239,473	
FY 2024 rate to recover FY 2024 cost allocation		$14.72	Proposed FY24 Comm3 WW rate is $36.73, 2.5x Leachate rate
Estimation of billing determinants (leachate flows)			
Average inches of rain (2016 - 2022)		95.8	
Flow (gallons) per inch of rain, Ordot (FY 2024)		154,669	See Flow Calculation Sheet
Flow (gallons) per inch of rain, Layon (FY 2024)		77,566	See Flow Calculation Sheet
Estimated FY 2024 flows (gallons)		22,239,473	
Adjusted FY 2023 leachate rate based on FY 2023 cost allocation		**$11.59**	

EXHIBIT E

Flow Calculation - Ordot Facility Summary

17.8% *CAGR for Ordot flow per inch of rainfall metric before problems started*

Year	Actual Total Flows	Months	Average Flows / Month	Total Rain (inches)	Flows per Inch of Rain	Estimated Change Over Time
						10.5%
2015	6,749,908	11	613,628	107.2	**62,971**	**62,971**
2016	7,399,162	12	616,597	93.9	**78,765**	**69,583**
2017	8,489,311	12	707,443	97.2	**87,366**	**76,890**
2018	**18,377,959**	**12**	**1,531,497**	**107.7**	**170,656**	84,963
2019	**22,277,949**	**12**	**1,856,496**	**92.0**	**242,257**	93,884
2020	**27,997,386**	**12**	**2,333,116**	**89.1**	**314,154**	103,742
2021	**28,471,094**	**12**	**2,372,591**	**99.9**	**285,024**	114,635
2022	**37,644,430**	**12**	**3,137,036**	**90.6**	**415,639**	126,672
2023	8,429,488	5	1,685,898	61.3	**137,490**	**139,972**
2024						**154,669**

Green shading represents Ordot facility data before leak or after problem was fixed

Flow Calculation - Layon Facility Summary

2015	2,927,000	11	266,091	107.2	27,307
2016	3,633,216	12	302,768	93.9	38,676
2017	3,657,600	12	304,800	97.2	37,641
2018	3,720,100	12	310,008	107.7	34,545
2019	3,926,300	12	327,192	92.0	42,696
2020	3,603,400	12	300,283	89.1	40,433
2021	5,765,527	12	480,461	99.9	57,719
2022	7,211,446	12	600,954	90.6	79,623
2023	4,270,365	5	854,073	61.3	69,652
2024					**77,566** (estimate)

12.8% *CAGR for flow per inch of rainfall metric for Layon*

12.4% *CAGR for flow per inch of rainfall metric for Layon*