Water and Wastewater Forecasting Technical Memorandum

Coastal Georgia Regional Water Planning Council

Cumberland Island

Supplemental Material

Coastal Georgia Regional Water Plan

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Cumberland Island
photo courtesy of the Georgia Department of Industry, Trade & Tourism

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Section 1
Introduction

Municipal and Industrial Water and Wastewater Forecasts were originally developed for the Coastal Georgia Regional Water Planning Council as part of the Georgia Comprehensive Statewide Water Management Plan (CSWMP) in 2011. Agricultural and Energy water needs were also identified and forecasted during the 2011 planning process. As part of the 5-year review and revision of that plan, all of these forecasts, except Industrial water and wastewater forecasts, have been updated. This Technical Memorandum describes how the original forecasts have been updated to account for changes in population and water use that have occurred since the original forecasts were produced.

Throughout this report, the prior Regional Planning process that occurred in 2009 – 2011 is referred to as "Round 1." Thus, the current (2016) update is referred to as "Round 2".

The basic approach to updating the forecasts starts with the same methodology used in developing the original forecasts, which are described in various Technical Memoranda, which were included as supplemental materials to the 2011 Coastal Georgia Regional Water Plan.[1] The purpose of this Technical Memorandum is to describe where modifications to the original forecast methodology were made and to provide the revised forecast values.

1.1 General Methodology

The basic methodology for forecasting water demand is to estimate demand separately for each major water use sector. For each sector, water demand is estimated using a 'driver' multiplied by the 'rate of use'. The driver is defined as a countable unit that can be projected in future years, such as number of people, number of employees in a business, acres irrigated or megawatts of power. The rate of use is defined as the quantity of water used by the driving unit per unit of time, such as gallons per person per day, gallons per day per acre, or gallons per megawatt produced.

The planning process examines and forecasts water demand for four major sectors:

- **Municipal** – this sector includes domestic, commercial, and low water use industries
- **Industrial** – this sector includes higher water use industries
- **Agricultural** – this sector includes major crops such as cotton, corn, peanuts, soybean, pecans, specialty crops, and nursery and horticulture; a snapshot of major livestock water use and golf course water use

[1] See "Water and Wastewater Forecasting Technical Memorandum," dated May 2011 (available at (http://www.coastalgeorgiacouncil.org/documents/CoastalGAForecastTM050211.pdf);

"Statewide Energy Sector Water Demand Forecast" Technical Memorandum, dated October 29, 2010 (available at http://www.georgiawaterplanning.org/pages/forecasting/energy_water_use.php);

and Agricultural Water Use forecast prepared by Dr. Jim Hook et al. (available at http://www.georgiawaterplanning.org/pages/forecasting/agricultural_water_use.php).

- **Energy** – this sector includes thermoelectric power generation

1.2 Population Update

State and County population projections are provided by the Governor's Office of Planning and Budget (OPB). These projections are used consistently throughout the state for multiple purposes such as transportation planning and allocation of education funds. The Georgia Environmental Protection Division (EPD) is required to use these population projections in statewide water planning. The 2010 Census statewide population count was lower than had been projected for 2010 in the Round 1 projections, although this trend of lower population than projected does not hold true for all counties. The prior forecast had the State's population growing at an annual rate of 1.69% while the new forecast grows at an annual rate of only 1.05% as shown in **Figure 1-1**.

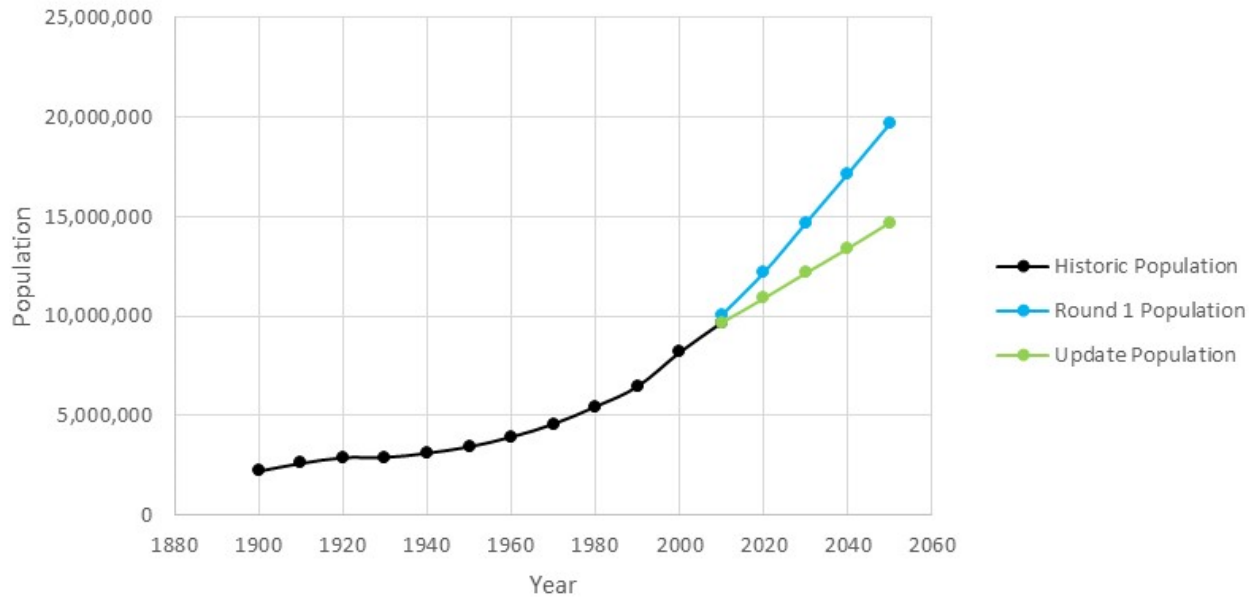


Figure 1-1
Georgia's Historic Population and Growth Projections

While the trend of a lower population in 2010 than projected was seen statewide, each county had its own individual trend. For the region as a whole, the population obtained from the 2010 Census data was 1.2 percent higher than the Round 1 projection. However, lower growth rates moving forward are predicted leading to a projected population in 2050 that is 20 percent less than the previous estimates as shown in **Figure 1-2**. The new population projections (OPB, 2015) by county are shown in **Table 1-1**.

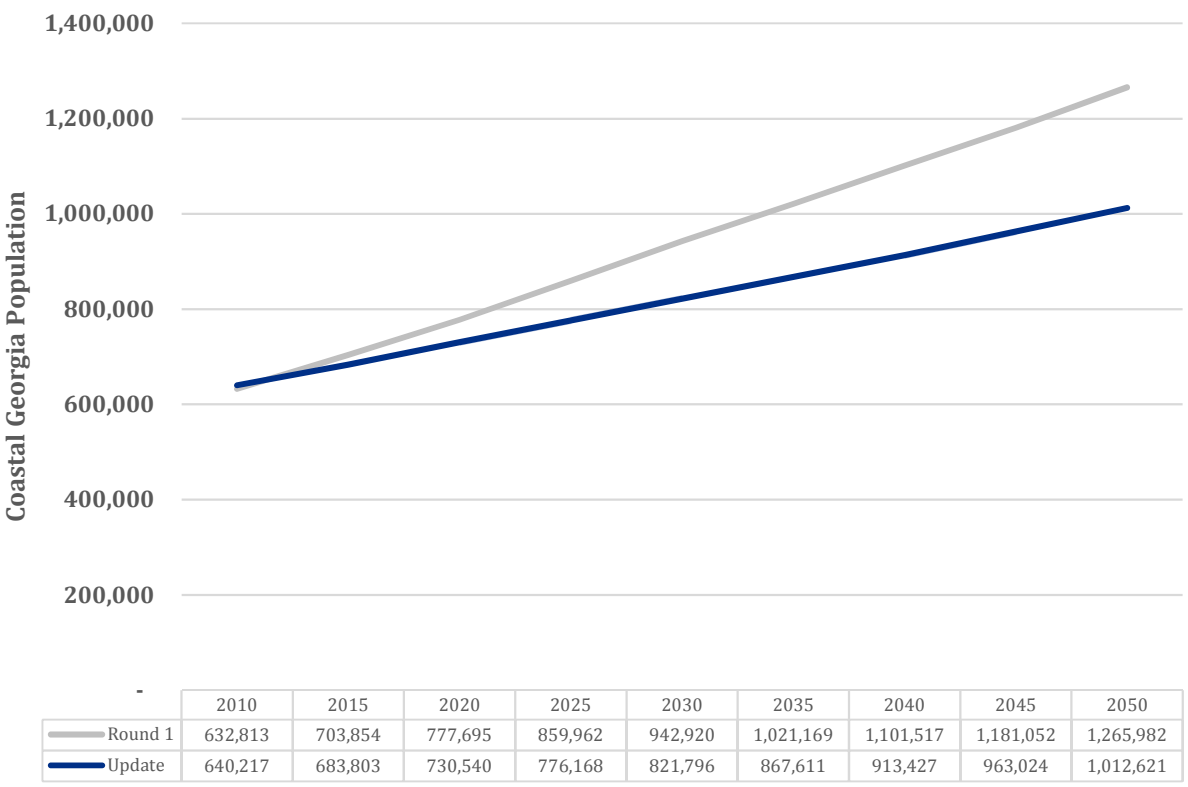


Figure 1-2
Coastal Georgia Population Projections

Table 1-1 Population Projections per County

County	2015	2020	2025	2030	2035	2040	2045	2050
Bryan	35,107	40,165	46,044	51,924	59,117	66,309	75,379	84,449
Bulloch	73,278	78,642	84,235	89,828	95,559	101,289	107,619	113,950
Camden	52,580	55,230	57,455	59,679	61,469	63,260	64,800	66,339
Chatham	285,958	304,482	321,787	339,092	355,532	371,973	388,773	405,573
Effingham	56,847	62,989	69,654	76,320	83,619	90,918	99,473	108,029
Glynn	83,355	87,921	92,294	96,667	101,061	105,455	110,478	115,502
Liberty	65,294	67,806	69,348	70,890	71,690	72,489	72,276	72,064
Long	17,447	19,600	22,109	24,618	27,495	30,372	33,565	36,757
McIntosh	13,937	13,706	13,242	12,778	12,070	11,362	10,660	9,958
Total	**683,803**	**730,540**	**776,168**	**821,796**	**867,611**	**913,427**	**963,024**	**1,012,621**

Section 2
Municipal Water Forecasting

This section describes the methodology and results of municipal water demand forecasts for the Coastal Georgia Planning Region.

2.1 Methodology

The county level municipal water demand includes both public-supplied (i.e., utility) water demand and self-supplied (i.e., private well) water demand. The self-supplied water is associated with groundwater use, while the public-supply water is associated with either surface water or groundwater use as indicated by permit data. Each county has an average weighted per capita water use value that was derived from an analysis of all reporting utilities within each county, and then vetted through the regional councils in Round 1. The following sections describe updates to the previous methodology used to produce the revised forecasts.

2.1.1 Percent Change in Gallons per Capita per Day

The Georgia EPD reviewed withdrawal data and estimated population served data reported by permitted municipal water systems from the years 2010 through 2014. GA EPD then calculated adjustment factors for each County's public-supplied municipal per capita water use rate. For each county, a per capita value for each year 2010-2014 was calculated based on actual withdrawal and estimated population served data for that county. The percent rate of change was calculated for each year interval (2010 to 2011, 2011 to 2012, 2012 to 2013, 2013 to 2014), and the average of those four values was calculated as the per capita water use adjustment factor.

These adjustment factors were applied to the gpcd values used in Round 1 to derive the 2015 gpcd values for each county. If no data were available to EPD, the prior gpcd value was used as the 2015 value. Of the counties with available data, roughly two-thirds had a decrease in gpcd while about one third showed an increase in gpcd. Note that a decrease in gpcd could be due to conservation and water loss control efforts during this time period, or other factors such as an increase in population with less increase in water use, or a drop in water use (e.g., loss of industrial customer) with the same population. **Table 2-1** shows the gpcd adjustment factor applied to the Round 1 gpcd for each county in the region.

The self-supplied value of 100 gpcd for each county remains unchanged from Round 1.

Table 2-1. Per Capita Demand Values by County, gpcd

County	Round 1 Per Capita	2015 Adjustment Factor	Round 2 Adjusted Per Capita
Bryan	138	-0.2%	138
Bulloch	138	-0.3%	138
Camden	138	-3.4%	133
Chatham	138	-1.6%	136
Effingham	138	1.7%	140
Glynn	138	-2.3%	135
Liberty	138	-1.2%	136
Long	138	-0.6%	137
McIntosh	138	-4.1%	132

2.1.2 Plumbing Code Adjustment Factor

In Round 1, the gpcd for each county was reduced over time due to the effects of plumbing codes based upon the age of housing stock in each county. Over time, as new houses are built with more efficiency fixtures, the county average gpcd will decrease. Previously a reduction (adjustment) was calculated for each county starting with zero in 2010 (the base year in Round 1) and increasing over time. For the update, these plumbing code adjustments were reset to zero in 2015 with the difference in the adjustment factor between 2010 and 2014 subtracted from the adjustment factor for all remaining years. The revised plumbing code adjustment was then applied to both public-supplied and self-supplied water demand.

Table 2-2 shows the municipal public-supplied gpcd value over time for each county as used in the current forecast. These adjusted values start with a regional water use rate of 138 gpcd for every county before the percent change adjustments are applied. As part of the water plan update the Coastal Council carefully considered whether they would make a change to their previously adopted region wide single gpcd value versus estimating county specific gpcd values for each county. Since this update did not include a detailed investigation of specific water use reporting, there was not sufficient information to modify the region wide gpcd value that was developed and adopted during the original water plan development (Round 1). The Coastal Council will revisit this topic as part of the full plan update during the next update cycle.

Table 2-2. Adjusted Public-Supplied GPCD

County	Regional Round 1 Base gpcd	County Specific gpcd*	Time Adjusted Values							
			2015	2020	2025	2030	2035	2040	2045	2050
Bryan	138	110	137.7	136.9	136.0	135.2	134.3	133.5	132.7	131.8
Bulloch	138	108	137.6	136.6	135.5	134.5	133.4	132.4	131.3	130.3
Camden	138	130	133.2	132.4	131.5	130.6	129.8	128.9	128.0	127.2
Chatham	138	136	135.8	134.5	133.1	131.8	130.5	129.2	127.9	126.5
Effingham	138	119	140.3	139.4	138.6	137.7	136.9	136.0	135.2	134.3
Glynn	138	157	134.8	133.6	132.4	131.2	130.0	128.8	127.6	126.4
Liberty	138	109	136.3	135.3	134.3	133.3	132.3	131.3	130.3	129.3
Long	138	116	137.1	136.2	135.2	134.3	133.4	132.4	131.5	130.6
McIntosh	138	136	132.3	131.2	130.2	129.1	128.0	126.9	125.8	124.7

*For planning purposes the Coastal Council has elected to use the region wide gpcd value for forecasting future water use.

2.2 Municipal Water Forecasting Results

Table 2-3 shows the forecasted municipal water demand in millions of gallons per day (MGD) (public-supplied and self-supplied) by county in the Coastal Georgia region. The total regional demand is shown graphically in **Figure 2-1** along with a comparison of the Round 1 estimates. Region-wide the municipal forecast is lower than in Round 1 due to the combination of lower population projections and lower per capita water use values.

Table 2-3 Average Annual Municipal Water Demand Forecast by County (MGD)

County	2015	2020	2025	2030	2035	2040	2045	2050	% Change
Bryan	4.4	5.0	5.6	6.3	7.1	8.0	9.0	10.0	129.2%
Bulloch	9.5	10.1	10.7	11.4	12.0	12.6	13.3	13.9	46.8%
Camden	6.4	6.7	6.9	7.2	7.3	7.5	7.6	7.7	19.9%
Chatham	37.6	39.6	41.4	43.2	44.8	46.4	48.0	49.5	31.8%
Effingham	6.9	7.6	8.4	9.1	9.9	10.7	11.6	12.6	80.7%
Glynn	10.9	11.4	11.8	12.2	12.7	13.1	13.6	14.1	29.6%
Liberty	8.5	8.8	8.9	9.0	9.1	9.1	9.0	8.9	4.5%
Long	1.9	2.2	2.4	2.7	3.0	3.2	3.5	3.8	98.3%
McIntosh	1.6	1.6	1.5	1.4	1.3	1.3	1.2	1.1	-33.3%
Total	**87.7**	**92.9**	**97.8**	**102.6**	**107.2**	**111.8**	**116.8**	**121.6**	**38.6%**

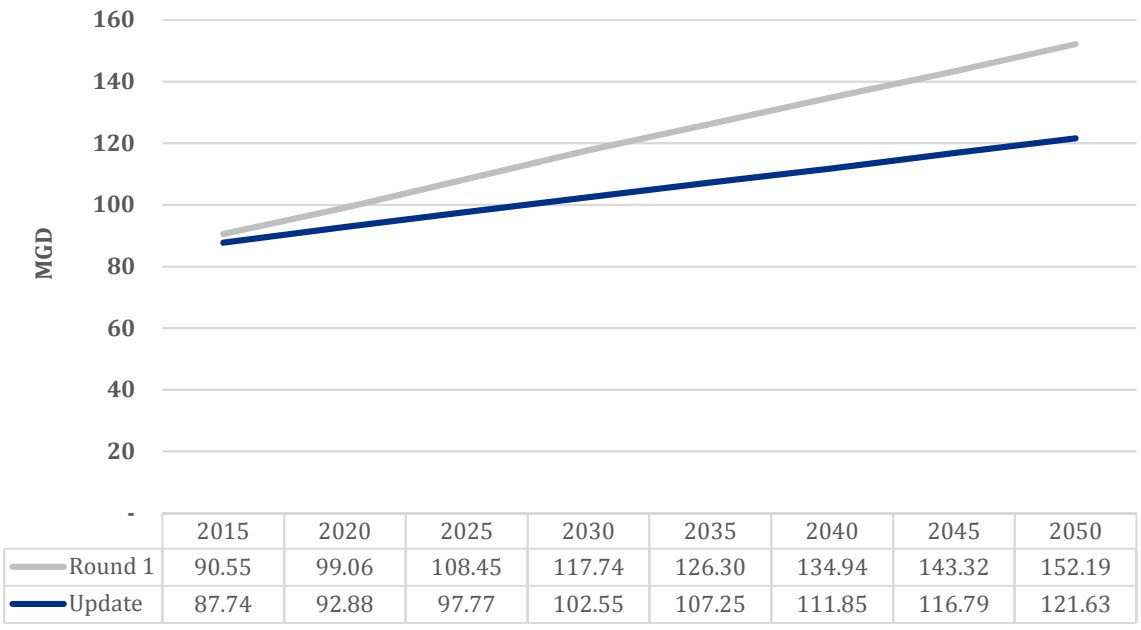


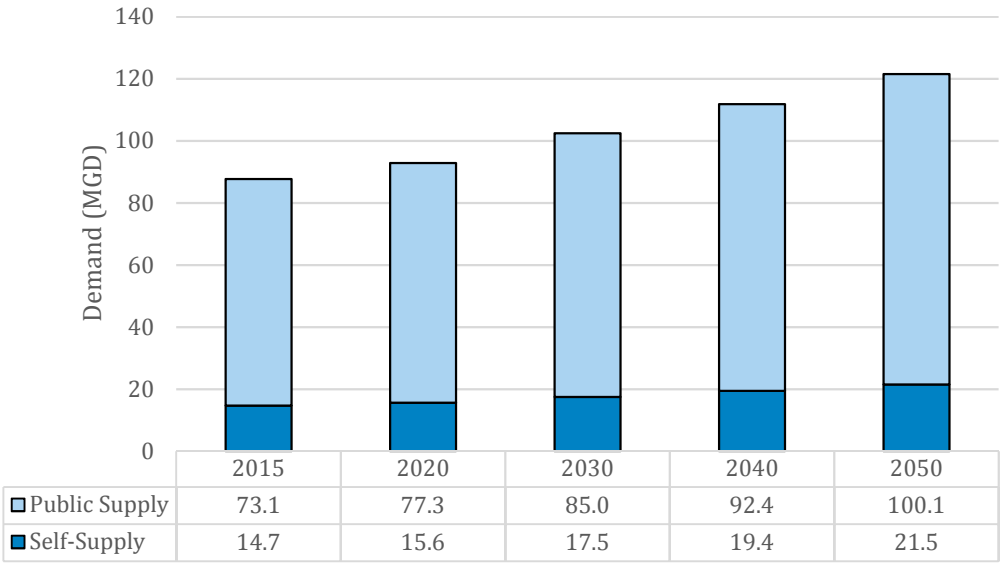
Figure 2-1
Forecasted Municipal Water Demand for Coastal Georgia Planning Council

2.3 Municipal Water Forecast Allocations

As noted above, the municipal water demand for each county is the summation of the public-supplied and self-supplied water demand estimates for each county. The percent of county population that is public-supplied and self-supplied have not been updated from Round 1. This split of county population was derived from USGS estimates, and were vetted through the regional council review process. **Figure 2-2** shows the split between self-supply versus public-supply for the region.

As in Round 1, it is assumed that all self-supplied (i.e., domestic residential) water use is from groundwater. The allocation of public-supplied municipal water among surface water and groundwater sources was determined in Round 1 by an analysis of surface water and groundwater permitted water withdrawals for municipal use by county. The percent of county public-supply municipal water by surface water and groundwater are retained from Round 1 and used to allocate the updated county municipal water demand by sources. Furthermore, the allocation of surface water by stream node (for the surface water models) and groundwater by aquifer (for the groundwater models) maintains the same proportions as in Round 1.

Thus the updated county municipal water demand forecasts are allocated among surface water nodes and groundwater aquifers for analysis with other components of the state water plan update. For the Coastal Georgia region, the majority of municipal water is groundwater from the Floridan aquifer with some groundwater supply from the Brunswick aquifer and some surface water supply from the Savannah basin, as shown in **Figure 2-3**.



	2015	2020	2030	2040	2050
Public Supply	73.1	77.3	85.0	92.4	100.1
Self-Supply	14.7	15.6	17.5	19.4	21.5

Figure 2-2
Self-Supply Versus Public-Supply of Municipal Water Demand

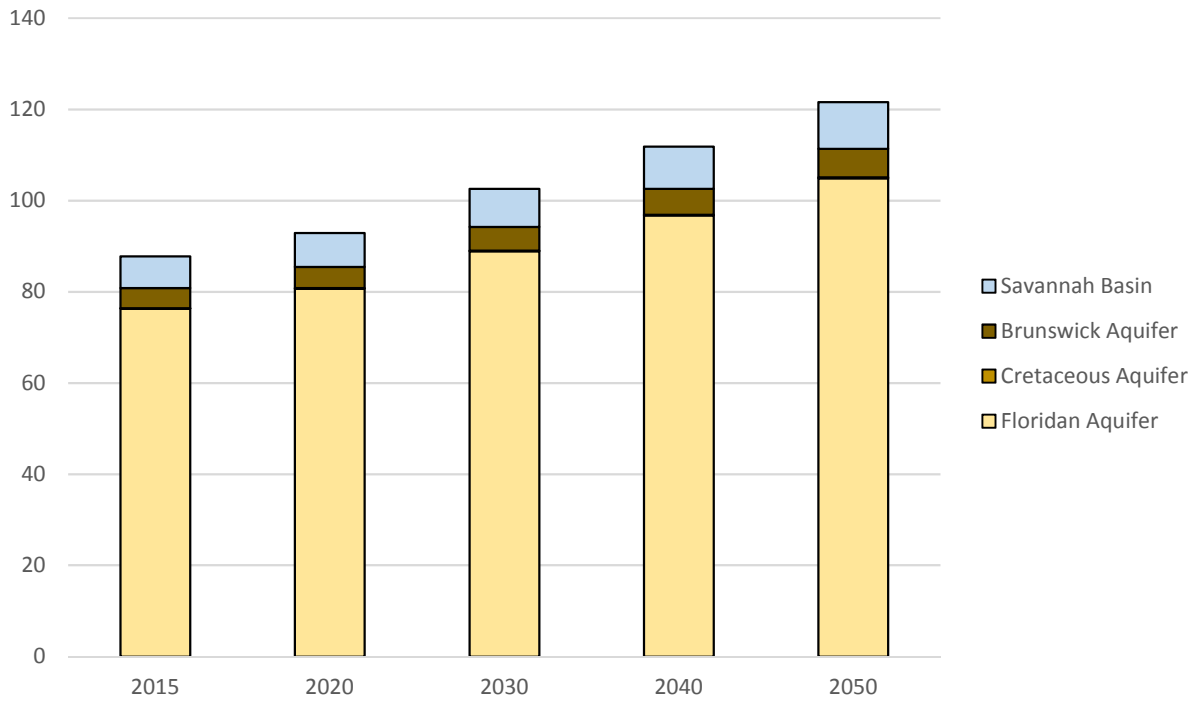


Figure 2-3
Municipal Water Demand for Coastal Georgia Planning Council by Aquifer and Basin

Section 3
Municipal Wastewater Forecasting

This section describes the methodology and results of the update of the municipal wastewater demand forecasts for the Coastal Georgia Planning Region.

3.1 Methodology

Within the previous analysis (i.e., Round 1), the municipal water demand served as the basis for estimating the municipal wastewater flows for each county with a portion of the water demand assumed to be indoor use that entered the centralized wastewater treatment system. While self-supplied water demand was assumed to go to a septic system, public-supplied water in each county had a proportion going to septic and a portion to centralized treatment. A percentage was then added to centralized flows for inflow and infiltration (I/I) that occurs on the way to the treatment facility. The centralized flow estimate was then allocated between point discharge (NPDES) and land application systems (LAS).

For the update, the Georgia EPD provided an analysis of 2014 NPDES permitted discharges by county and a recommended methodology for the municipal wastewater forecast update.

- The percent of county total wastewater flow that is septic is retained from Round 1. Any percentage change over time is from council member input in Round 1.
- Future septic flow by county is estimated from the Round 1 septic flow forecast times the percent change in county population between the Round 1 and Round 2 population projections for the county.
- Future septic flows are allocated to watersheds and stream nodes based on the same percent of county area in watersheds as in Round 1.
- The sum of annual average 2014 NPDES point discharges by county are adjusted by the change in percent of county that is septic/centralized over time (if applicable), and increased/decreased over time with the rate of change in the new county population projections to derive the new point discharge forecast for the county.
- The updated point discharge for the county is allocated to watersheds and stream nodes based on the permit locations of the 2014 NPDES flows in the county.
- The sum of annual average 2014 land application system (LAS) flows by county are adjusted by the change in percent of county that is septic/centralized over time (if applicable), combined with 2014 subsurface flows (if any), and increased/decreased over time with the rate of change in the new county population projections to derive the new LAS + subsurface forecast for the county.

- The updated LAS + subsurface flow forecast for the county is allocated to watersheds and stream nodes based on the permit locations of the 2014 LAS (and subsurface) flows in the county.
- County centralized flow is the sum of the point source discharges and LAS + subsurface discharges.
- County total wastewater flow is the sum of the centralized and septic flows.

3.2 Results

Table 3-1 shows the forecasted municipal wastewater generated per County in the Coastal Georgia region. The total regional wastewater generated is then shown graphically in **Figure 3-1** broken down between septic treatment and centralized treatment that is discharged via a point source or land application. **Figure 3-2** gives a snapshot of the how the generated wastewater is discharged per watershed for 2015.

Table 3-1 Total Wastewater Generated in Coastal Georgia Planning Region per County (MGD)

County	2015	2020	2030	2040	2050	% Change 2015 to 2050
Bryan	4.9	5.6	7.2	9.1	11.5	137%
Bulloch	9.9	10.6	12.0	13.5	15.0	52%
Camden	6.4	6.7	7.2	7.6	7.9	25%
Chatham	34.8	37.5	41.7	45.6	49.7	43%
Effingham	6.2	6.8	8.2	9.6	11.3	82%
Glynn	14.1	14.9	16.4	17.8	19.4	37%
Liberty	4.6	4.9	5.1	5.1	5.1	9%
Long	1.5	1.6	2.0	2.5	2.9	97%
McIntosh	1.6	1.5	1.4	1.2	1.1	-33%
Total	**83.9**	**90.2**	**101.1**	**112.0**	**123.9**	**48%**

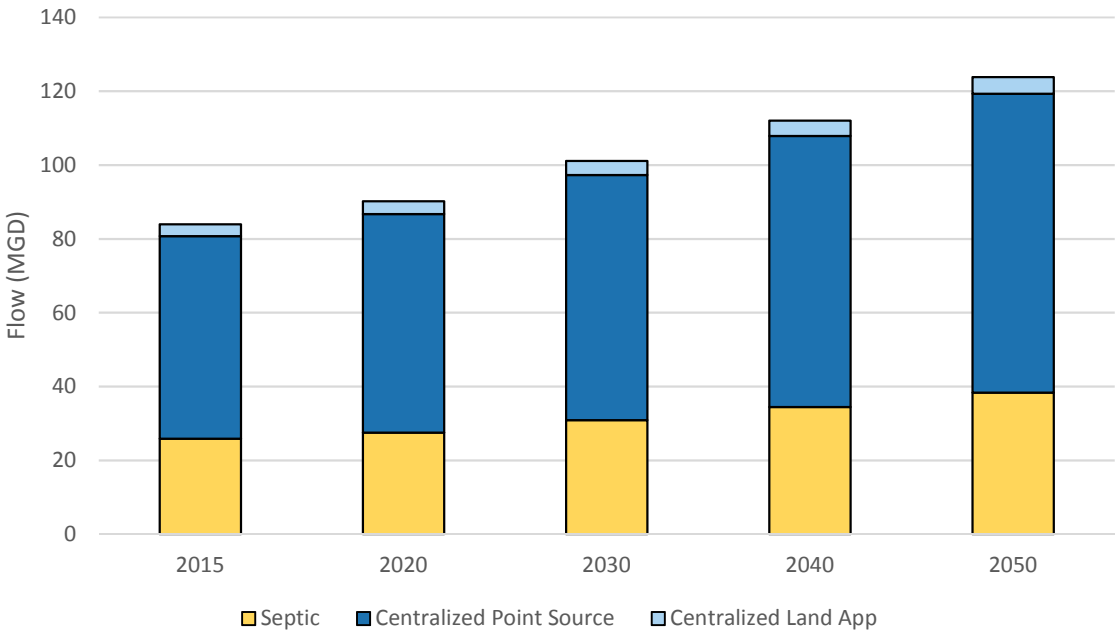


Figure 3-1
Total Wastewater Generated Coastal Georgia Planning Region by Type

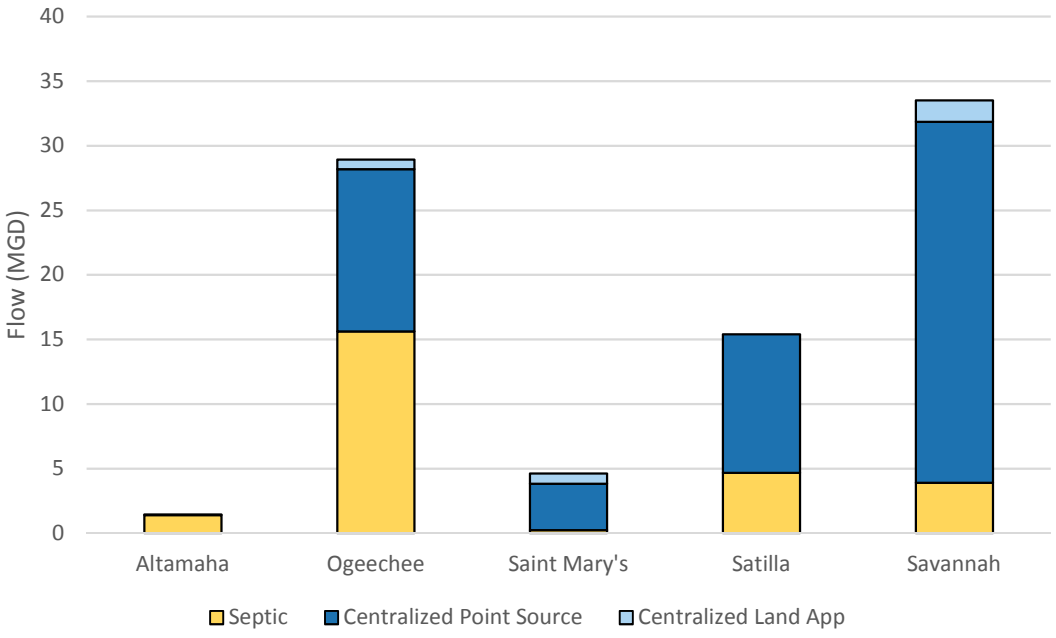


Figure 3-2
2015 Snapshot of Wastewater Discharge Type per Watershed

Section 4
Industrial Forecasting

This section describes the methodology and results of industrial water and wastewater demand forecasts for the Coastal Georgia Planning Region.

4.1 Methodology

The industrial water and wastewater forecasts were not updated from those produced in Round 1 other than any significant issues or changes that individual Planning Councils believed should be incorporated. For the Coastal Georgia Planning Council, no changes were identified.

The original methodology forecasted industrial water demand based on employment projections per industry with the 2010 water use multiplied by the expected employment growth rate into the future for that type of industry. The industrial wastewater flow was then estimated from a wastewater to water ratio developed for each industrial category.

In the Coastal Georgia region, the Council elected to also develop an alternate forecast that included a higher industrial growth rate than the baseline forecast as it was believed that past trends may not accurately reflect future trends in industrial growth for the region. Locations for potential future industrial development were identified and the council estimated an increase of 35 MGD in industrial water use over the planning horizon which represents a 22 percent increase compared to the 0.3 percent growth predicted under the baseline conditions.

4.2 Results

4.2.1 Industrial Water Forecasts

Table 4-1 shows the (Round 1) industrial water demand by county as well as the percent increase in demand between 2015 and 2050 for the baseline forecast. **Table 4-2** shows the same water demand broken down by industry with estimates for both the baseline and alternate forecasts. All additional demand for the alternate forecast was assigned to the 'other industrial' category and is expected to occur in the aerospace, general manufacturing and warehouse distribution industries. **Table 4-3** shows the geographical assignment of the additional demand under the alternate forecast. Industrial water demand in the region is currently supplied 54 percent from surface water and 46 percent from groundwater. This split is assumed to remain the same under the baseline forecast and adjust only slightly under the alternate forecast as future demand to Chatham and Effingham Counties is assumed to be supplied by surface water with the remaining to groundwater.

Table 4-1 Baseline Industrial Water Demand Forecast per County (MGD)

County	2015	2020	2030	2040	2050	% Change 2015 to 2050
Bryan	0.00	0.00	0.00	0.00	0.00	0%
Bulloch	0.23	0.26	0.28	0.31	0.35	30%
Camden	0.06	0.06	0.06	0.06	0.06	0%
Chatham	69.88	69.98	70.05	70.12	70.23	0%
Effingham	17.75	17.75	17.75	17.75	17.75	0%
Glynn	64.50	64.53	64.56	64.58	64.61	0.1%
Liberty	8.53	8.53	8.53	8.53	8.53	0%
Long	0.00	0.00	0.00	0.00	0.00	0%
McIntosh	0.04	0.04	0.04	0.05	0.06	33%
Total	**161.1**	**161.2**	**161.3**	**161.4**	**161.6**	**0.3%**

Table 4-2 Baseline and Alternate Industrial Water Demand Forecast per Industry (MGD)

Industry	2015	2020	2030	2040	2050
Other Industrial: Baseline	0.68	0.71	0.79	0.88	1.00
Other Industrial: Alternate	4.93	8.86	21.60	29.15	35.00
Food - Food Manufacturing	3.12	3.12	3.12	3.12	3.12
Paper	133.9	133.9	133.9	133.9	133.9
Petroleum	0.62	0.64	0.66	0.68	0.71
Chemicals	22.50	22.50	22.50	22.50	22.50
Stone and Clay	0.23	0.24	0.27	0.29	0.32
Primary Metals	0.03	0.03	0.03	0.03	0.03
TOTAL: Baseline	**161.1**	**161.2**	**161.3**	**161.4**	**161.6**
TOTAL: Alternate	**166.0**	**170.0**	**182.9**	**190.6**	**196.6**

Note: The following categories have zero forecast water demand in the Coastal Planning Region: Mining, Food - Beverage and Tobacco, Textile Mills, Textile Product Mills, Apparel, Rubber, Fabricated Metal Products, Electrical Machinery, and Automotive Manufacturing

Table 4-3 Geographic Distribution of Additional Alternate Industrial Water Demand

County	Distribution of Additional 2050 Demand (MGD)	Source of Supply
Bryan	2.0	Groundwater
Bulloch	2.0	Groundwater
Camden	2.0	Groundwater
Chatham and Effingham	19.0	Surface Water
Glynn	5.0	Groundwater
Liberty	4.8	Groundwater
Long	0.0	Groundwater
McIntosh	0.2	Groundwater
Total	**35.0**	**-**

4.2.2 Industrial Wastewater Results

Table 4-4 provides the baseline forecast of industrial wastewater generated per County while **Table 4-5** give the wastewater demand by discharge method for the baseline forecast and **Table 4-6** provides similar information for the alternate forecast. The majority of industrial wastewater in the Planning Region is discharged via a permitted point source for the industrial facility.

Table 4-4 Baseline Industrial Wastewater Generation Forecast per County (MGD)

County	2015	2020	2030	2040	2050	% Change 2015 to 2050
Bryan	0	0	0	0	0	0%
Bulloch	0.15	0.16	0.18	0.2	0.22	32%
Camden	0.06	0.06	0.06	0.06	0.06	0%
Chatham	68.43	68.46	68.51	68.56	68.62	0%
Effingham	17.74	17.74	17.74	17.74	17.74	0%
Glynn	64.10	64.13	64.18	64.23	64.27	0.3%
Liberty	8.5	8.5	8.5	8.5	8.5	0%
Long	0	0	0	0	0	0%
McIntosh	0.03	0.03	0.03	0.03	0.04	25%
Total	**159.0**	**159.1**	**159.2**	**159.3**	**159.5**	**0.3%**

Table 4-5 Baseline Industrial Wastewater Generation Forecast by Discharge Method (MGD)

Discharge Method	2015	2020	2030	2040	2050
Industrial – Point Source	156.81	156.82	156.83	156.84	156.85
Industrial – LAS	0	0	0	0	0
Total Industrial Discharge	**156.81**	**156.82**	**156.83**	**156.84**	**156.85**
Industrial to Municipal POTW – Point Source	1.77	1.8	1.85	1.92	2.00
Industrial to Municipal POTW – LAS	0	0	0	0	0
Total Industrial to Municipal Publicly Owned Treatment Plant (POTW)	**1.77**	**1.80**	**1.85**	**1.92**	**2.00**

Table 4-6 Alternate Industrial Wastewater Generation Forecast by Discharge Method (MGD)

Discharge Method	2015	2020	2030	2040	2050
Industrial – Point Source	160.9	162.39	169.84	173.75	177.17
Industrial – LAS	0	0	0	0	0
Total Industrial Discharge	**160.9**	**162.39**	**169.84**	**173.75**	**177.17**
Industrial to Municipal POTW – Point Source	1.91	2.07	2.51	3.32	3.59
Industrial to Municipal POTW – LAS	0	0	0	0	0
Total Industrial to Municipal Publicly Owned Treatment Plant (POTW)	**1.91**	**2.07**	**2.51**	**3.32**	**3.59**

Section 5
Agricultural Water Forecasting

This section describes the methodology and results of agricultural water demand forecasting for the Coastal Georgia Planning Region.

5.1 Methodology

Agricultural water demand forecasts were originally developed, and recently updated, by the Georgia Water Planning & Policy Center at Albany State University (GWPPC), with support from the University of Georgia's (UGA) College of Agricultural and Environmental Sciences. GWPPC was contracted by Georgia Environmental Protection Division (GAEPD) to prepare estimates of current and future use of water by the agricultural sector in Georgia. The basic methodology involved estimating the projected irrigated area for each crop type and multiplying that area by the predicted monthly irrigation need in inches per each crop type. The proportion of irrigation water derived from different water source types was also considered. The projections cover row and orchard crops as well as most vegetable and specialty crops accounting for more than 95 percent of Georgia's irrigated land. Additionally, estimates of current use are made for animal agriculture, horticultural nurseries and greenhouses, as well as golf courses.

Metered observations were utilized from the 2010-2013 growing seasons and then projected into the future demand years using methods consistent with Round 1. To address potential climate extremes, a range of agricultural demand scenarios were considered. The 75th percentile of water demand was selected to represent dry year conditions when higher irrigation demands are expected. For planning purposes, GWPPC used the 75th percentile values for each region to represent a more conservative scenario than the median value. It is the 75th percentile demands that are presented in this report.

5.2 Results

Table 5-1 shows the forecasted agricultural water needs by county in the Coastal Georgia region. The Coastal Georgia region as a whole is expected to see an increase of 6 percent in agricultural water demand by 2050. **Figure 5-1** shows the agricultural demands split by basin for surface water and aquifer for groundwater with the same data also provided in **Table 5-2**. Currently 69 percent of the agricultural demand in the Coastal Georgia region is met from groundwater.

Table 5-1 Coastal Georgia Agricultural Demand Forecast by County (MGD)

County	2015	2020	2030	2040	2050	Percent Increase 2015 to 2050
Bryan	0	0	0	0	0	0%
Bulloch	11.1	11.3	11.6	11.7	11.9	7%
Camden	0	0	0	0	0	0%
Chatham	0.19	0.20	0.22	0.24	0.25	32%
Effingham	1.8	1.8	1.8	1.7	1.7	-8%
Glynn	0.03	0.04	0.04	0.04	0.04	28%
Liberty	0.01	0.01	0.02	0.02	0.02	17%
Long	0.39	0.40	0.42	0.44	0.46	19%
McIntosh	0.39	0.40	0.43	0.46	0.48	25%
Total	13.9	14.2	14.5	14.7	14.8	6%

Table 5-2 Coastal Georgia Agricultural Demand Forecast per Source (MGD)

Source Water Type	Basin/Aquifer	2015	2020	2030	2040	2050	Percent Increase 2015 to 2050
Surface Water	Altamaha	0.21	0.22	0.23	0.24	0.25	21%
	Ogeechee	4.3	4.4	4.4	4.4	4.4	2%
	Savannah	0.084	0.084	0.082	0.080	0.078	-7%
	Sub Total	**4.6**	**4.7**	**4.7**	**4.7**	**4.7**	**3%**
Groundwater	Brunswick	0.27	0.28	0.30	0.32	0.33	23%
	Floridan	9.1	9.2	9.5	9.6	9.7	8%
	Sub Total	**9.3**	**9.5**	**9.8**	**9.9**	**10.1**	**8%**
Total		**13.9**	**14.2**	**14.5**	**14.7**	**14.8**	**6%**

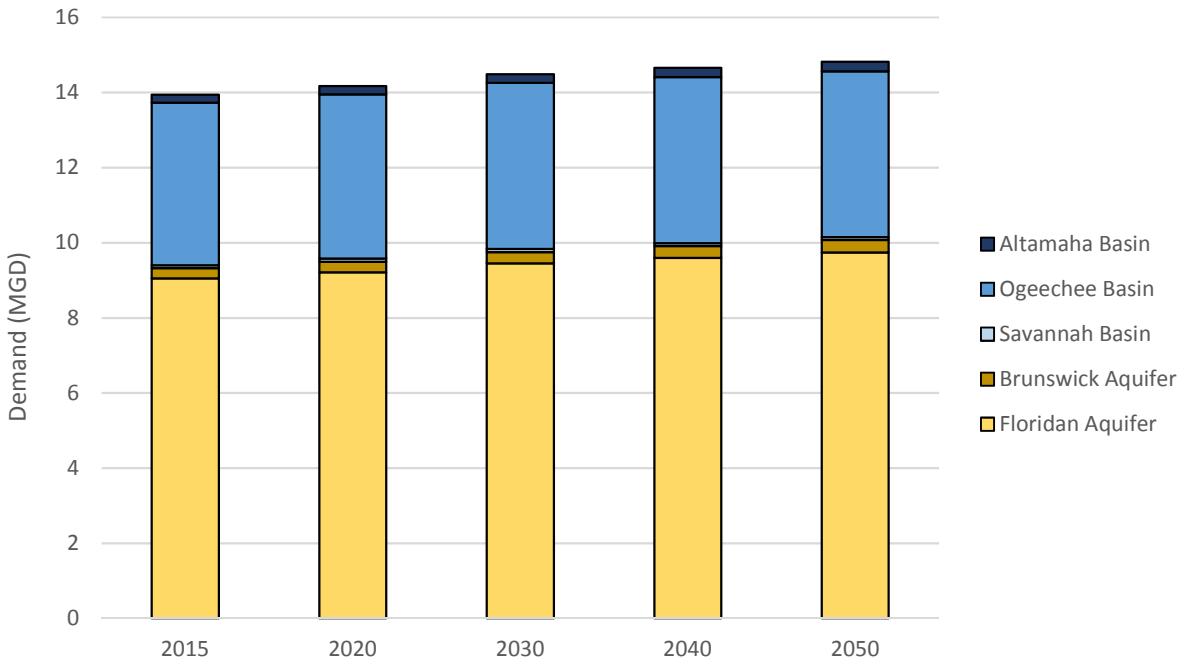


Figure 5-1
Agricultural Water Demand by Source Water Type

Section 6
Energy Water Forecasting

This section describes the methodology and results of energy sector water demand for the Coastal Georgia Planning Region.

6.1 Methodology

Demands forecasted in this section are associated with future energy sector utilities (NAICS 22) power generation. Water demands associated with power generation by facilities with other industry codes are captured as part of the municipal and industrial water demand forecasts discussed in previous sections.

The analysis covers both water withdrawal requirements and water consumption associated with energy generation. Information related to water withdrawals is an important consideration in planning for the water needed for energy production. However, water consumption is the more important element when assessing future resources because a large volume of water is typically returned to the environment following the energy production process.

Water requirements for thermoelectric power generation facilities are estimated based on future energy demands along with the water requirements and consumption rates in gallons per megawatt-hour (MWh) for different power generating configurations. For a full discussion of the original forecast methodology see the 2010 technical memorandum "Statewide Energy Sector Water Demand Forecast" or the "Update of GA Energy Needs & Generating Facilities" memorandum. The following updates to the original methodology were incorporated into the current estimates:

- Projections of the statewide energy demand were updated using the new population projections with the relationship between population and energy demand the same as previously estimated.
- The list of existing facilities, facilities under construction, and planned and permitted new facilities was updated. In addition, some prior facilities were retired from service or converted from one generating configuration to another configuration.
- The same water withdrawal and consumptive use factors (gallons per MWh) by generating configuration were maintained as previously developed.
- To meet the future energy demand, the energy generation of existing facilities is increased over time to a predetermined maximum sustainable generating capacity based on the generation configuration. As additional capacity is needed in the future, "new" capacity is added to the most likely to be developed generating configurations, but the "new" generating capacity is not assigned geographically to any specific region within the state.

- The estimated future generating capacity of existing facilities, and associated water requirements, is allocated to regions based on the location of the existing facilities.

6.2 Results

Energy facilities within the Coastal Georgia Planning Region include: Effingham County Power Project, Plant McIntosh, Plant McManus, and Plant Wentworth (Kraft). Plant Wentworth is assumed retired in the forecasts following 2015. **Table 6-1** shows the projected expected scenario average annual daily withdrawal and consumption at these facilities over the planning horizon.

Table 6-1 Coastal Georgia Forecasted Expected Energy Sector Demands (MGD)

Demand Type	2015	2020	2030	2040	2050
Withdrawals	344	75	86	94	97
Consumption	7.7	9.3	10.7	11.9	12.7

Within the previous statewide analysis, the generating capacity of the existing and planned facilities was not able to meet the projected statewide power needs through 2050 and additional generating capacity was assumed to be developed beyond 2020. The Coastal Georgia Planning Council had assumed a portion of this future generation could occur in their region. Additional generating capacity may be needed to meet the statewide power need estimate. However, the water requirements associated with the potential new capacity are minimal; less than 20 MGD withdrawals and less than 10 MGD consumption, statewide. Thus, no future water demands for currently unassigned power generation facilities have been added to the estimates for the Coastal Georgia region within this update. Projections for the need of new energy capacity are less than estimated previously because: (a) population projections are lower, (b) high water-using facilities have been retired, and (c) the types of generating facilities likely to be constructed in the future to meet the additional need have lower water use requirements.

Section 7
Regional Summary

This section summarizes the water and wastewater forecasts within the region for all the sectors combined.

7.1 Water Demand Summary

The full regional water demand including municipal, industrial, agricultural and energy uses are summarized in the figures and tables of this section. **Figure 7-1** shows the regional water demand per basin for surface water withdrawals and per aquifer for groundwater withdrawals while **Figure 7-2** shows the regional water demand per sector. **Table 7-1** provides a breakdown of the demand types and withdrawal locations per County. The summary values include the alternative forecast for industrial water demand and the consumptive demand rather than total withdrawals for the energy forecasts.

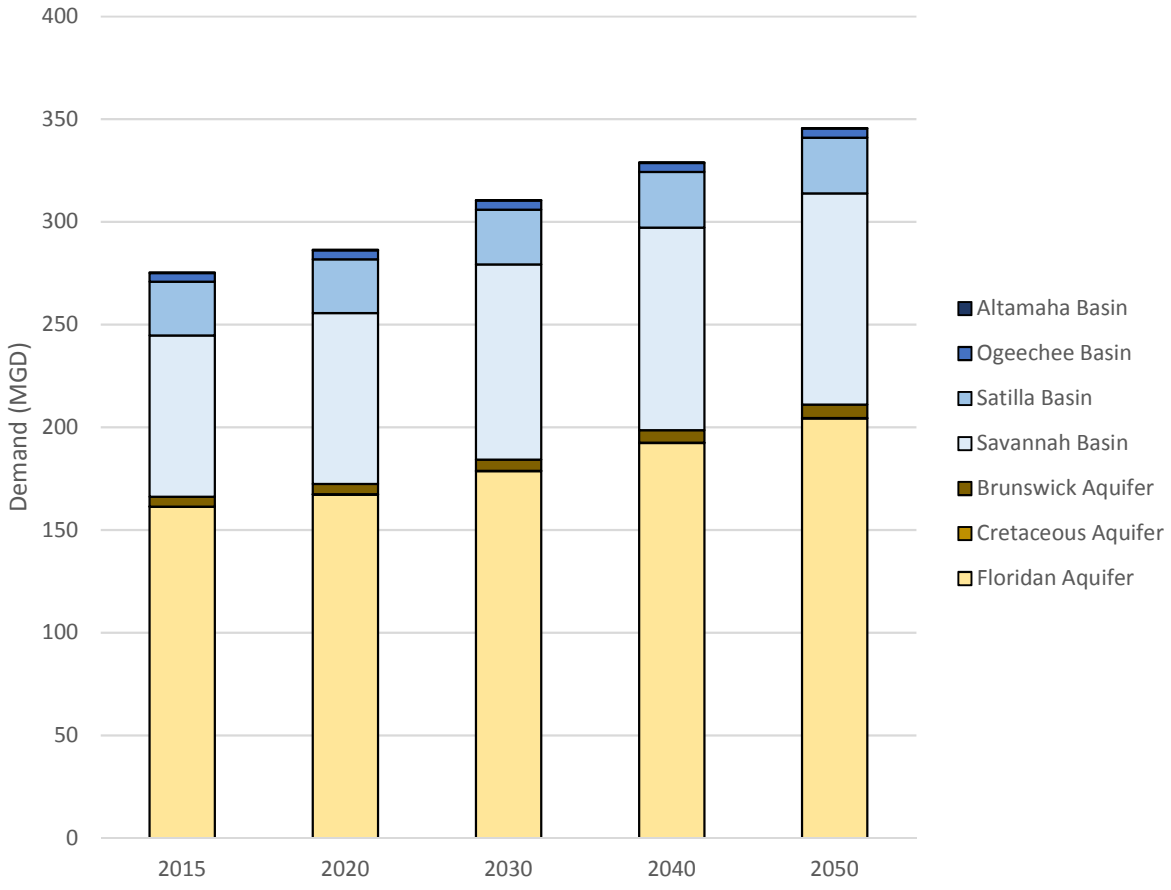


Figure 7-1
Regional Water Demand by Basin and Aquifer

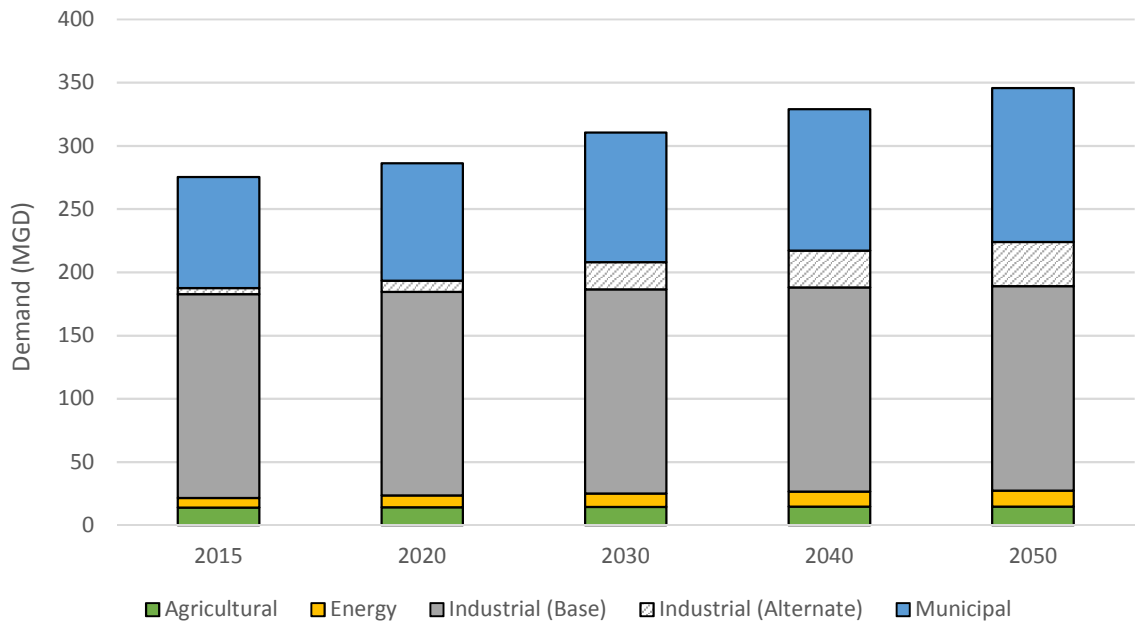


Figure 7-2
Regional Water Demand by Sector

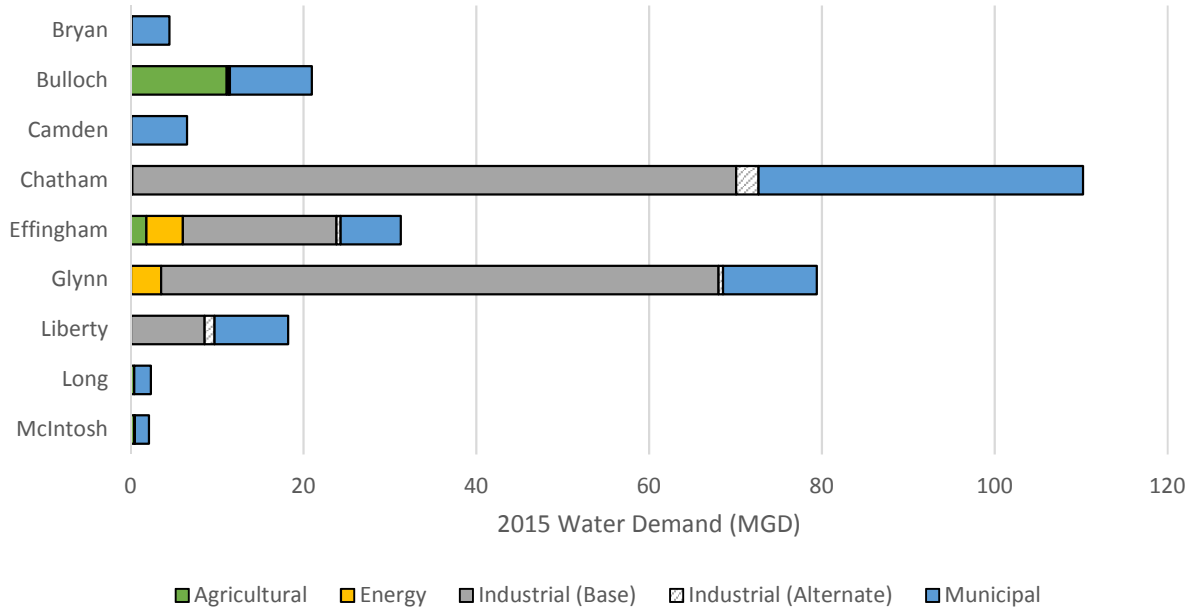


Figure 7-3
County Water Demand by Sector for 2015

Table 7-1 Summary of Water Demand per County (MGD)

County	Sector	Aquifer/Node	2015	2020	2030	2040	2050
Bryan	GW Industrial	Floridan	0.1	0.2	0.52	1.58	1.8
	GW Municipal Public Supply	Floridan	3.10	3.52	4.49	5.67	7.13
	GW Municipal Self Supply	Floridan	1.26	1.43	1.82	2.29	2.86
	Total		**4.46**	**5.15**	**6.84**	**9.53**	**11.79**
Bulloch	GW Agricultural	Floridan, Brunswick	6.91	7.06	7.30	7.46	7.62
	GW Industrial	Floridan	0.35	0.46	0.8	1.89	2.15
	GW Municipal Public Supply	Floridan	7.95	8.47	9.53	10.58	11.71
	GW Municipal Self Supply	Floridan	1.42	1.51	1.69	1.87	2.05
	GW Municipal Self Supply	Cretaceous	0.12	0.13	0.15	0.16	0.18
	Groundwater Total		16.8	17.6	19.5	22.0	23.7
	SW Agricultural	Kings Ferry, Eden, Claxton	4.20	4.24	4.28	4.28	4.27
	Total		**21.0**	**21.9**	**23.7**	**26.2**	**28.0**
Camden	GW Industrial	Floridan	0.06	0.06	0.06	1.06	1.7
	GW Municipal Public Supply	Floridan	4.77	4.98	5.31	5.55	5.75
	GW Municipal Self Supply	Floridan	1.62	1.69	1.79	1.87	1.92
	GW Municipal Self Supply	Brunswick	0.05	0.06	0.06	0.06	0.07
	Total		**6.51**	**6.79**	**7.22**	**8.54**	**9.43**
Chatham	GW Agricultural	Floridan, Brunswick	0.19	0.20	0.22	0.24	0.25
	GW Industrial	Floridan	21.30	21.31	21.33	21.34	21.36
	GW Municipal Public Supply	Floridan	28.99	30.57	33.38	35.88	38.31
	GW Municipal Public Supply	Brunswick	0.26	0.27	0.30	0.32	0.34
	GW Municipal Self Supply	Floridan	3.54	3.72	4.03	4.30	4.56
	GW Municipal Self Supply	Brunswick	0.03	0.03	0.04	0.04	0.04
	Groundwater Total		54.31	56.11	59.29	62.11	64.87
	SW Industrial	Savannah	44.62	46.68	54.45	55.96	57.9
	SW Industrial	DS-Savannah	6.54	6.54	6.54	6.54	6.54
	SW Municipal	Savannah	4.73	4.99	5.44	5.85	6.25
	Surface Water Total		55.89	58.21	66.43	68.35	70.69
	Total		**110.20**	**114.31**	**125.72**	**130.46**	**135.55**

Table 7-1 Summary of Water Demand per County (MGD)

County	Sector	Aquifer/Node	2015	2020	2030	2040	2050
Effingham	GW Agricultural	Floridan	1.73	1.73	1.69	1.64	1.59
	GW Industrial	Floridan	1.98	1.98	1.98	1.98	1.98
	GW Municipal Public Supply	Floridan	2.19	2.41	2.89	3.40	3.99
	GW Municipal Self Supply	Floridan	2.55	2.81	3.34	3.91	4.56
	Groundwater Total		9.47	10.13	11.55	13.05	14.61
	SW Agriculture	Savannah, Clyo, Eden	0.095	0.095	0.093	0.090	0.088
	SW Energy	Savannah	4.2	5.8	6.6	7.5	8.1
	SW Industrial	Savannah	16.27	16.77	19.01	19.39	19.89
	SW Municipal	Savannah	2.20	2.42	2.90	3.41	4.00
	Surface Water Total		22.78	25.07	28.59	30.34	32.09
	Total		**32.25**	**35.20**	**40.15**	**43.39**	**46.69**
Glynn	GW Agricultural	Floridan	0.034	0.035	0.038	0.041	0.044
	GW Industrial	Floridan	42.40	42.91	43.55	44.95	46.77
	GW Industrial	Brunswick	0.04	0.04	0.04	0.05	0.06
	GW Municipal Public Supply	Floridan	6.60	6.90	7.45	7.98	8.58
	GW Municipal Public Supply	Brunswick	3.18	3.33	3.59	3.85	4.14
	GW Municipal Self Supply	Floridan	1.02	1.06	1.14	1.21	1.29
	GW Municipal Self Supply	Brunswick	0.06	0.06	0.07	0.07	0.08
	Groundwater Total		56.81	57.91	59.99	62.64	65.56
	SW Energy	DS-Atkinson	3.48	3.57	4.11	4.49	4.60
	SW Industrial	DS-Atkinson	22.58	22.58	22.58	22.58	22.58
	Surface Water Total		26.06	26.15	26.69	27.07	27.18
	Total		**79.39**	**80.49**	**82.57**	**85.22**	**88.14**
Liberty	GW Industrial	Floridan	9.69	10.34	11.76	12.94	13.54
	GW Municipal Public Supply	Floridan	7.47	7.71	7.94	8.00	7.83
	GW Municipal Self Supply	Floridan	1.04	1.07	1.10	1.10	1.07
	Groundwater Total		18.20	19.12	20.80	22.04	22.44
	SW Agricultural	Kings Ferry	0.014	0.014	0.015	0.016	0.016
	Total		**18.22**	**19.13**	**20.81**	**22.05**	**22.46**
Long	GW Agricultural	Brunswick, Floridan	0.072	0.074	0.079	0.082	0.085
	GW Municipal Public Supply	Floridan	0.16	0.18	0.22	0.27	0.32
	GW Municipal Public Supply	Brunswick	0.56	0.63	0.78	0.95	1.13
	GW Municipal Self Supply	Floridan	0.96	1.07	1.32	1.60	1.90
	GW Municipal Self Supply	Brunswick	0.25	0.28	0.35	0.42	0.50
	Groundwater Total		2.01	2.24	2.75	3.32	3.93
	SW Agricultural	Doctortown, Kings Ferry, DS-Doctortown	0.31	0.32	0.34	0.36	0.37
	Total		**2.33**	**2.56**	**3.09**	**3.68**	**4.31**

Table 7-1 Summary of Water Demand per County (MGD)

County	Sector	Aquifer/Node	2015	2020	2030	2040	2050
McIntosh	GW Agricultural	Floridan, Brunswick	0.39	0.40	0.43	0.46	0.48
	GW Industrial	Floridan	0.09	0.14	0.25	0.28	0.32
	GW Municipal Public Supply	Floridan	0.90	0.87	0.80	0.70	0.60
	GW Municipal Self Supply	Floridan	0.72	0.70	0.64	0.55	0.47
	Total		**2.09**	**2.11**	**2.12**	**1.99**	**1.88**
Planning Region Total Groundwater Demand			**172.6**	**179.2**	**192.0**	**207.2**	**220.2**
Planning Region Total Surface Water Demand			**102.8**	**107.2**	**118.6**	**121.8**	**125.6**
Planning Region Total Demand			**275.4**	**286.4**	**310.6**	**329.0**	**345.7**

7.2 Wastewater Summary

The full regional wastewater forecasts including municipal and industrial discharges are summarized in the figures and tables of this section. **Figure 7-4** shows the wastewater discharges per basin while **Figure 7-5** shows the forecasted discharge per method. **Table 7-2** provides a summary of the discharge type per watershed model node. The summaries utilize the baseline forecast for industrial discharges.

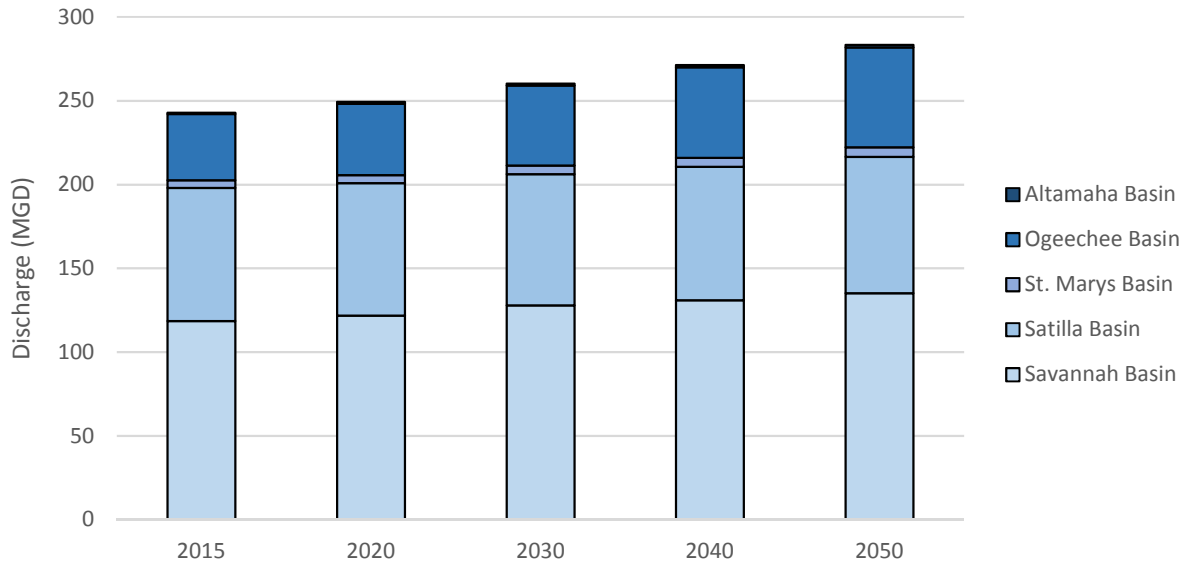


Figure 7-4
Regional Wastewater Discharge per Basin

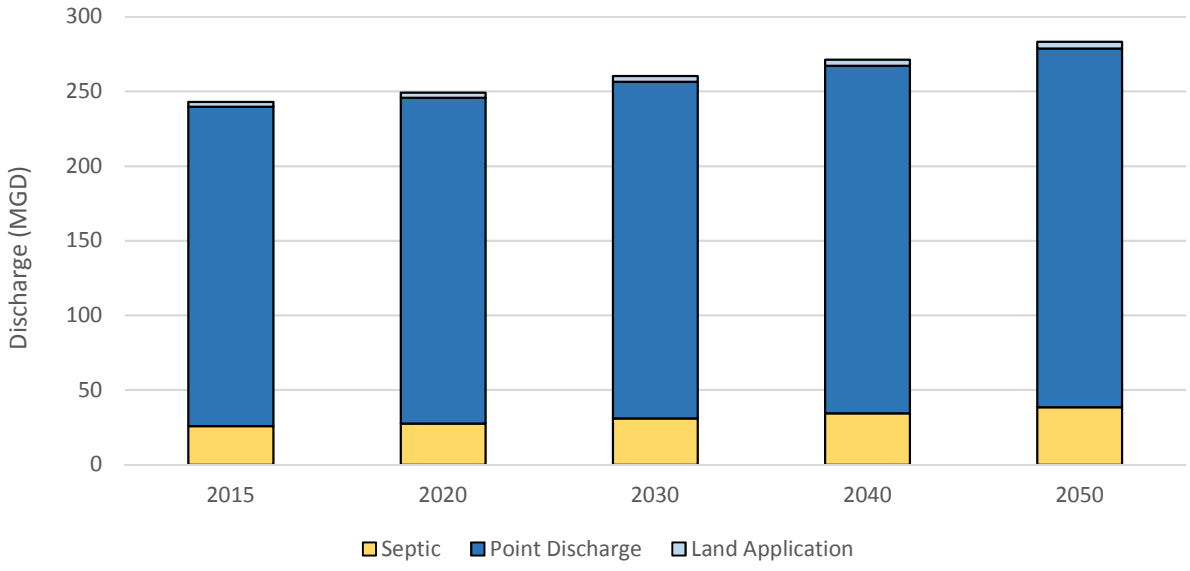


Figure 7-5
Regional Wastewater Discharge per Method

Table 7-2 Summary of Regional Wastewater Flows at Applicable Nodes (MGD)

Node	Discharge Type	2015	2020	2030	2040	2050
Claxton	Land Application	-	-	-	-	-
	Point Discharge	-	-	-	-	-
	Septic	0.12	0.13	0.15	0.16	0.18
	Total	0.12	0.13	0.15	0.16	0.18
Clyo	Land Application	-	-	-	-	-
	Point Discharge	-	-	-	-	-
	Septic	0.13	0.14	0.17	0.19	0.23
	Total	0.13	0.14	0.17	0.19	0.23
Doctortown	Land Application	-	-	-	-	-
	Point Discharge	-	-	-	-	-
	Septic	0.30	0.33	0.41	0.50	0.59
	Total	0.30	0.33	0.41	0.50	0.59
DS-Atkinson	Land Application	-	-	-	-	-
	Point Discharge	74.64	74.13	72.84	73.78	75.26
	Septic	4.83	5.02	5.38	5.70	6.03
	Total	79.48	79.15	78.23	79.48	81.29
DS-Doctortown	Land Application	-	-	-	-	-
	Point Discharge	0.04	0.11	0.18	0.20	0.23
	Septic	0.56	0.58	0.59	0.61	0.63
	Total	0.60	0.68	0.77	0.81	0.86
DS-Gross	Land Application	0.80	0.85	0.92	0.98	1.03
	Point Discharge	3.59	3.82	4.13	4.38	4.60
	Septic	-	-	-	-	-
	Total	4.40	4.67	5.05	5.36	5.63
DS-Kings Ferry	Land Application	1.32	1.42	1.54	1.66	1.76
	Point Discharge	15.52	16.69	18.33	20.09	21.81
	Septic	7.91	8.40	9.33	10.29	11.36
	Total	24.75	26.51	29.21	32.03	34.92
DS-Savannah	Land Application	0.30	0.33	0.37	0.40	0.44
	Point Discharge	29.01	30.36	32.48	34.64	36.92
	Septic	-	-	-	-	-
	Total	29.32	30.69	32.84	35.04	37.36
Eden	Land Application	-	-	-	-	-
	Point Discharge	0.02	0.13	0.31	0.89	0.98
	Septic	3.92	4.25	5.02	5.86	6.84
	Total	3.94	4.39	5.33	6.75	7.82

Table 7-2 Summary of Regional Wastewater Flows at Applicable Nodes (MGD)

Node	Discharge Type	2015	2020	2030	2040	2050
Gross	Land Application	-	-	-	-	-
	Point Discharge	-	-	-	-	-
	Septic	0.08	0.08	0.09	0.09	0.10
	Total	0.08	0.08	0.09	0.09	0.10
Kings Ferry	Land Application	0.34	0.38	0.40	0.41	0.44
	Point Discharge	5.98	6.58	7.59	9.00	10.00
	Septic	4.35	4.62	5.16	5.68	6.22
	Total	10.67	11.58	13.14	15.09	16.66
Savannah	Land Application	0.44	0.49	0.60	0.71	0.85
	Point Discharge	85.07	86.49	89.70	89.72	90.61
	Septic	3.65	3.95	4.65	5.38	6.22
	Total	89.16	90.94	94.94	95.82	97.67
Grand Total (with Baseline Industrial)		**242.9**	**249.3**	**260.3**	**271.3**	**283.3**
Alternative Industrial Wastewater Flows		**4.2**	**5.8**	**13.6**	**18.4**	**21.9**
Grand Total (with Alternate Industrial)		**247.2**	**255.1**	**274.0**	**289.7**	**305.3**

Section 8
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