# RED ZONE WATER SUPPLY MANAGEMENT PLAN

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CHATHAM COUNTY – SAVANNAH METROPOLITAN PLANNING COMMISSION



Prepared by

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## **EXECUTIVE SUMMARY**

Saltwater intrusion into the Floridan aquifer in the Savannah area threatens the continued viability of the region's primary drinking water supply source. Chatham County and the southern portion of Effingham County (south of GA Hwy 119) were identified in the 2006 Coastal Georgia Water and Wastewater Permitting Plan for Managing Salt Water Intrusion as having the highest vulnerability for the groundwater cone of depression that extends into South Carolina, where saltwater intrusion has already occurred. This region, classified as the "Red Zone," recently experienced significant reductions to their groundwater withdrawal permit limits. In general, most 2015 permit limits for Red Zone users were reduced by 22% for 2025.



The water suppliers and users within Chatham County have been very successful in achieving significant groundwater withdrawal reductions over the past quarter-century. In order to address water management concerns and the threat of saltwater intrusion, Chatham County and all the jurisdictions within the County, as well as large industrial and golf course users, collaborated to develop the Comprehensive Water Supply Management Plan in 1995 (hereinafter referred to as the Chatham County Plan). The Chatham County Plan was updated in 2000 and most recently in 2006. The 2000 Plan identified 16 strategies to address how the community might go about reducing groundwater withdrawals, and the list was expanded to 28 strategies in the 2006

Plan. EPD required Chatham County to reduce groundwater withdrawals from the Upper Floridan aquifer by 10 million gallons per day (MGD) by December 31, 2005. Chatham County surpassed this requirement, as total groundwater withdrawal reductions in Chatham County were 16.56 MGD by 2004. Based on reported usage in 1992 and 2004, industrial water users accounted for 12.09 MGD of the reduction, and domestic/commercial water users accounted for the balance (4.47 MGD) through a reduction in per capita water usage by nearly 20% from 169 gallons per day (GPD) in 1993 to 135.5 GPD in 2004. As a result of this success, a similar planning process, which includes a coordinated effort of the water withdrawal permittees, was initiated for the Red Zone. This plan, the *Red Zone Water Supply Management Plan*, serves to revisit and update the *Chatham County Plan* and the most recent 28 management strategies. It also addresses water supply sustainability issues and expands the geographic boundary of the original *Chatham County Plan* to include the entire Red Zone.

The Water Supply Task Force from the *Chatham County Plan* was reestablished as the "Red Zone Water Supply Task Force" to obtain formal community input. The Task Force was structured to provide program guidance and technical assistance throughout the planning process. This group met on a quarterly basis during 2017 to develop and review materials included in this Plan.

Members represented large groundwater users including local governments and industries, as well as local environmental and non-governmental organizations, Georgia Department of Community Affairs, and University of Georgia (UGA) Marine Extension and Georgia Sea Grant and UGA Cooperative Extension.

A data assessment (Chapter 2) was completed to describe current and historical water usage for the Red Zone in order to show changes over time and conservation progress from previous plans and associated management strategies. Updated water usage is provided for 2015, and it is presented separately for Chatham and Effingham counties to explore progress since the 2006 *Chatham County Plan* was last updated. From 2004 to 2015, Chatham County's population increased by about 19% (46,138 people); however, total Floridan groundwater usage decreased by 10.94 MGD, from 58.56 to 47.62 MGD. Industrial users were responsible for about 60% (6.65 MGD) of the groundwater usage reduction. The per capita usage for Domestic and Commercial Systems decreased by nearly 30% from 135.5 gallons per capita per day (GPCD) in 2004 to 97.2 GPCD in 2015. Groundwater withdrawal reductions continued over the past decade because of the water conservation programs and efforts in place from the 2006 *Chatham County Plan*, as well as improvements in water use technology and changes in marketable products manufactured or grown in the County. Another major driver in groundwater withdrawal reductions was the permitting managed by Georgia EPD.

In 2015, Red Zone groundwater usage from the Floridan aquifer totaled 51.577 MGD, with Chatham County using 92.3%. Municipal permittees (55.7%) and industrial permittees (35.9%) were the two largest users, so these groups are the primary focus for this plan. However, conservation measures and efforts should also consider private water systems (community and non-community systems, which accounted for 5.0% of all Floridan usage) and individual wells in Effingham County (1.8% of total Floridan usage). Agricultural users and golf courses were the two smallest groundwater users. These groups used 0.9% and 0.6%, respectively, and this usage was entirely within Chatham County. While Effingham County has a lot of agriculture, most is located outside of the Red Zone.

The data assessment also explored surface water systems, per capita usage, seasonal usage, water reuse/reclamation, conservation measures, rate structures, and summaries from water loss audit reports to identify areas in which there is potential to reduce groundwater usage. A few key findings from this research are as follows:

- There was a strong seasonal trend for municipal users during the growing season. This
  was attributed to irrigation usage and inefficient irrigation practices. In total, 10% of
  municipal usage during the growing season (March November) was above the baseline
  usage during the non-growing season months, and this accounts for an average of 3.04
  MGD distributed across the year.
- Water reuse/reclamation is very underutilized in the Red Zone. The total average daily reuse for 2015 was 0.454 MGD, which is less than 1% of the total groundwater used in the Red Zone from the Floridan aquifer (52.674 MGD). In 2015, only four water pollution control plants (WPCPs) produced reuse water. One facility in Effingham County is a no discharge, land application/reuse system, and it produced 76% of its effluent as reuse

through delivery to year-round, dedicated customers. The remaining 24% was discharged as spray irrigation.

• Several groundwater permit holders are currently purchasing treated surface water from the City of Savannah to remain under their permit limits. The purchased volume and number of permittees purchasing will likely increase as populations continue to grow and permit limits are reduced. Savannah Industrial and Domestic (I&D) is currently operating at 33.03 MGD, which is about half of its capacity (62.5 MGD), so capacity is available.

Chatham and Effingham counties have experienced tremendous growth in recent decades, so it is important to consider future growth as planning efforts are conducted and coordinated for this water supply management plan (Chapter 3). The most recent countywide population projections from the Georgia Governor's Office of Planning and Budget (OPB) were used for planning. From 2015 to 2025, Chatham County is projected to grow by 35,241 (12%) and Effingham County by 12,405 (22%). Looking beyond the 2025 permit limit reductions, populations are projected to continue to grow. From 2015 to 2050, the population in Chatham County is projected to grow by 118,617 (41%) and in Effingham County's by 50,923 (89%). As a long-term goal, it is important to plan for when the Floridan aquifer is no longer viable as a drinking water source.

The 28 management strategies identified in the 2006 Chatham County Plan were used as the baseline for developing the management strategy list (Chapter 4). As part of the planning process, the Task Force reviewed the existing strategies and provided comments on whether they were still relevant or how they should be edited/updated. One major modification to the 2006 list of strategies was changing the classification of several previously identified strategies that are either covered in current/new permit requirements or are EPD regulatory functions. These are still listed, but they are not management strategies for municipalities to adopt. The Task Force added new strategies specific to the Red Zone and its current needs and issues. Many of these new strategies were created as a result of the data assessment. Instead of a numerical list of strategies, they are now presented based on category. The new list includes 37 specific strategies under the following 10 water supply management strategy categories:

- Plan Adoption
- Data Management & Evaluation
- Planning / Master Planning
- Irrigation Conservation
- Water Reclamation
- Water Rate Structures
- Water Conservation (General/Incentives)
- Stormwater Capture & Reuse
- Water Quality Protection
- Legislative Action

In order to preserve and protect the long-term viability of the Floridan aquifer as a source of potable water for residential and industrial use in Chatham and Effingham counties, groundwater users of the Floridan aquifer system should continue working together to solve water supply issues. It is

also important to start planning for redundancy of water sources for when the Floridan aquifer in this area becomes impacted by saltwater intrusion. Water supply management strategies identified in Chapter 4 can reduce groundwater usage from the Floridan aquifer to extend the lifetime of this inexpensive and high-quality water source. Through implementation of the strategies outlined in this plan over the next decade, the potential reduction of groundwater pumping from the Floridan aquifer is about 10 MGD. This value was calculated by estimating the impact of the strategies presented and accounting for the projected population increase during this period.

## **1. INTRODUCTION**

#### 1.1. Background

Saltwater intrusion into the Floridan aquifer in the Savannah area threatens the continued viability of the region's primary drinking water supply source. Groundwater wells in the Hilton Head Island area have already experienced saltwater intrusion. Schematics showing predevelopment and present-day groundwater flow in these areas are depicted in Figure 1.



*Figure 1. Predevelopment and Present-Day Groundwater Flow in Savannah and Hilton Head Area* [USGS Report; Provost et. al, 2006]

According to the Hilton Head Public Service District (PSD), which serves 19,000 customers in the north- and mid-island areas of Hilton Head Island, it has lost six of its 12 Upper Floridan wells since 2000 because of saltwater intrusion. They expect to lose five of the remaining six wells by 2024. As a result, the following major steps were taken: (1) added pipeline from mainland to provide treated surface water in 1999, (2) conducted feasibility study for an alternate supply in 2004-2006, (3) opened a 3-MGD reverse osmosis (RO) water treatment facility that treats groundwater from the Middle Floridan aquifer in 2009, (4) built the Island's first-ever Aquifer Storage and Recovery (ASR) facility in 2011 to provide 2 MGD during peak demand, and (5) added an additional 1 MGD to the RO facility in 2015. The Hilton Head PSD and the other two PSDs on the Island estimate that they have spent about \$129 million combatting saltwater intrusion since 1998, and the expect to spend another \$80 million in the next 20 years as they continue to replace lost supply. Hilton Head PSD produces about 40% of its water supply from the RO water treatment facility, and it purchases about 30% from the Beaufort-Jasper Water and Sewer Authority on the mainland.

Modeling studies have shown that saltwater intrusion will eventually migrate to the Savannah area. In an effort to slow this process, the Georgia Environmental Protection Division (EPD) produced the Interim Strategy for Managing Salt Water Intrusion in the Upper Floridan Aquifer of Southeast Georgia (hereinafter, Interim Strategy) in 1997 and required Chatham County to reduce groundwater withdrawals from the Upper Floridan aquifer by 10 million gallons per day (MGD) by December 31, 2005. The Interim Strategy was replaced in 2006 with the Coastal Georgia Water and Wastewater Permitting Plan for Managing Salt Water Intrusion (hereinafter, 2006) Coastal Georgia Plan). In order to address water management concerns and the threat of saltwater intrusion, Chatham County and all the jurisdictions within the County collaborated to develop the Chatham County Comprehensive Water Supply Management Plan in 1995. In addition to local jurisdictions, public and private water providers and users for golf courses, industrial, military, and commercial entities participated in the development of this plan. Georgia EPD and local environmental and non-governmental organizations were also represented. The Plan was updated in 2000 and most recently in 2006. The 2006 Chatham County Plan included a list of 28 specific strategies related to water conservation, water supply efficiency, and alternative water supply sources. These strategies were expanded from a list of 16 strategies in the 2000 Chatham County Plan. Progress updates for each of the 28 management strategies as well as overall progress since the previous versions of the plan are described in detail in the 2006 Chatham County Plan.

A requirement of the *Interim Strategy* and goal of the *Chatham County Plan* was to reduce groundwater consumption by 10 MGD by December 31, 2005. Based on reported usage in 1992 and 2004, groundwater withdrawal reductions in Chatham County exceeded the requirements of the *Interim Strategy* and were reduced by 16.56 MGD. Industrial water users accounted for 12.09 MGD of the reduction, and domestic/commercial water users accounted for the balance (4.47 MGD) through a reduction in per capita water usage by nearly 20% from 169 gallons per day (GPD) in 1993 to 135.5 GPD in 2004. The huge success achieved during this timeframe can be at least partially attributed to the coordinated effort of the water withdrawal permittees to meet Stateestablished groundwater withdrawal reduction goals and through participation in the countywide planning process. Changes in the plumbing code also contributed to this success.

The 2006 Coastal Georgia Plan identified sub-regions within the 24 coastal counties based on the vulnerability for or contribution to salt water intrusion. Sub-region 1 overlays the groundwater cone of depression that extends into South Carolina where saltwater intrusion has occurred. It

includes Bryan County, Chatham County, Liberty County, and the southern portion of Effingham County (south of GA Hwy 119). In this sub-region, Chatham County and the southern portion of Effingham County are classified as the "Red Zone" because they have the highest vulnerability of saltwater intrusion into their drinking water systems based on modeling. Bryan Liberty County County and have moderate vulnerability and comprise the "Yellow Zone." A list of conservation and reuse practices was created for (1) industrial water users, (2) public and private drinking water providers, (3) agricultural users, and (4) golf courses. These became the basis for the special permit conditions outlined in groundwater withdrawal permits,



and many required adoption, program implementation, or progress updates in 2008 and 2009. The Red Zone has the most stringent regulations regarding water conservation and efficiency and the most recently issued water withdrawal permits include groundwater withdrawal reductions for almost all permittees. In general, most groundwater withdrawal permit limits for Red Zone users were reduced by 13.6% for 2020 and 22.0% for 2025.

#### 1.2. Purpose

The *Chatham County Plan* was a very successful planning process through which local permittees came together to develop strategies to achieve significant groundwater withdrawal reductions, so a similar planning process was initiated for the Red Zone. This plan, the *Red Zone Water Supply Management Plan* (hereinafter, *Red Zone Plan*), serves to revisit and update the *Chatham County Plan*. It will compile permit data, consumption and trends; recommend management strategies; and expand its geographic boundary to include the entire Red Zone, as identified by EPD. As part of the planning process, the Task Force has evaluated the 28 specific management strategies from the *2006 Chatham County Plan*, and developed new strategies specific to the Red Zone and its current needs and issues. Updated water usage is provided for 2015, as it is the most recent full calendar year when the data acquisition process began.

As the coastal region of Georgia continues to see unprecedented growth, there is a recognized need for the conservation, protection, and sustainability of the area's drinking water resources. These resources are paramount to a thriving economy and quality of life. To sustain the Floridan aquifer as a primary drinking water source for the coast for the near-term, it is understood that groundwater withdrawals must decrease within the Red Zone. However, there needs to be continued access to water supplies to support future growth in the affected areas. Municipal water providers voiced a desire to create a plan with local management measures to promote intergovernmental coordination on water issues within the Red Zone. This approach and subsequent plan would be

more detailed and focused than the broader regional perspective present in the *Coastal Georgia Regional Water Plan*, which is adopted and overseen by the Georgia EPD. The planning area for the *Coastal Georgia Regional Water Plan* includes nine counties. With a larger area, there are more jurisdictions and water resources challenges to consider, so the level of detail for analysis and management strategy recommendations addressing the potential for saltwater intrusion in the Red Zone is somewhat limited. The *Coastal Georgia Regional Water Plan* was recently updated in June 2017. The update included a management practice that specifically addressed and supported coordination with the *Red Zone Plan*. This management practice, *AAGS–1 Cross-Jurisdictional Collaboration*, included the following action: "Participation by the Coastal Council to assist with developing a Chatham/Effingham Red Zone Water Supply Management Plan." The category *AAGS* represents "Additional/Alternate Sources to Present Groundwater Sources in Gap Areas."

The position paper, "Coastal Sound Science Initiative Modeling of Salt Water Intrusion: Conclusions about Salt Water Intrusion into the Upper Floridan Aquifer in Coastal Georgia and South Carolina," was developed by the Coastal Sound Science Initiative (CSSI) to assist Georgia EPD and South Carolina Department of Health and Environmental Control (DHEC) with identifying feasible options for managing the Floridan aquifer. The paper presents the CSSI's saltwater intrusion model, which was refined from the U.S. Army Corps of Engineers, Savannah District's Savannah Harbor Expansion model. The refined model was constructed to reasonably match the chloride contours in the Hilton Head region in 2007 and used to explore several scenarios of Floridan groundwater usage in the Hilton Head and Savannah regions. This model showed that reducing groundwater pumping will slow saltwater intrusion, but in order to stop saltwater plume movement completely, a 90% reduction in pumping from both regions is needed. Therefore, future long-term plans need to include strategies for an alternate source that can fully replace the Floridan aquifer. However, current steps to reduce usage will help to extend the lifetime of this source.

#### 1.3. Planning Process

The Chatham County-Savannah Metropolitan Planning Commission (MPC) applied for and received a Coastal Incentive Grant from the Georgia Department of Natural Resources, Coastal Resources Division, to prepare and develop this plan. Ecological Planning Group (EPG) was hired to assist with general coordination of the planning process; collection, analysis, and presentation of data; and preparation of the final report. To help accomplish these tasks, MPC formed the Red Zone Water Supply Task Force (hereinafter, Task Force) to obtain formal community input. The Task Force was structured to provide program guidance and technical assistance throughout the planning process. The Task Force members represent large groundwater users including local governments, military installations, and industries, as well as local environmental and non-governmental organizations, Georgia Department of Community Affairs, and University of Georgia (UGA) Marine Extension and Georgia Sea Grant and UGA Cooperative Extension.

The Task Force met on a quarterly basis during 2017 to develop and review materials for the Red Zone Water Supply Management Plan. Meetings and materials were facilitated by a smaller project team, which included: MPC, EPG, and the Garden City Special Projects Coordinator. A brief summary of the tasks and topics for each quarterly Task Force meeting is highlighted below:

- Kickoff Meeting, February 2, 2017
  - Introduction to project and planning process
  - Presentation on summary of 2006 Chatham County Plan and preliminary data analysis comparing groundwater usage changes from 2004 to 2015
  - Open discussion about individual goals for this plan by Task Force members
  - General discussion about existing strategies from the 2006 Chatham County Plan
  - General discussion about goal setting for the Red Zone Plan
- 2<sup>nd</sup> Meeting, May 23, 2017
  - Review Draft Data Assessment
    - E-mailed to Task Force before meeting and deadline for comments was June 16<sup>th</sup>
  - Presentation on highlights from Data Assessment
  - Review existing management strategies from the 2006 Chatham County Plan
  - Dot voting exercise to prioritize ideas for new management strategies that arose from the *Data Assessment*
  - An online survey was sent to the entire Task Force to allow those unable to attend the opportunity to vote on existing and new management strategies.
- 3<sup>rd</sup> Meeting, August 8, 2017
  - o Review Draft of Management Strategies
    - E-mailed to Task Force before meeting, and based on comments from the meeting, an updated version was resent for review
  - The results from the survey and dot exercise were presented, and an open discussion formed about new strategies that emerged since the previous discussion
  - Three guest presentations were given on higher priority water management strategies identified in previous meeting:
    - Water Conservation at The Landings / New Metering Technology, Ron Medders, Regional Manager for Georgia Operations, Utilities, Inc. of GA
    - *"The Newton Model,"* Mike Hopkins, Executive Director, Newton County Water & Sewerage Authority
    - "Sustainable Water and the Emory WaterHub A Different Approach to Reducing Potable Water Consumption," Matt McCormack, Vice President, Business Unit Leader – Water Resources, Reeves Young
- 4<sup>th</sup> Meeting, December 14, 2017
  - o Review Draft Red Zone Plan

Following the development of the *Red Zone Plan*, the Plan will be presented in early 2018 to the MPC and at public hearings within each governmental jurisdiction at the time that it is considered for adoption by the elected bodies.

# 2. DATA ASSESSMENT – Water Supply Systems

This chapter presents current and historical water usage for the water users and water systems located in the Red Zone to examine changes over time and conservation progress from previous plans and associated management strategies. In addition to collective groundwater usage, other topics were explored to identify areas in which there is potential to reduce usage and develop future strategies. These topics include: surface water systems, per capita usage, seasonal usage, water reuse/reclamation, conservation measures, rate structures, and summaries from water loss audits.

Throughout this chapter, the water users and water systems are categorized by user type, aquifer source, and type of permit. User types include: industrial systems, municipal systems, private community and non-community water systems, individual wells, agricultural users, and golf courses. As classified in withdrawal permits by EPD, the aquifer sources from the shallowest to deepest include: Surficial, Miocene, Upper Floridan, and Lower Floridan. The groundwater and surface water withdrawal permit types are summarized in Table 1. The non-farm withdrawal and Safe Drinking Water Act (SDWA) permits require reporting, so most of the data presented in the sections below was received from Georgia EPD or directly from the permit holder.

Type of Permit	Conditions	<b>Reporting Required</b>
Non-Farm Groundwater Withdrawal	Systems using more than 100,000 GPD of groundwater	Yes
Non-Farm Surface Water Withdrawal	Systems using more than 100,000 GPD of surface water	Yes
Agricultural Water Withdrawal	Both groundwater and surface water withdrawals	No
Safe Drinking Water Act (SDWA)	Systems that serve more than 25 people	Yes

Table 1. Water Permit Types and Conditions

Overall, most of the permitted groundwater usage accesses the Floridan aquifer. The shallower Miocene and Surficial aquifers are generally used for irrigation purposes, but many of the agricultural users utilize the Floridan aquifer. In addition to groundwater, some systems supplement their water supply by purchasing water treated at the Savannah Industrial and Domestic (I&D) surface water treatment plant, and some industrial users have separate surface water withdrawal permits.

The geologic and hydrogeologic units in the northern coastal area of Georgia are described in Figure 2. The Miocene system refers to the geologic unit that is the upper confining unit separating the Surficial aquifer from the Upper Floridan aquifer. Locally, the Miocene unit contains permeable strata that form the upper and lower Brunswick aquifers (Williams and Gill, 2010). All wells in this layer are referenced as Miocene by EPD. It was once hypothesized that pumping groundwater from the deeper, Lower Floridan aquifer would have little effect on saltwater intrusion. Therefore, three municipal systems were permitted to add Lower Floridan wells. However, recent results from the CSSI found that there was no significant hydrological separation,

so both the Upper and Lower Floridan aquifer are combined for data presentation as total Floridan aquifer usage. The confining unit between the Upper Floridan and Lower Floridan aquifer is classified as semi-confining (Williams and Gill, 2010).



*Figure 2. Geologic and Hydrogeologic Units in the Northern Coastal Area of Georgia* [USGS Report; Williams and Gill, 2010]

#### 2.1. Current Capacity and Future Permit Limits

Groundwater withdrawal permit holders in the Red Zone that utilize the Floridan aquifer are listed in Table 2. This table includes: aquifer source (UF=Upper Floridan, LF=Lower Floridan), the user classification by Georgia EPD (M=Municipal, I=Industrial, and O=Other), the reported and permitted annual usage in 2015, and the reduced permit levels for 2025. The 2015 values represent current capacity and regulatory limits, and the 2025 values represent future regulatory limits for groundwater withdrawals for these permits. It is noted if the permit holder also purchases surface water from City of Savannah in the column for Aquifer Source (P=Purchase), but the amount purchased is described later in Section 2.3.1 (Table 17).

There are currently 24 groundwater withdrawal permits from the Floridan aquifer for municipal systems in Chatham County and seven in Effingham County. The City of Pooler, Hunter Army Airfield, and City of Rincon have separate groundwater withdrawal permits for the Upper Floridan and Lower Floridan aquifers, but both have the same SDWA permit. The same is for Consolidated Utilities, Inc., but they have a third groundwater withdrawal permit for the Miocene aquifer. The Lower Floridan aquifer permit for City of Rincon was not actively used in 2015. There are currently nine industrial systems in Chatham County and two in Effingham County that have a groundwater withdrawal permit for the Upper Floridan aquifer, and all but one from Chatham County was an active user in 2015. Two permit holders utilizing the Floridan aquifer are classified as "Other," and these include golf courses (The Landings Club, Inc. – Golf Course Well No. 1 & No. 2).

Collectively, permit limits in the Red Zone are being reduced 23% (14.185 MGD) by 2025, from 61.337 to 47.152 MGD. This task is not quite as daunting as a 14.185 MGD permit limit reduction may seem because average annual usage in 2015 for the entire Red Zone is only 0.096 MGD (0.2%) larger than the 2025 permitted usage. However, there are a few permittees that will require more reductions than others to meet the 2025 permit limits. Some must also appropriately plan for future growth and increased demand by 2025. Without considering future growth or reallocation of usage from municipalities with multiple permits, 13 out of 44 permit holders utilizing the Floridan aquifer are currently exceeding their 2025 annual average permit limits (10 municipal, 2 industrial, and 1 other), so work is needed to explore alternate sources, conservation, and other management strategies to satisfy consumer demands and regulatory limits. The specific permits where current usage exceeds 2025 permit limits are highlighted with orange shading in Table 2.

A summary of 2015 annual average usage compared with 2015 and 2025 annual average permit limits for the 44 groundwater withdrawal permits in the Red Zone is presented in Figure 3. Details by county and user type are described below:

- 2015 permit limits are exceeded for 2 permits
  - Municipal users 1 in Chatham County and 1 in Effingham County
- 2015 permit limits are satisfied, but current usage would exceed 2025 permit limits for 11 permits
  - Municipal users 7 in Chatham County and 1 in Effingham County
  - Industrial users 2 in Chatham County
  - Other users -1 in Chatham County
- 2025 permit limits are satisfied based on current usage, but 2015 reported usage is within 15% of 2025 permit limits for 6 permits (highlighted with gray shading in Table 2)
  - Municipal users 5 in Chatham County and 1 in Effingham County
- 22 permits are using less than 85% of the 2025 permit limits
- 3 permits reported no usage in 2015
  - Municipal users 1 in Chatham County and 1 in Effingham County
  - Industrial users 1 in Chatham County



Figure 3. Comparison of 2015 Usage to 2025 Permit Limits [number of permits noted]

Most groundwater withdrawal permits in the Red Zone had their permitted usage reduced by 22% from 2015 to 2025. However, two permits had no change in permitted usage – Utilities, Inc. of Georgia (Landings S/D) [025-0028] and Skidaway Institute of Oceanography (025-0054). The Landings Subdivision has already implemented many conservation measures and continues to explore more, as detailed in Section 2.7.1, and Skidaway Institute of Oceanography is operating at less than 20% of its permit limit.

Permit	Permit Holder	Aquifer	Use <sup>2</sup>	2015	2015	2025
Number		Source <sup>1</sup>		Permit	Reported	Permit
				Avg.	Avg.	Avg.
				Annual	Annual	Annual
				Usage	Usage	Usage
				(MGD)	$(MGD)^3$	$(MGD)^4$

Table 2. Summary of permitted usage for 2015 and 2025 and reported usage for 2015 from groundwater withdrawal permit holders in Red Zone accessing Floridan aquifer.

				(MGD)	$(MGD)^3$	$(MGD)^4$
Chatham County						
025-0004	New NGC, Inc.	UF	Ι	0.164	0.085	0.128
025-0005	Declar City of	UF & P	м	0.324	0.306	0.253
025-0066	Pooler, City of	<i>LF &amp; P</i>	IVI	1.130	1.048	0.880
025-0006	Savannah Sugar Refinery	UF	Ι	0.845	0.380	0.659
025-0007	Garden City, City of	UF	Μ	1.321	0.896	1.030
025-0008	Savannah Acid Plant, LLC	UF	Ι	1.737	0.998	1.355
025-0009	International Paper - Savannah Plant	UF	Ι	15.588	14.848	12.157
025-0010	The Landings Club, Inc Golf Course Well No. 1	UF	0	0.045	0.019	0.035

Permit	Permit Holder	Aquifer	Use <sup>2</sup>	2015	2015	2025
Number		Source <sup>1</sup>		Permit	Reported	Permit
				Avg.	Avg.	Avg.
				Annual	Annual	Annual
				Usage	Usage	Usage
	Southern States Describets and			(MGD)	(MGD) <sup>3</sup>	(MGD)*
025-0011	Fertilizer	UF	Ι	1.333	0.231	1.040
025-0012	Epic Midstream LLC	UF	Ι	0.010	0.000	0.008
025-0013	GAF Materials Corporation	UF	Ι	0.234	0.047	0.183
025-0018	Savannah, City of	UF	Μ	23.530	20.414	17.962
025-0021	Port Wentworth, City of	UF & P	Μ	0.310	0.195	0.242
025-0022	Thunderbolt, Town of	UF & P	Μ	0.247	0.208	0.193
025-0023	Memorial University Medical Center	F & P	Μ	0.167	0.138	0.130
025-0025	Solenis LLC	UF	Ι	1.025	0.612	0.799
025-0027	Tybee Island, City of	UF	Μ	0.916	0.775	0.516
025-0028	Utilities, Inc. of Georgia (Landings S/D)	UF	М	1.695	1.270	1.695
025-0030	EMD Millipore Corp.	UF	Ι	0.450	0.413	0.351
025-0034	DPW Environmental Division - Hunter	UF & P	м	0.769	0.382	0.600
025-0061	Army Airfield	LF & P	M	0.720	0.065	0.000
025-0035	Bloomingdale, City of	UF	Μ	0.222	0.107	0.173
025-0040	Chatham Water Company - Glen of Robin Hood & Montgomery Area	UF	М	0.729	0.497	0.569
025-0041		UF LF M		0.213	0.291	0.166
025-0060	Consolidated Utilities, Inc.		М	0.921	0.352	0.719
025-0044	The Landings Club, Inc Golf Course Well No. 2	UF	0	0.100	0.088	0.078
025-0045	Chatham Water Company - Hunter's Ridge	F	М	0.100	0.030	0.078
025-0046	Candler Hospital	F	М	0.100	0.048	0.078
025-0054	Skidaway Institute of Oceanography	F	М	0.120	0.021	0.120
025-0056	South Atlantic Utilities	UF	М	0.194	0.000	0.151
025-0062	Coastal Georgia Water Company - Ogeechee Farms	UF	М	0.151	0.102	0.118
005 00 50	Chatham Water Company -	T TE		0.420	0.1.66	0.000
025-0063	Parkersburg	UF	Μ	0.420	0.166	0.328
025-0064	South Atlantic Utilities - Scarborough Cove & Talahi Island Community	UF	М	0.176	0.129	0.137
025-0065	Chatham Water Company - Burnside & Rio Vista Community Water System	UF	М	0.127	0.087	0.099
025-0067	South Atlantic Utilities - Harbour Creek Community Water System	UF	М	0.120	0.025	0.094
Effingham	County	1	1	1	1	
051-0001		UF & P		1.021	0.786	0.796
051-0015	Rincon, City of	LF & P	М	1.000	0.000	0.779
051-0004	Georgia Power Company - Plant McIntosh	UF	Ι	0.364	0.057	0.350

Permit Number	it Permit Holder Ad per So		Use <sup>2</sup>	2015 Permit Avg. Annual Usage (MGD)	2015 Reported Avg. Annual Usage (MGD) <sup>3</sup>	2025 Permit Avg. Annual Usage (MGD) <sup>4</sup>
051-0006	Georgia-Pacific Consumer Products, LP	UF	Ι	1.695	0.732	1.322
051-0010	Coastal Water & Sewerage Company	UF	Μ	0.123	0.147	0.096
051-0011	Effingham County Board of Commissioners	F	М	0.429	0.027	0.335
051-0014	Lakeside Water Company, Inc. F		М	0.092	0.078	0.072
051-0016	South Atlantic Utilities - Azalea Point / Barrister Crossing / Kingsley Plantation / Lonesome Oak CWS	UF	М	0.235	0.094	0.183
051-0017	7 South Atlantic Utilities - Goshen Villas UF M Water System		М	0.125	0.050	0.097
Chatham County Total				56.253	45.276	43.122
Effingham	a County Total			5.084	1.972	4.030
Red Zone	Total			61.337	47.248	47.152

Table Source: Georgia EPD Atlanta Office

<sup>1</sup> UF = Upper Floridan, F = Floridan, LF = Lower Floridan (italicized too), and P = surface water purchased from Savannah (amount purchased not included in this table).

 $^{2}$  M = Municipal, I = Industrial, O = Other.

<sup>3</sup> Orange shaded cells highlight that 2015 reported usage exceeded 2015 permit limits.

<sup>4</sup> Orange shaded cells highlight that 2025 permit limits currently exceed 2015 reported usage, and gray shaded cells highlight that 2025 permit limits are within 15% of 2015 reported usage.

There are five groundwater withdrawal permit holders that utilize aquifers shallower than the Floridan (M=Miocene, and S=Surficial), and these are described in Table 3. Two are municipal users that utilize the Miocene aquifer, and their 2015 usage was only 2% and 18% of their permit limits. Three groundwater withdrawal permit holders utilize the surficial aquifer, and they are all golf courses in Chatham County. In 2015, one permittee had no reported usage and the other two were operating at less than half of their annual average permit limits. In total, the annual average groundwater usage from the Miocene and Surficial aquifers by groundwater withdrawal permit holders was only 0.683 MGD – 1.4% of Floridan aquifer usage from groundwater withdrawal permits.

Table 3. Summary of permitted and reported usage for 2015 from groundwater withdrawal permit holders in Red Zone accessing aquifers other than the Floridan aquifer.

Permit Number	Permit Holder	Aquifer Source <sup>1</sup>	Use <sup>2</sup>	2015 Permit Avg. Annual Usage (MGD)	2015 Reported Avg. Annual Usage (MGD)
Chatham	County				
025-0057	Consolidated Utilities, Inc.	М	Μ	2.000	0.359
025-0052	Chatham County Public Works - Henderson Golf Course	S	0	0.100	0.000
025-0058	The Landings Club, Inc North Well Field	S	0	0.375	0.185
025-0059	The Landings Club, Inc South Well Field	S	0	0.375	0.137
Effingham	County				
051-0013	Coastal Water Company - Westwood Heights	М	Μ	0.100	0.002
Red Zone	Total			2.950	0.683

Table Source: Georgia EPD Atlanta Office

 $^{1}$  M = Miocene, S = Surficial.

<sup>2</sup> M = Municipal, O = Other.

In addition to the groundwater withdrawal permit holders, there are another 155 permitted private systems in the Red Zone based on SDWA permits. Chatham County has 88 and Effingham County has 67. Most of these are community systems (121), but there are also some transient noncommunity systems (22) and non-transient non-community systems (12). These systems are not subject to usage limits now or in the future, as long as they continue to operate at less than 100,000 GPD. Interestingly, the 2025 groundwater withdrawal permit limits for seven municipal users will be less than 100,000 GPD. The reduced permit limits for average annual usage range from 72,000 to 99,000 GPD. Based on the previously mentioned 100,000 GPD threshold, these systems would technically no longer require a groundwater withdrawal permit and associated requirements and regulations. Therefore, if these systems maintain groundwater withdrawal permits, high-usage private systems that are currently operating slightly less than 100,000 GPD should also be held to a similar standard for consistency. In 2015, average annual usage for six private systems without a groundwater withdrawal permit exceeded 72,000 GPD. If the standard 22% reduction for permitted usage from 2015 to 2025 was applied to 100,000 GPD, the new limit would be 78,000 GPD, and in 2015, the average annual usage for three private systems exceeded this rate. Usage statistics presented above are for average annual usage, so several more systems are expected to exceed these daily withdrawal rates during periods of peak usage, and this is described later in Section 2.2.4.

#### 2.2. Current and Historic Groundwater Usage

#### 2.2.1. Summary of Groundwater Usage from the Floridan Aquifer

The Floridan aquifer groundwater usage in 2015 is presented in Figure 4 and described in Table 4 by county. The details for each user type and county are presented in the subsections below. In

2015, 51.577 MGD of groundwater from the Floridan aquifer was used in the Red Zone, and 92.3% was in Chatham County. The two largest users were municipal systems in Chatham County (53.4%) and industrial systems in Chatham County (34.4%). Private systems and individual wells comprised 5.0% and 1.8% of total groundwater usage, so they are meaningful contributions and should not be ignored when developing new strategies. Since many of the agricultural users in Effingham County were outside of the Red Zone, agricultural usage was estimated to be only used 0.9% of total Floridan groundwater usage. Golf course irrigation was even less, for a total of 0.6%.



Figure 4. 2015 Floridan Groundwater Usage in Red Zone by User Group

User Type	2015 Average Annual Usage (MGD)									
	Chatham	Chatham	Effingham	Effingham	Red Zone	Red Zone				
	(MGD)	(%)	(MGD)	(%)	(MGD)	(%)				
Domestic/Commercial	29.113	56.4%	3.162	6.1%	32.275	62.6%				
Municipal	27.552	53.4%	1.182	2.3%	28.734	55.7%				
Private System	1.561	3.0%	1.031	2.0%	2.592	5.0%				
Individual Well	0.000	0.0%	0.949	1.8%	0.949	1.8%				
Industrial	17.734	34.4%	0.789	1.5%	18.523	35.9%				
Agricultural	0.445	0.9%	0.002	0.0%	0.447	0.9%				
Irrigation/Golf Course	0.332	0.6%	0.000	0.0%	0.332	0.6%				
Total	47 624	02 3%	3 953	7 7%	51 577	100.0%				

Table 4. 2015 Floridan Groundwater Usage in Red Zone by User Group and County

#### 2.2.2. Methods to Determine Current Usage

All public water systems are required to obtain a SDWA Permit from EPD as well as comply with all of its associated requirements. These permits require that the systems report their daily and monthly usage in Daily Operating Reports (DORs). However, there are some systems that do not report usage, but the percentage of reporting systems has increased greatly from 35% to 90% since

the 2006 Chatham County Plan. EPD was encouraged to enforce metering requirements as a strategy in the 2006 Chatham County Plan, so this demonstrates the progress for this strategy. Water systems that withdraw over 100,000 GPD of groundwater are also required to hold and comply with groundwater withdrawal permits from EPD. These permits also require that water usage be reported, and EPD has complete records for all of these large users. The SDWA Permits report population served, and the reported values, as of January 2017, are presented in this plan. Monthly usage from DORs and groundwater withdrawal reports were reviewed, compiled, and analyzed during the development of this plan.

#### 2.2.3. Municipal Users (Groundwater Withdrawal Permits)

Municipal groundwater users with groundwater withdrawal permits in the Red Zone and their historical usage are identified below. The usage and population served in 2015 were compared with those reported in the *2006 Chatham County Plan* for 2004 in Table 5. There are 31 groundwater withdrawal permits for municipal users in the Red Zone. Chatham and Effingham counties have 24 and 7, respectively. Since 2004, there have been several changes to this list for Chatham County. City of Pooler and Hunter Army Airfield had Lower Floridan aquifer wells added as a separate permit. City of Rincon in Effingham County also had a Floridan aquifer well added. There were also five new groundwater withdrawal permits added in Chatham County, and two were upgraded from a SDWA permit-only because of increased usage (Coastal Georgia Water Company – Ogeechee Farms [025-0062]; South Atlantic Utilities – Scarborough Cove and Talahi Island Community [025-0064]).

Six municipal users supplement their groundwater with surface water purchased from City of Savannah. More details on these permit holders (City of Port Wentworth, Town of Thunderbolt, City of Pooler, Memorial University Medical Center, Hunter Army Airfield, and City of Rincon) and their surface water and pumped groundwater is presented later in Section 2.3.1. As a note, the permit for City of Savannah (025-0018), includes six, large community systems with separate SDWA permits (population served in parentheses): Savannah-Main (168,958), Wilmington Island (13,652), Georgetown/Gateway (13,504), Whitemarsh Island (4,215), Savannah Quarters (3,350), and Dutch Island (1,207).

In exploring the historical groundwater usage of municipal users from 2004 to 2015, 13 users reduced groundwater usage and five had an increase. For the 13 users reporting reductions, the reductions ranged from 6-54%, the average reduction was 27%, and the median reduction was 21%. The five users with increases in groundwater usage included the two SDWA permit-only users that were upgraded to a groundwater withdrawal permit. The other three were City of Pooler, Town of Thunderbolt, and the Lower Floridan well for Consolidated Utilities, Inc. The City of Pooler's population-served increased by 107% to 21,187. The Town of Thunderbolt did not have a change in reported population served, but it purchases water from City of Savannah. Consolidated Utilities, Inc., experienced a 49% increase in population served. This utility has wells in three aquifers that are tied to one SDWA permit. While there was an increase in usage from the Lower Floridan aquifer, the usage was shifted among the three aquifers to utilize the Miocene aquifer more. Over one-third of usage in 2015 was from the Miocene aquifer, compared with about 1% in 2004.

Permit	Permit Holder	Average Annual Reported		Population Served			
Number		2004	Jsage (M	(GD)	200.43	20153	<b>D</b> (
		2004	2015	Percent	2004	2015	Percent
Chatham (	Sounty			Change-			Cnange
$025_{-}0005$	Pooler (UE)	0.695	0.306				
025-0066	Pooler (LF)	0.075 NA	1 048	95%	10,217	21,187	107%
025-0007	Garden City	1 317	0.896	-32%	7 753	8 141	5%
025-0018	Savannah-Main	25.377	20.414	-20%	169.610	205.091	21%
025-0021	Port Wentworth	0.309	0.195	-37%	2,480	5,500	122%
025-0022	Thunderbolt	0.142	0.208	46%	2,624	2,668	2%
025-0023	Memorial Univ. Medical Center	0.169	0.138	-18%	NA	4,800	NA
025-0027	Tybee Island	0.887	0.775	-13%	4,093	8,047	97%
025-0028	Utilities Inc. of GA (Landings Subdivision)	1.692	1.270	-25%	7,731	11,058	43%
025-0034	Hunter Army Airfield (UF)	0.977	0.382	5404	5 160	7 500	450/
025-0061	Hunter Army Airfield (LF)	NA	0.065	-34%	5,100	7,500	43%
025-0035	Bloomingdale	0.136	0.107	-21%	1,714	1,690	-1%
025-0040	Chatham Water Company - Glen of Robin Hood & Montgomery Area	0.666	0.497	-25%	9,720	6,185	-36%
025-0045	Chatham Water Company - Hunter's Ridge	0.065	0.030	-54%		660	
025-0041	Consolidated Utilities, Inc. (UF)	0.308	0.291	510/			
025-0060	Consolidated Utilities, Inc. (LF)	0.117	0.352	51%	7,908	11,799	49%
025-0057 <sup>1</sup>	Consolidated Utilities, Inc. (Miocene)	0.005	0.359	7,802%			
025-0046	Candler Hospital	0.10	0.048	NA	NA	NA	NA
025-0054	Skidaway Institute of Oceanography	0.025	0.021	-16%	108	108	0%
025-0056	South Atlantic Utilities	0	0	NA	NA	NA	NA
025-0062	Coastal Georgia Water Company - Ogeechee Farms	0.049	0.102	108%	962	918	-5%
025-0063	Chatham Water Company - Parkersburg	NA	0.166	NA	NA	1,253	NA
025-0064	South Atlantic Utilities - Scarborough Cove & Talahi Island Community	0.127	0.129	2%	1,027	2,806	173%
025-0065	Chatham Water Company - Burnside & Rio Vista Community Water System	NA	0.087	NA	NA	702	NA
025-0067	South Atlantic Utilities - Harbour Creek Community Water System	NA	0.025	NA	NA	543	NA

Permit Number	Permit Holder	Averag	Average Annual Reported Usage (MGD)			oulation Se	rved
		2004	2015	Percent Change <sup>2</sup>	2004 <sup>3</sup>	2015 <sup>3</sup>	Percent Change
Effingham County							
051-0001	City of Rincon (UF)	NA	0.786	NIA	NA	0 000	NIA
051-0015	City of Rincon (LF)	NA	0	NA	NA	9,000	NA
051-0010	Coastal Water & Sewerage Company	NA	0.147	NA	NA	1,370	NA
051-0011	Effingham County Board of Commissioners	NA	0.027	NA	NA	293 <sup>4</sup>	NA
051-0014	Lakeside Water Company, Inc.	NA	0.078	NA	NA	993	NA
051-0016	South Atlantic Utilities - Azalea Point / Barrister Crossing / Kingsley Plantation / Lonesome Oak CWS	NA	0.094	NA	NA	1,037	NA
051-0017	South Atlantic Utilities - Goshen Villas Water System	NA	0.050	NA	NA	608	NA
Chatham County Total		33.158	27.552	-17%	229,922	300,656	31%
Effingham	County Total	NA	1.182	NA	NA	14,181	NA
Red Zone	Fotal	NA	28.734	NA	NA	314,837	NA

Table Source: Georgia EPD Atlanta Office.

<sup>1</sup> Data from this GWU Permit are not included in the total because the aquifer source is Miocene and not Floridan, but it is reported here since the Safe Drinking Water Act (SDWA) Permit with associated population served for Consolidated Utilities combines the 3 GWU permits.

<sup>2</sup> Orange shaded cells highlight groundwater withdrawal permits that had an increase in usage from 2004 to 2015.

<sup>3</sup> Gray shaded cells represent "non-transient non-community" systems that are also listed within the Municipal user category.

<sup>4</sup> Population served based on reported usage and 92.2 per capita per day average for community systems.

#### 2.2.4. Industrial Users (Groundwater Withdrawal Permits)

Industrial groundwater users with groundwater withdrawal permits in the Red Zone and their historical usage are identified below. Usage in 2015 was compared with those reported in the 2006 *Chatham County Plan* for 1992, 1999, and 2004 in Figure 5 and Table 6. Over the last two decades, the amount of groundwater pumped from the Floridan aquifer by industrial users in Chatham County has decreased steadily and substantially (Figure 5). From 1992 to 2015, the amount of groundwater used by this group has been cut in half, from 36.47 to 17.734 MGD. In 2004, the actual groundwater usage was 59% of the total permit limits. A proactive step taken after 2004 to protect the Floridan aquifer was removing permits that were no longer actively using groundwater. In total, seven permits were removed, which accounted for 7.864 MGD of the permitted groundwater usage. This in combination with other permit reductions cut the permitted usage for Chatham County in 2015 in half to 21.386 MGD.



Figure 5. Historical Groundwater Usage by Industrial Users in Chatham County.

There are currently 11 industrial groundwater withdrawal permits in the Red Zone. Two are in Effingham County, and nine are in Chatham County. Chatham County also has three industrial users with a SDWA permit only (classified as non-transient non-community) that were listed as industrial users in the *2006 Chatham County Plan*. All of these permits, and the historical usage for Chatham County are described in Table 6. From 2004 to 2015, 8 active industrial users in Chatham County reported individual reductions ranging from 8% to 83%, with a median and mean individual reduction of 47%. All 11 groundwater withdrawal permit holders met their 2015 limits. If current usage rates continue, all but two permits will satisfy the 2025 permit limits.

Permit Number	Permit Holder	Ave	Average Annual Reported Usage (MGD)				Average Annual Permitted Usage (MGD)		
		1992	1999	2004	2015	2004	2015		
Chatham Cou	inty								
025-0003	Hunt Wesson	2.51	NA	NA	NA	3.2	Removed		
025-0004	New NGC, Inc.	0.19	0.18	0.164	0.085	0.185	0.164		
025-0006	Savannah Sugar Refinery	1.00	1.08	0.842	0.380	1.08	0.845		
025-0008	Savannah Acid Plant, LLC (formerly Kerr-McGee and Kemira)	4.28	4.70	1.731	0.998	4.4	1.737		
025-0009	International Paper (formerly Union Camp)	23.80	19.90	16.822	14.848	23.9	15.588		
025-0010	GA Pacific Corp Saw Mill	NA	0.04	NA	NA	NA	Permit # Reassigned		

Table 6. Historical Groundwater Usage for Industrial Permit Holders.

Permit Number	Permit Holder	Ave	Average Annual Reported Usage (MGD)				ge Annual tted Usage /IGD)
		1992	1999	2004	2015	2004	2015
025-0011	Southern States Phosphate and Fertilizer	0.85	1.51	1.068	0.231	1.512	1.333
025-0012	Epic Midstream LLC (formerly Citgo Asphalt Refining Co.)	0.10	0.10	0.010	0.000	0.10	0.010
025-0013	GAF Materials Corporation	0.30	0.33	0.278	0.047	0.37	0.234
025-0014	SEPCO - Operations	0.22	NA	NA	NA	0.22	Removed
025-0015	SEPCO - Riverside	NA	2.60	0.013	NA	2.0	Removed
025-0017	Certainteed Product Corp.	NA	0.50	NA	NA	0.5	Removed
025-0019	GA Pacific Corp.	0.01	0.10	0.026	NA	0.1	Removed
025-0024	SEPCO - Plant Kraft	0.51	0.00	1.638	NA <sup>1</sup>	1.728	Removed
025-0025	Solenis LLC (formerly Hercules)	2.40	1.07	1.148	0.612	1.5	1.025
025-0030	EMD Millipore Corp.	0.30	0.35	0.449	0.413	0.5	0.450
025-0048	Chatham County - Port Authority Industrial Park	NA	NA	0.196	NA	0.116	Removed
GA0510258 <sup>2</sup>	Georgia Atlantic Port (formerly Atlantic Wood Industries)	NA	0.01	NA	0.001	None	None
GA0510171 <sup>2</sup>	Roger Wood Packing Co.	NA	0.09	NA	0.105	None	None
GA0510195 <sup>2</sup>	Southern LNG, Inc.	NA	0.42	NA	0.014	None	None
Effingham Co	ounty						
051-0004	Georgia Power Company - Plant McIntosh	NA	NA	NA	0.057	NA	0.364
051-0006	Georgia-Pacific Consumer Products, LP	NA	NA	NA	0.732	NA	1.695
Chatham Cou	Chatham County Total		32.98	24.385	17.734 <sup>3</sup>	41.411	21.386
Effingham Co	ounty Total	NA	NA	NA	0.789	NA	2.059
Red Zone Tot	l Zone Total		NA	NA	18.523 <sup>3</sup>	NA	23.445

Table Source: Georgia EPD Atlanta Office and EPD Coastal District Office (Brunswick).

Note: GA0510236, DOT-Rest Area/Welcome Center 112 (a transient non-community system) was listed as an industrial user in the 2006 Chatham County Plan, but complete data was not reported in 2015 from this site. It also recently experienced a major upgrade, so it is not included in this table.

<sup>1</sup> SEPCO – Plant Kraft was in operation during 2015, but has since been shut down permanently. In 2015, it pumped 0.905 MGD of groundwater. Since the plant is no longer in use, its total was excluded from this table and the evaluation of current usage.

<sup>2</sup> Permit numbers are Safe Drinking Water Act (SDWA) Permit numbers because these users do not have a GWU permit.

<sup>3</sup> Including usage from SEPCO-Plant Kraft in 2015, the total Chatham County usage was 18.639 MGD and total Red Zone usage was 19.428 MGD.

#### 2.2.5. Private Water Systems (Community and Non-Community Systems)

The Red Zone has 155 permitted private water systems, and most of these systems (90%) reported their usage in DORs submitted to EPD. The summary statistics based on type of system and reporting frequency are described in Table 7. Most of these systems are community systems (121). The per capita usage varied substantially between community and non-community systems. Therefore, usage was estimated for the 15 systems not providing DORs by multiplying the population served by the respective average per capita usage by county reported in Table 7. One non-reporting community system purchased treated surface water from the City of Savannah through an emergency connection, so its estimated usage was considered separately from those using groundwater. From Table 7, the transient non-community and non-transient non-community systems had a higher percentage not reporting, as well as substantially smaller per capita usage than community systems. The average per capita usage in Chatham County was 12% larger than Effingham County, and Chatham County had a wider interquartile range (25<sup>th</sup> to 75<sup>th</sup> percentile). The median per capita usage was comparable for the two counties.

Type of System	County	Systems	Per C	Systems		
		Reporting	Average,	Median	Interquartile	Not Poporting
			Cumulative		Kange	Reporting
Community	Chatham	57	103.2	83.6	65.0 - 110.5	$4^{1}$
Community	Effingham	57	92.2	81.8	72.2 - 93.5	3
Transient Non-	Chatham	14	60.7	19.9	2.9 - 46.0	6
Community	Effingham	2	9.6	10.8	6.5 - 15.0	0
Non-Transient	Chatham	6	11.4	22.5	8.9 - 56.7	1
Non-Community	Effingham	4	33.6	19.0	11.7 - 62.3	1

Table 7. Summary of Reporting Statistics for Private Water Systems.

Data Source: Georgia EPD Coastal District Office (Brunswick).

<sup>1</sup> Runaway Point was one of these systems. They purchased surface water from Savannah through an emergency connection because their system was being repaired.

The reported groundwater usage for 140 systems with DORs and estimated groundwater usage for the 14 systems without DORs is summarized by county in Table 8, and the individual results for each system are presented in Appendix C. Reported usage for Chatham County in 2004 is also presented as a comparison to prior reported usage. Three private systems that had been in this category in the *2006 Chatham County Plan* were shifted into the municipal section because they currently have a groundwater withdrawal permit. The fraction reporting in Chatham County increased greatly, from 36% in 2004 to 88% in 2015. In Chatham County, the total per capita usage for community systems increased from 94.1 gallons per capita per day (GPCD) in 2004 to 103.2 GPCD in 2015. Since 2004, an additional 30 permits were added in Chatham County, and the population-served increased by 5,222 (41%).

Characteristic	Chathar	n County	<b>Effingham County</b>	Red Zone
	2004	2015	2015	2015
Number of Systems	58 <sup>1</sup>	88	67	155
With Reported Usage	21 (36%)	77 (88%)	63 (94%)	140 (90%)
Usage Not Available	37 (64%)	11 <sup>2</sup> (12%)	4 (6%)	15 (10%)
Total Groundwater Usage (MGD)	1.100	1.561	1.031	2.592
With Reported Usage	0.458	1.419	0.990	2.409
Usage Not Available	0.642	0.142	0.041	0.183
Population Served	12,709	17,931	11,917	29,848
Per Capita Usage (GPCD),	94.1 <sup>3</sup>	103.2	92.2	98.2
Community Systems Only				

Table 8. Summary of Private System Usage.

Data Source: Georgia EPD Coastal District Office (Brunswick).

<sup>1</sup> Three community systems reported here were moved to Municipal section because they now have a groundwater withdrawal permit.

 $^{2}$  One of these systems purchased treated surface water from Savannah, so its usage (0.084 MGD) and population (814) are not included in this table.

<sup>3</sup> This value was calculated based on raw data presented in the 2006 *Chatham County Plan* for community systems only (20 systems).

Only 18 systems reported usage in both 2004 and 2015, and 17 are categorized as community systems. A comparison of their reported per capita usage for both years is presented in Table 9. The compared systems in Table 9 only represent 30% of the active permits in 2004 and 20% in 2015. The average per capita usage for these systems increased by 9% from 83.2 to 90.5 GPCD. This change in per capita usage is consistent with the 10% increase from 94.1 to 103.2 GPCD for community systems reported in Table 8. The small increase in per capita usage could be attributed to these systems not being held to the same requirements as groundwater withdrawal permits, so developing targeted management strategies for this user group should be considered to reverse the increasing per capita usage trend.

SDWA Permit	Water System Name	Populatio	Population Served		pita Water (GPCD)	: Usage
Number		2004	2015	2004	2015	Change
GA0510011	Golden Isles Subdivision	525	555	93	79	-14
GA0510014	Azalea Mobile Home Plaza	385	300	74	226	+152
GA0510015	Water's Bluff Mobile Home Park	98	109	167	97	-70
GA0510024	Estill/Spanish Hammock	317	374	92	118	+26
GA0510031	Holiday Mobile Park	88	94	53	99	+46
GA0510042	Plantation Inn Mobile Estates	216	229	86	37	-49
GA0510055	Vicks Mobile Home Park	247	182	45	54	+9
GA0510085	Oliver Pines	26	26	178	87	-91
GA0510103	Parkway Mobile Estates	86	86	93	59	-34
GA0510110	Foss Mobile Home Park	203	221	86	75	-11
GA0510111	Live Oak Mobile Home Park	55	55	83	72	-11
GA0510112	Shady Acres Mobile Home Park	138	138	21	7	-14

Table 9. Private Systems with Reported Usage in 2004 and 2015.

SDWA Permit	Water System Name	Population Served		Per Capita Water Usage (GPCD)		Usage
Number		2004	2015	2004	2015	Change
GA0510113	Grove Point Mobile Estates	206	206	73	84	+11
GA0510123	Derrick Subdivision	143	114	92	93	+1
GA0510126	Miller Pines Mobile Home Park	109	96	102	91	-11
GA0510144	Riverview Mobile Inn	172	179	122	65	-57
GA0510207	Sandman Motel <sup>1</sup>	25	25	23	52	+29
GA0510275	Dean Forest Rd. TP-North	39	39	14	35	+21
Average Per	Capita Usage (Total Usage / Total )	Population	)	83.2	90.5	+7.3

Data Source: Georgia EPD Coastal District Office (Brunswick).

<sup>1</sup> This system is categorized as "transient non-community."

As mentioned earlier, some of the groundwater withdrawal permits in 2025 will have usage limits less than 100,000 GPD, so some of the current systems approaching 100,000 GPD may need to be considered for more stringent requirements and regulations for consistency. Private systems with the highest average annual usage are presented in Table 10. Average annual usage of 50,000 GPD was selected as the minimum threshold for this table because usage varies by month and the current limit of 100,000 GPD is established for daily usage and not average annual usage. Since average annual usage for most private systems were calculated for this report by subtracting the final meter reading on 12/31/2015 from the initial meter reading on 1/1/2015, as reported in the DORs, monthly data was not inspected in detail for each system. Therefore, a ratio of peak monthly usage to average annual usage available for private systems. The median ratio for municipal systems was 1.37, so 72,000 GPD (the lowest groundwater withdrawal limit in 2025) was divided by this ratio. The resulting 52,600 GPD was rounded to the nearest 10,000 to reach the 50,000 GPD threshold.

Average annual usage exceeded 50,000 GPD for 14 private systems. These 14 systems comprised 9% of all private systems (155) and 24% of population served from private systems (7,353 of 30,662); however, they used 36% of the water for private systems in the Red Zone (0.936 MGD of 2.588 MGD). Many of the per capita usage rates for these systems are high. The exact reason is unknown, but it could be a result of excessive irrigation, other usage, less regulation, or an underreported population served. Savannah Yacht Club was only non-community system in the group, and it had the highest per capita usage at 443.3 GPCD. Three of the 12 reporting community systems had per capita usage over 208 GPCD, three were between 108 and 168 GPCD, and the lowest was 80.3 GPCD, which is only 3.3 GPCD above the median community system for Chatham County in Table 7. Since the per capita usage for many of the systems in Table 10 are high and these 14 systems utilize 36% of the groundwater usage for the private systems, these could be the ones to target with future management strategies.

SDWA Permit Number	Water System Name	2015 Average Annual Usage (GPD)	Population Served	Per Capita Usage (GPCD)
Chatham County	y			
GA0510014	Azalea Mobile Home Plaza	67,794	300	226.0
GA0510023	East Pines Subdivision	72,452	348	208.2
GA0510026	Garden Acres Estates <sup>1</sup>	Est. 54,180	525	*103.2
GA0510028	Grays Subdivision	57,442	715	80.3
GA0510046	River Oaks Subdivision	51,321	541	94.9
GA0510050	Southwinds Community	85,121	572	148.8
GA0510051	Savannah Pines Mobile Home Park	51,935	632	82.2
GA0510089	Nassau Woods Mobile Home Park	74,260	772	96.2
GA0510091	Commodore Point	50,645	302	167.7
GA0510104	Whitfield Park Subdivision	59,272	676	87.7
GA0510216	Savannah Yacht Club <sup>2</sup>	77,579	175	443.3
Effingham Coun	ty			
GA1030095	Conifer Crossing/Pine Hill	67,835	759	89.4
GA1030100	Hickory Knob Subdivision	80,704	745	108.3
GA1030108	Lakewood Subdivision	85,130	291	292.5
Total (14 System	s)	935,670	7,353	127.3

Table 10. Summary of High-Usage Private Systems (>50,000 GPD).

Data Source: Georgia EPD Coastal District Office (Brunswick).

<sup>1</sup> Usage for this system was not reported, so it was estimated based on population served.

<sup>2</sup> This system is categorized as "transient non-community."

#### 2.2.6. Individual Wells

Individual wells that provide drinking water from the Upper Floridan aquifer have historically comprised another component of the groundwater supply system for domestic users. The number of people using individual wells in Chatham County at the time of the *2006 Chatham County Plan* was estimated to be approximately 6,500 people. However, because the reported population served from the SDWA permits for municipal and private systems exceeded the Census population in 2015, we can assume that many of these wells have been abandoned and that the number of people in Chatham County served by individual well is negligible.

It was much more complex to estimate the number of individual wells in Effingham County because only a portion of the county is in the Red Zone. The 2015 county population was 57,106, according to the U.S. Census. From the SDWA permits, the reported population served for municipal and private systems outside of Red Zone was 5,883 people, and this was predominantly from the cities of Guyton and Springfield. The population served from the Red Zone for municipal systems with groundwater withdrawals permits (14,181), purchased surface water only (4,519), and private systems (11,917) totaled 30,617. The difference between these populations and the U.S. Census population for the entire County in 2015 is 20,606. For the purposes of this study, we assumed that one half of the remaining population would have individual wells in the Red Zone. This equates to 10,303 people in the Red Zone in Effingham County served by individual wells. Based on the county's average household size of 2.95, the total number of individual wells

in the Red Zone is estimated to be 3,489. Using the per capita usage calculated for the community systems in Effingham County, 92.2 GPCD, this would equate to water withdrawals of approximately 0.949 MGD.

#### 2.2.7. Agricultural Users

Agricultural users are required to obtain a permit for use over 100,000 GPD, and these are issued for both surface water and groundwater withdrawals. In Chatham County, there are 14 agricultural water withdrawal permits for groundwater and 3 for surface water. The groundwater withdrawal permits are described in Table 11. In total, 12 permits covering 498 acres use the Floridan aquifer and 2 permits covering 6 acres use the Miocene aquifer. Since agricultural users are not required to report their usage to EPD, irrigation was estimated based on area permitted and typical irrigation rates. Typical irrigation rates were based on a USGS Report that presented metered irrigation results for 4,304 sites in southwestern Georgia (Levin and Zarriello, 2013). Annual irrigation depth was calculated separately for four types of crops: corn, cotton, peanuts, and soybeans. The average for the four crops ranged from 9.2 to 15.4 in./yr., so the middle of this range, 12 in./yr., was used to estimate agricultural irrigation use in the Red Zone. The growing season, crop type, and weather influence irrigation. Levin and Zarriello (2013), described that crops are generally irrigated from May to October, and June to August have peak usage. For purposes of this plan, total usage was converted into an average annual usage rate to be comparable to other users. In Chatham County, 162.3 MG (0.445 MGD) was used from the Floridan aquifer and 2.0 MG (0.005 MGD) from the Miocene aquifer.

Effingham County has 41 agricultural water withdrawal permits, covering 5,218 acres. However, 32 permits and an accompanying 4,432 acres are located outside of the Red Zone (north of GA Hwy 119), as shown in Figure 6. For the nine permits inside the Red Zone, three use groundwater and six use surface water. There is one permit each that utilizes the Floridan, Miocene, and Gordon aquifers. These groundwater withdrawal permits correspond to 2 acres irrigated with the Floridan, 12 acres with the Miocene, and 10 acres with the Gordon. Following the same procedure used for Chatham County permit holders, agricultural usage was estimated for the Red Zone portion of Effingham County, and the results are presented in Table 12. The Miocene and Gordon aquifers were grouped as "Other." The total usage in the Red Zone portion of Effingham County is 0.7 MG (0.002 MGD) from the Floridan and 7.2 MG (0.020 MGD) from "Other" aquifers. In the Red Zone portion of Effingham County, the total Floridan aquifer usage is essentially negligible.

Following the same procedures, surface water usage was estimated for the Red Zone based on the surface water withdrawal permits. The three permits in Chatham County and six in Effingham County cover 305 and 762 acres, respectively. Based on these areas, surface water use for agricultural purposes is estimated to be 99.4 MG (0.272 MGD) in Chatham County and 248.3 MG (0.680 MGD) in Effingham County.

Permit ID	Permit Holder	Aquifer Source	Area (acres)	Maximum Rate (gpm)	Annual Estimated Usage (MG)
A03-025-0016	Ottawa Farms	Floridan	250	1,500	81.5
A89-025-0001	Ping E. Tyner	Floridan	20	70	6.5
A89-025-0002	Ping E. Tyner	Floridan	4	30	1.3
A89-025-0003	Ping E. Tyner	Floridan	20	70	6.5
A89-025-0004	Ping E. Tyner	Floridan	20	70	6.5
A89-025-0005	UGA Coastal Area Extension Center	Floridan	50	130	16.3
A89-025-0006	William J. Hunter	Miocene	3	50	1.0
A89-025-0007	William J. Hunter	Miocene	3	50	1.0
A89-025-0008	William J. Hunter	Floridan	5	80	1.6
A89-025-0009	William J. Hunter	Floridan	5	80	1.6
A90-025-0010	Wendell Keith Graves	Floridan	4	50	1.3
A90-025-0011	Elizabeth S. Johnson	Floridan	10	300	3.3
A91-025-0012	Turf South Inc	Floridan	100	450	32.6
A91-025-0015	UGA Coastal Area Extension Center	Floridan	10	200	6.5
Total, Floridan			498		162.3
Total, Miocene			6		2.0
Total, Both	504		164.2		

Table 11. Agricultural Groundwater Withdrawal Permits in Chatham County.

Table 12. Agricultural Groundwater Withdrawal Permits in Effingham County (Red Zone).

Permit ID	Permit Holder	Aquifer Source	Area (acres)	Maximum Rate (gpm)	Annual Estimated
					Usage (MG)
A90-051-0005	James W. Smith	Miocene	12	45	3.9
A91-051-0007	Robert E. Regan	Floridan	2	60	0.7
A91-051-0008	Dent & Ann Purcell	Gordon	10	80	3.3
Total, Floridan	l		2		0.7
Total, Other			22		7.2
Total, Both			24		7.8



Figure 6. Map of Agricultural Permit Holders in Effingham County.

Note: The portion of Effingham County considered the Red Zone is the area south of State Route 119, which divides the county in half.

#### 2.2.8. Golf Courses

Golf course irrigation has been addressed in previous local and regional water supply studies and plans, including the *Interim Study* and *Chatham County Plan*. As a result, many golf courses now use surface water (stormwater ponds and lagoons), reuse water, or the surficial aquifer. There are 18 golf courses are in the Red Zone, and all but one is in Chatham County. The Landings Club, Inc., has six courses. The only golf courses with their own water withdrawal permits are The Landings Club, Inc., Henderson Golf Course, and Southbridge Golf Club. The 2006 Chatham County Plan identified that Hunter Golf Club, on Hunter Army Airfield, and La Vida Country Club were also users of the Floridan aquifer, but their current source was not confirmed at the time of completion of this Data Assessment.

The Landings Club, Inc., has two Upper Floridan withdrawal permits and two surface water withdrawal permits. Henderson Golf Course has one surface water withdrawal permit, but it did not report any usage from it in 2015. The Southbridge Golf Club is the only golf course with an agricultural water withdrawal permit, and it is for surface water. A summary of these permits and their reported usage in 2004 is listed in Table 13. Surprisingly, the reported usage for the four permits for the Landings Club, Inc., showed increases from reported usage in the 2006 Chatham County Plan, even in the Upper Floridan aquifer.

Permit Number	Permit Limit (MGD)		Reported/Estimated Usage (MGD)			
			2004	2015	2004	2015
025-0010	The Landings Club, Inc Golf Course Well No. 1	Upper Floridan	0.225	0.045	0.000	0.019
025-0044	The Landings Club, Inc Golf Course Well No. 2	Upper Floridan	0.200	0.100	0.016	0.088
025-0058	The Landings Club, Inc North Well Field	Surficial	0.375	0.375	0.131	0.185
025-0059	The Landings Club, Inc South Well Field	Surficial	0.375	0.375	0.078	0.137
025-0052	Chatham County Public Works - Henderson Golf Course	Surficial	0.100	0.100	0.040	0.000
A91-025-0013	Southbridge Golf Club	Southbridge Lake	N/A	N/A	N/A	0.143* Est.

Table 13. Water Withdrawal Permits for Golf Courses.

Table Source: Georgia EPD Atlanta Office.

<sup>1</sup> Usage was estimated based on 160 acres of permitted land for irrigation and procedure followed for agricultural permits in Section 2.2.5. (12 inches of irrigation per year).

Later investigation of reported irrigation data from The Landings Club (Table 14) indicated that groundwater usage in 2004 was higher than reported, and that groundwater usage has been relatively consistent since 2004. However, this is likely because many of the conservation measures initiated by The Landings Club were implemented the early 2000s, prior to the 2004 reporting period. Starting in 2001, the Landings Club golf courses renovated the irrigation systems

and pump stations for all six golf courses with newer, more efficient technology. The turf grass used on the fairways for all six courses were converted to Celebration (type), and this has resulted in a 10-15% water savings for irrigation. Lastly, in the early 2000s, shallow well systems were installed to allow transfer of water across island and reduced reliance on the Floridan aquifer. From 2004 to 2015, irrigation for The Landings Club has been primarily using shallow wells and surface water from lagoons. During this 11-year period, the average annual contribution from each source is 45% from surface water, 43% from shallow wells, and only 12% from Floridan aquifer.

Year	Total	Deep Aquifer Wells		Shallo	w Wells	Lagoon	
	<b>Irrigation</b>	MGD	% of Total	MGD	% of Total	MGD	% of Total
	(MGD)						
2004	0.726	0.092	13%	0.284	39%	0.350	48%
2005	0.863	0.025	3%	0.263	30%	0.575	67%
2006	1.149	0.148	13%	0.504	44%	0.497	43%
2007	1.118	0.185	17%	0.442	40%	0.490	44%
2008	0.958	0.177	18%	0.395	41%	0.386	40%
2009	0.864	0.048	6%	0.180	21%	0.637	74%
2010	1.043	0.090	9%	0.539	52%	0.414	40%
2011	0.990	0.138	14%	0.516	52%	0.337	34%
2012	0.767	0.106	14%	0.517	67%	0.144	19%
2013	0.644	0.062	10%	0.318	49%	0.264	41%
2014	0.657	0.128	19%	0.261	40%	0.268	41%
Average	0.889	0.109	12%	0.383	43%	0.397	45%

Table 14. Irrigation Records for The Landings Club (2004-2014).

Table Source: Sean Burgess, Environmental Manager, The Landings Association.

A summary of the golf courses in the Red Zone and respective water sources are described below in Table 15 based on information gathered by MPC for the *2006 Chatham County Plan*. If current information was known, these were updated. In general, most of the courses utilize reuse water or surface water from stormwater ponds and lagoons.

It was reported in the 2006 Chatham County Plan that the national standard irrigation rate for golf courses was 17,000 gallons per day per hole. This equates to an annual average of 0.306 MGD for an 18-hole golf course. The average for the six Landings Club courses (total average annual water usage of 0.889 MGD) was 0.148 MGD per golf course. This rate closely matched the estimate for Southbridge Golf Club of 0.143 MGD, when using 12 inches of irrigation per year across 160 permitted acres. Therefore, the assumption for the two golf courses that use the Floridan aquifer and do not report usage will be 0.15 MGD per 18 holes.
Golf Course	Water Source	Number of Holes	Other Notes
Hunter Golf Club (Hunter Army Airfield)	Upper Floridan	18	Part of Hunter AAF, 025-0034
La Vida Country Club	Floridan	9	Not metered
The Landings Club, Inc. [6 Courses]	Upper Floridan, Shallow Wells, Lagoons	108	See Table 14. Six courses include: Marshwood, Plantation, Oakridge, Magnolia, Palmetto, and Deer Creek.
Henderson Golf Course (Chatham County Public Works)	Stormwater Ponds (Shallow Well Backup)	18	025-0052 not used during 2015
Southbridge Golf Club	Lagoons, Southbridge Lake	18	Only course with an agricultural permit, A91-025-0013.
Bacon Park	Shallow Wells	27	
Savannah Quarters Country Club	Reuse, Stormwater Detention Ponds	18	Located in Pooler at I-16, started reuse in 2006.
The Club at Savannah Harbor (Hutchinson Island)	Reuse	18	
Mary Calder Golf Course	City of Savannah	9	Since the water source is City of Savannah, this is likely using groundwater, but the fraction used is accounted for in the City of Savannah groundwater usage data
Crosswinds Golf Club	Stormwater Ponds (Savannah I&D as Backup)	18	By Savannah Airport
Savannah Golf Club	Reuse	18	
Wilmington Island Golf Club	Miocene into Lagoons	18	
Lost Plantation Golf Club	Reuse	18	Only course in Effingham County

Table 15. Summary of Golf Courses in Red Zone.

Table Source: 2006 Chatham County Plan.

#### 2.3. Surface Water Systems

Surface water is a major water source in the Red Zone. The primary surface water source is the Savannah River. In the Red Zone, there are seven surface water withdrawal permits. Three of the surface water withdrawal permit holders also have a groundwater withdrawal permit – (1) Georgia Power Company – Plant McIntosh, (2) Georgia-Pacific Consumer Products, and (3) Savannah Acid Plant. In addition, another permit holder (Georgia Power Company – Plant Kraft) formerly had a groundwater withdrawal permit but it has since been removed because groundwater was no longer being used.

#### 2.3.1. Current Surface Water Usage

While there are fewer surface water withdrawal permits than groundwater withdrawal permits, the total surface water usage was higher. A summary of surface water withdrawals and permit limits is provided below in Table 16. In 2015, the total surface water withdrawals were 241.291 MGD, which is almost fivefold the groundwater withdrawals from the Floridan aquifer (51.577 MGD). The largest water users were power plants and paper plants. In total, the two power plants used 171.292 MGD (71.0%), Savannah I&D plant used 33.030 MGD (13.7%), two paper plants used 29.511 MGD (12.2%), and the remaining two other industrial users used 7.458 MGD (3.1%).

In late 2015, the largest surface water user, Georgia Power Company-Plant Kraft, was shut down and demolished, so this permit and large water user is no longer in operation. After removing this user from the list of current permittees, total surface water withdrawals decreased by about 40% to 140.833 MGD. Permitted surface water usage was cut in half from 529.61 MGD to 262.61 MGD.

Permit Number	Permit Holder	User Type	Source	Current Permitted Monthly Average (MGD)	2015 Reported Annual Avg. Usage (MGD)
025-0115-02	Republic Services of GA, LP	Industrial	Sediment Pond	0.11	0.004
025-0192-02	GA Power Co Plant Kraft <sup>1</sup>	Power Plant	Savannah River	267.00	100.458
025-0192-03	Weyerhaeuser NR Port Wentworth Mill	Paper	Savannah River	27.50	16.342
025-0192-06	Savannah Acid Plant LLC <sup>2</sup>	Industrial	Savannah River	20.00	7.454
051-0114-01	Georgia-Pacific Consumer Products LP <sup>2</sup>	Paper	Savannah River	35.00	13.170
051-0115-01	Savannah Industrial & Domestic Water System	Industrial/ Municipal	Abercorn Creek	50.00	33.030
051-0192-01	GA Power Co Plant McIntosh <sup>2</sup>	Power Plant	Savannah River	130.00	70.833
2015 Total				529.61	241.291
2015 Total, ex	cluding GA Power Co Plant	Kraft		262.61	140.833

Table 16. Summary of Surface Water Withdrawal Permit Limits and Usage in 2015.

Table Source: Georgia EPD Atlanta Office.

<sup>1</sup> Former groundwater withdrawal permit holder; power plant shut down in late 2015 and has since been demolished.

<sup>2</sup> Current groundwater withdrawal permit holder.

# 2.3.2. Savannah Industrial and Domestic (I&D) Plant

The City of Savannah I&D surface water plant was constructed in 1947 to provide water service to industries along the Savannah River. The plant is located on Highway 21 near Port Wentworth. The I&D plant receives raw water from Abercorn Creek, a tributary of the Savannah River located in Effingham County, approximately nine miles from the plant. Four large pumps at Abercorn Creek withdraw the river water through large intake suction screens on the pump piping lying near

the creek bottom. The water is pumped through two, 48-inch diameter, raw water lines to the plant where it is treated and distributed to various industrial, commercial, wholesale and residential customers.

The plant utilizes a conventional treatment process consisting of chemical coagulation, flocculation, sedimentation, filtration, and disinfection. An orthopolyphosphate is also added to the finished water for corrosion control. Although established as an industrial supply, the plant produces high quality, potable drinking water which meets and/or exceeds all state and federal drinking water standards.

The I&D plant maintains a 48-inch diameter distribution system and three separate booster pumping stations. A booster station at the plant provides water to the Crossroads/Godley Road and airport service areas. The booster stations at Lathrop Avenue and President Street increase distribution pressure to Hutchinson Island, as well as the ends of the distribution system.

In 1998, the plant had a \$14,000,000 upgrade. The upgrade was initiated to meet customer demand and to satisfy *Interim Strategy's* requirement to reduce groundwater consumption in Chatham County in 2005 by 10 MGD. The three-phase project increased the capacity of the I&D plant from 50 MGD to 62.5 MGD with available storage of 14.6 MGD. The plant, Abercorn Creek station, and all booster stations are equipped with auxiliary power. Operations staff monitors the entire system utilizing a Supervisory Control and Data Acquisition (SCADA) system. The SCADA system allows for monitoring 24 hours per day, 7 days per week, of pressure, flows, and water quality parameters as well as allowing staff to make adjustments to pump controls and chemical feed systems from the control room. The plant also has skilled, experienced maintenance staff as well as a state-certified laboratory responsible for sampling and water quality monitoring for both the surface water and ground water systems.

The City of Savannah's initiative to upgrade and expand the plant has enabled it to not only continue providing water to Chatham County's industries and largest employers, but has also ensured that a high-quality drinking water supply is available for continued growth and economic development. Intergovernmental agreements with the City of Pooler and City of Port Wentworth have allowed for needed water supplies to be available for recent and future growth within those cities. An intergovernmental agreement has also been established with Effingham County. Under this agreement, water is being supplied to Effingham County's recently initiated water system (GA1030131: Effingham County Surface Water System).

The City entered into wholesale water supply agreements with the following municipalities: City of Garden City, City of Pooler, City of Port Wentworth, Effingham County, and Bryan County. Pursuant to these agreements, effective April 1, 2017, the wholesale rate for water sales to municipalities is \$2.06 per thousand gallons.

#### 2.3.3. Purchased Surface Water (Municipal Users)

There are six municipal users with groundwater withdrawal permits that supplement their supply with water purchased from the City of Savannah. The six municipal users have nine permits because City of Pooler, Hunter Army Airfield, and City of Rincon have separate permits for their Upper and Lower Floridan wells. Without purchasing surface water, four users (Pooler, Port Wentworth, Thunderbolt, and Memorial University Medical Center), would have exceeded groundwater withdrawal permit limits in 2015. Based on current groundwater usage in 2015, Pooler, Thunderbolt, and Memorial University Medical Center will exceed 2025 permit limits, so these users will need to purchase additional surface water by 2025, or initiate major water conservation initiatives. Purchasing surface water is required for these municipal users to satisfy current and future regulatory limits in addition to supporting future growth. With the reduced permit limits for 2025, additional municipal systems may need to explore supplementing their groundwater with purchased surface water from the City of Savannah.

There is also one private, community system in Chatham County and one large user with a SDWA permit only in Effingham County that purchase surface water from Savannah. A summary of those using surface water purchased from Savannah, the amount purchased, and permit limits are presented in Table 17. As a note, nearly three-quarters of the Effingham County Surface Water System's purchased water is used by the power plant. Because of the distance pumped from the Savannah I&D plant, the water needs to be flushed, and the flushed water (discharged and not sent to customers) slightly exceeds that used by customers (0.339 MGD versus 0.322 MGD). Lastly, losses account for 0.028 MGD.

The Savannah I&D plant used an average of 33.030 MGD in 2015, and while the expansion increased capacity to 62.5 MGD, the current permit limits are 50 MGD per month and 55 MGD maximum per day. The water purchased by municipalities in Table 17 accounted for about 12% of reported usage by the Savannah I&D plant. About half of this purchased water was used for non-residential/commercial purposes as part of Effingham County Surface Water System permit (either flushed or used by the power plant). The Savannah I&D plant has a lot of capacity remaining.

Ground- water Permit Number	SDWA Permit Number	Permit Holder	2015 Surface Water Purchased (MGD) [% of Total]	2015 Ground- water Used (MGD)	2015 Total Water Used (MGD)	2015 Permit Limit (MGD)	2025 Permit Limit (MGD)
025-0005	0510001	Pooler (Upper Floridan)	0.607	0.306	1.962	0.324	0.253
025-0066		Pooler (Lower Floridan)	[31.0%]	1.048		1.130	0.880
025-0021	0510002	Port Wentworth	0.704 [78.3%]	0.195	0.899	0.310	0.242
025-0022	0510006	Thunderbolt	0.075 <sup>1</sup> [26.8%]	0.2041	0.2791	0.247	0.193
025-0023	0510083	Memorial Univ. Medical Center	0.094 <sup>2</sup> [40.6%]	0.138	0.232	0.167	0.130
025-0034	0510107	HAAF (Upper Floridan)	0.004	0.382	0.451	0.769	0.600
025-0061	0310107	HAAF (Lower Floridan)	[0.9%]	0.065	0.431	0.720	0.000
N/A	0510096	Runaway Point	$0.084^{3}$ [100%]	0	0.084	N/A	N/A

Table 17. Summary of Surface Water Usage by Municipal Users with a SDWA Permit.

Ground- water Permit Number	SDWA Permit Number	Permit Holder	2015 Surface Water Purchased (MGD)	2015 Ground- water Used	2015 Total Water Used	2015 Permit Limit (MGD)	2025 Permit Limit (MGD)
			[% of Total]	(MGD)	(MGD)	(11202)	(11202)
N/A	1030131	Effingham Co. Surface	2.465	0	$2.465^4$	N/A	N/A
		Water System	[100%]				
051-0001	1030001	Rincon (Upper Floridan)	0.0245	0.786	<u>5</u> 0.811	1.021	0.796
051-0015	1050001	Rincon (Lower Floridan)	[3.0%]	0		1.000	0.779
Chatham -	- Groundw	ater Withdrawal Permit	1.484	2.339	3.823	3.667	2.298
Chatham -	- Drinking	Water Permit Only	0.084	0	0.084	N/A	N/A
Effingham	- Ground	water Withdrawal	0.024	0.786	0.811	2.021	1.575
Permit							
Effingham – Drinking Water Permit Only			2.465	0	2.465	N/A	N/A
Red Zone	– All		4.057	3.125	7.183	5.688	3.873

Data Source: Municipalities and AWWA Water Loss Audit Reports

<sup>1</sup> Data for Thunderbolt is from 2016 because 2015 had incomplete data.

<sup>2</sup> Annual surface water purchased is estimated based on average reported in the DORs for Jan.-Apr. 2015.

<sup>3</sup> Surface water purchased is estimated based on the average per capita/day usage rate for private

community systems in Chatham County (103.2 gpd/person) and reported population served (814 people) <sup>4</sup> Only 0.322 MGD is used by customers. The power plant uses 1.776 MGD and 0.339 MGD is flushed. <sup>5</sup> City of Dingon purchases its under dingely from Effination County Surface Water System but the

<sup>5</sup> City of Rincon purchases its water directly from Effingham County Surface Water System, but the original source is the Savanah I&D plant.

#### 2.4. Per Capita Water Usage

Per capita water usage for domestic/commercial systems was calculated separately for Chatham and Effingham counties. Chatham County per capita usage reported in previous versions of the *Chatham County Plan* will serve as a comparison. In the first plan, it was reported that per capita usage was 169 GPCD in 1993, and it continued to decrease to 141.6 GPCD in 1999 and 135.5 GPCD in 2004. Based on reported usage and estimates from 2015, it has decreased to 97.2 GPCD. A lot of this reduction can be attributed to conservation, but better reporting and metering has also improved accuracy. The results by type of system and aquifer source are presented in Table 18. The population served is based on the value provided on the SDWA Permit (except for individual wells, which were estimated), and it totaled 319,401 people in Chatham County. This is 32,445 people (11%) more than the 2015 Chatham County population according to the U.S. Census. Some of the additional population served that is not accounted for by the U.S. Census is non-residents working in the county, as well as commercial users or hospitals with their own SDWA permits or groundwater withdrawal permits.

Type of System	Number of Permits/	Population Served	Estimated Reported Usage by Aquifer Source (MGD)			oorted Usage by urce (MGD)2015 Per Capita Per Day Usage	
	Systems	2015	Floridan	Miocene	Surface Water	Reported (GPCD)	
Municipal	25	300,656	27.552	0.359	1.484	97.8	
Private Systems	88	18,745	1.561	NA	0.084	87.8	
Total		319,401	29.113	0.359	1.568	97.2	

Table 18. 2015 Per Capita Water Usage for Domestic/Commercial Systems in Chatham County.

The per capita usage results for Effingham County are described in Table 19. For the purposes of estimating per capita water usage, only systems that report the population served and water used were considered in the calculation. Individual wells were not included, and it is likely that their actual per capita water usage is the same as that for private systems. For the portion of Effingham County in the Red Zone, the per capita usage was estimated to be 94.8 GPCD. One possible reason for the lower per capita usage in Effingham County is that the proportion of commercial usage that is unavoidably included within the calculation is larger in Chatham County.

*Table 19. 2015 Per Capita Water Usage for Domestic/Commercial Systems in Effingham County.* 

Type of System	Number of Permits/	of Population Estimated Reported Usage by 201   Served Aquifer Source (MGD) Per		2015 Per Capita Per Day Usage		
	Systems	2015	Floridan	Miocene	Surface Water	Reported (GPCD)
Municipal	9	18,700	1.182	0.002	$0.689^{1}$	100.2
Private Systems	67	11,917	1.031	NA	NA	86.5
Total		30,617	2.213	0.002	0.689	94.8

<sup>1</sup> This value excluded the water used by the power plant (1.776 MGD) as part of the Effingham County Surface Water System permit. It includes water used by customers, water flushed, and water losses.

Per capita was also calculated separately for each municipal user. Per capita usage for data reported in 2015 is presented in Table 20, and per capita usage from 2004, as reported in the *2006 Chatham County Plan*, is also presented as comparison. The 2004 data included groundwater usage only. Since it did not include purchased surface water, this would explain the reported increase in per capita usage for Pooler, Port Wentworth, and Thunderbolt in Table 20. Otherwise, eight permit holders had reductions in per capita usage and three had increases. The three reporting increases still had relatively low per capita usage in 2015 – Consolidated Utilities (84.9), Chatham Water Company [Glen of Robin Hood, Montgomery Area, and Hunter's Ridge] (77.0), and Coastal Georgia Water Company [Ogeechee Farms] (111.1). Ogeechee Farms was upgraded to a groundwater withdrawal permit from 2004 to 2015. In Chatham County, the median per capita usage in 2015 was 97.9 GPCD (reduced by 26.0 GPCD since 2004). The upper quartile (25<sup>th</sup> percentile) decreased dramatically from 184.5 to 113.9 GPCD. In the Red Zone, the median per capita usage in 2015 was 92.6 GPCD, and the interquartile range was 78.5–111.1 GPCD.

Permit	Permit Holder	Popula-	2015 Avg. Annual		Per Capita Usage			
Number		tion	Reported	l Usage	(GPCD)			
		Served	(MG	<b>D</b> )				
			Ground-	Total	2004	2015	Change	
			water	Water <sup>1</sup>				
Chatham C	County		0.004					
025-0005	Pooler (UF)	21,187	0.306	*1.962	68.0	92.6	+24.6	
025-0066	Pooler (LF)	, 	1.048		1 - 0 0			
025-0007	Garden City	8,141	0.896	0.896	170.0	110.1	-59.9	
025-0018	Savannah-Main	205,091	20.414	20.414	149.6	99.5	-50.1	
025-0021	Port Wentworth	5,500	0.195	*0.899	124.6	163.5	+38.9	
025-0022	Thunderbolt	2,668	0.2042	*0.2792	54.1	104.6	+50.5	
025-0023	Memorial Univ. Medical Center	4,800	0.138	*0.232	NA	48.3	NA	
025-0027	Tybee Island	8,047	0.775	0.775	216.7	96.3	-120.4	
025-0028	Utilities Inc. of GA (Landings Subdivision)	11,058	1.270	1.270	218.9	114.8	-104.1	
025-0034	Hunter Army Airfield (UF)	7 500	0.382	*0 /51	180 3	60.1	120.2	
025-0061	Hunter Army Airfield (LF)	7,500	0.065	-0.431	109.3	00.1	-129.2	
025-0035	Bloomingdale	1,690	0.107	0.107	79.3	63.3	-16.0	
025-0040	Chatham Water Company - Glen of Robin Hood & Montgomery Area	6,185	0.497	0.497	75.2	80.4	+1.8	
025-0045	Chatham Water Company - Hunter's Ridge	660	0.030	0.030		45.5		
025-0041	Consolidated Utilities, Inc. (UF)		0.291					
025-0060	Consolidated Utilities, Inc. (LF)	11,799	0.352	1.002	54.4	84.9	+30.5	
025-0057 <sup>1</sup>	Consolidated Utilities, Inc. (Miocene)		0.359					
025-0046	Candler Hospital	NA	0.048	0.048	NA	NA	NA	
025-0054	Skidaway Institute of Oceanography	108	0.021	0.021	231.5	194.4	-37.1	
025-0062	Coastal Georgia Water Company - Ogeechee Farms	918	0.102	0.102	50.9	111.1	+60.2	
025-0063	Chatham Water Company - Parkersburg	1,253	0.166	0.166	NA	132.5	NA	
025-0064	South Atlantic Utilities - Scarborough Cove & Talahi Island Community	2,806	0.129	0.129	123.2	46.0	-77.2	
025-0065	Chatham Water Company - Burnside & Rio Vista Community Water System	702	0.087	0.087	NA	123.9	NA	
025-0067	South Atlantic Utilities - Harbour Creek Community Water System	543	0.025	0.025	NA	46.0	NA	

Table 20.	Per C	Capita	Water	Usage f	for M	lunici	pal Systems.
		1		0,			~

Permit Number	Permit Holder	Popula- tion Served	2015 Avg. Annual Reported Usage (MGD)		Per Capita Usage (GPCD)				
			Ground- water	Total Water <sup>1</sup>	2004	2015	Change		
Effingham	Effingham County								
051-0001	City of Rincon (UF)	0.000	0.786	*** 0.1.1		00.1			
051-0015	City of Rincon (LF)	9,880	0	*0.811	NA	82.1	NA		
051-0010	Coastal Water & Sewerage Company	1,370	0.147	0.147	NA	107.3	NA		
051-0011	Effingham County Board of Commissioners	293	0.027	0.027	NA	92.2 <sup>4</sup>	NA		
051-0014	Lakeside Water Company, Inc.	993	0.078	0.078	NA	78.5	NA		
051-0016	South Atlantic Utilities - Azalea Point / Barrister Crossing / Kingsley Plantation / Lonesome Oak CWS	1,037	0.094	0.094	NA	90.6	NA		
051-0017	South Atlantic Utilities - Goshen Villas Water System	608	0.050	0.050	NA	82.2	NA		
GA- 1030131	Effingham County Surface Water System	4,519	N/A	*0.6893	NA	152.5	NA		
Median, Cl	Median, Chatham County Only					97.9	-26.0		
Median, Re	ed Zone Combined				NA	92.6	NA		

<sup>1</sup> Asterisks (\*) designate surface water was purchased in addition to groundwater withdrawals.

<sup>2</sup> Data for Thunderbolt is from 2016 because 2015 had incomplete data.

<sup>3</sup> This value excluded the water used by the power plant (1.776 MGD) as part of the Effingham County

Surface Water System permit. It includes water used by customers, water flushed, and water losses.

<sup>4</sup> Population served was estimated using the community system average in Effingham, 92.2 GPCD.

Three municipalities provided additional breakdown between residential and other users and water audit reports. Effingham County Surface Water System only had 12.9% going to residential customers, which was a smaller percentage than the power plant (72.1%) and flushed (13.8%). In Garden City, residential customers used 43.4%, followed by commercial at 31.1%, and the next largest group was water losses at 12.2%. In Thunderbolt, 90.6% was invoiced and 8.9% was not accounted for and likely water losses. Per capita usage was calculated for residential users based on the assumption that population served in the SDWA Permit was for residential customers only. This assumption might not be valid for Garden City since they have many commercial users.

Permit Number	Permit Holder	Use Type	2015 Reported Avg. Annual Usage (MGD)	Percentage of Total Usage	Residential Per Capita Usage (GPCD)
		Residential	0.317	12.9%	71.1
GA1030131	Effingham	Commercial	0.017	0.7%	
	County Surface	School	0.018	0.7%	
	Water System	Power Plant	1.776	72.1%	
		Flushed	0.339	13.8%	
		Residential	0.389	43.4%	47.8
		City	0.043	4.8%	
		Commercial	0.279	31.1%	
025 0007	Gordon City	Unmetered	0.017	1.9%	
023-0007	Garden City	Water Losses	0.109	12.2%	
		Supply Error	0.031	3.4%	
		Adjustments			
		Other (unknown)	0.028	3.1%	
		Invoiced	0.253	90.6%	94.7
025 0022	Thundarhalt	Town	0.001	0.5%	
023-0022	Thunderbolt	Building/Parks			
		Losses	0.025	8.9%	

Table 21. Analysis of Water Usage for Residential and Other Uses.

Data Source: Municipalities and AWWA Water Loss Audit Reports.

<sup>1</sup> Data for Thunderbolt is from 2016 because 2015 had incomplete data.

#### 2.5. Seasonal Water Usage

Monthly groundwater withdrawals were analyzed collectively by user group to determine if either industrial or municipal users demonstrated a seasonal trend (Figure 7). Cumulatively, municipal users withdrew 9.3 MGD (38%) more groundwater during the peak month of June than during the least-used month of December. Industrial users had a steady usage except for February, when the industrial user that accounted for about 80% of annual industrial usage was not in operation for a portion of the month. Excluding February, there was only 2.4 MGD (14%) more groundwater used in the most used month of September than the least used month of January.

As another metric to analyze individual permittees, the month with peak usage rate was divided by the average annual usage rate for groundwater withdrawal permits utilizing the Floridan aquifer. Permit holders with multiple permits in different aquifers were combined (e.g., Pooler, Consolidated Utilities, and Hunter Army Airfield), and treated surface water purchased from Savannah was also included in the calculations for total water used by month. The average ratio of peak monthly usage to average annual usage was 1.68 for municipal users and 1.29 for industrial users, and the median ratio was 1.37 and 1.17, respectively. The higher average and median ratios from individual municipal users supports that municipalities have peak seasonal usage. Out of 25 municipal users in the calculation above; June was the peak month for 14 systems, July was for 5 systems, and May was for 4 systems. Interestingly, August was never the peak usage month, but as described later in this section, May was a month with a rainfall deficit compared to normal and August had a surplus of rain compared to normal. Based on the peak month usage occurring almost entirely in May, June, and July, the seasonal peak is attributed to increased demand for irrigation in the summer. Industrial users were more evenly distributed across the year. Ratios for the two "Other" users were 4.78 and 5.55. These "Other" users were golf courses, so the influence of irrigation in the summer months was expected to cause the higher ratios.



Figure 7. Seasonal Groundwater Usage in 2015.

As there appeared to be a strong seasonal trend for municipal users that peaked in the summer, the fraction that could potentially be attributed to irrigation use was explored. The growing season in Chatham County is March-November (inclusive), so the monthly average from December to February was calculated and assumed to be the non-growing season baseline. The total usage (MG) per month versus the baseline was calculated and summed for the growing season months. This total was then calculated as the percentage of the annual usage. Examples presenting this methodology are presented in Figure 8. The 9-month growing season is identified by the vertical lines, and the dashed orange line represents the non-growing season baseline. Some municipal users also purchase surface water, so the total water usage (groundwater pumped plus surface water purchased) was used for City of Pooler, City of Port Wentworth, and Town of Thunderbolt. Purchased surface water data from Memorial University Medical Center was not available for all months, so this site was not included in the analysis.



Figure 8. Examples of Calculating Potential Seasonal Irrigation Usage in 2015.

A summary of the annual usage by municipal users and the additional usage above the nongrowing season baseline is presented in Table 22. Collectively, there was an additional 10% of water used during the growing season that was above the non-growing season baseline. The median system used an additional 14%. While not all of this can be attributed strictly to irrigation, it is likely a large contributor for many communities. As a result, irrigation conservation needs to be prioritized when developing new strategies for the *Red Zone Plan*.

Growing and non-growing season usage was also calculated for the Effingham County Surface Water System, but the result for this system was not included in Table 22 because it does not use water from the Floridan aquifer. Only monthly customer usage was included in the calculations; power plant usage and flushed water were omitted. This system used an additional 27% above the non-growing season baseline.

As one example, a known exception for the increased usage from a community not being primarily from irrigation is Tybee Island because it has heavily-influenced seasonal population. Seasonal population was presented in a recent report for City of Tybee Island, "Carrying Capacity Study." The "Carrying Capacity Study" investigated and estimated daytime and overnight populations, including short-term rental population for hotels, houses/condos, and campground by month. The average short-term rental population from December to February was 1,898, and this peaked to 7,086 in July. July can also experience a peak daytime population of over 30,000. These populations are compared to a resident population of 3,082.

Permit	Permit Holder	2015	Usage Above	2015
Number		Annual	Non-Growing	Growing
		Usage	Season	Season
		(MG)	<b>Baseline</b> (MG)	Excess, %
025-0005,	Pooler, City of	716.8	111.0	15%
025-0007	Garden City City of	327.0	18.8	6%
025-0018	Savannah City of	7451.2	502.2	7%
025-0021	Port Wentworth City of	327.9	38.8	12%
025-0022	Thunderbolt Town of	101.81	12.5 <sup>1</sup>	$12\%^{1}$
025-0023	Memorial University Medical Center <sup>2</sup>	10110	12.0	12/0
025-0027	Typee Island, City of	283.1	82.9	29%
025-0028	Utilities Inc. of Georgia (Landings S/D)	463.7	132.7	29%
025-0034	Hunter Army Airfield (Upper Floridan) <sup>3</sup>	139.5	28.6	$21\%^{3}$
025-0061	Hunter Army Airfield (Lower Floridan) <sup>3</sup>	23.7	3.4	$14\%^{3}$
Two	DPW Environ, Division - Hunter Army Airfield <sup>3</sup>	163.3	32.0	$20\%^{3}$
025-0035	Bloomingdale. City of	38.9	2.4	6%
	Chatham Water Company - Glen of Robin Hood	000		0,0
025-0040	& Montgomery Area	181.3	16.2	9%
025-0041	Consolidated Utilities, Inc. (Upper Floridan)	106.1	35.6	34%
025-0060	Consolidated Utilities, Inc. (Lower Floridan)	128.6	-7.0	-5%
025-0057	Consolidated Utilities, Inc. (Miocene)	131.1	24.2	18%
Three	Consolidated Utilities, Inc.	365.7	52.8	14%
025-0045	Chatham Water Company - Hunter's Ridge	11.0	0.7	7%
025-0046	Candler Hospital	17.6	9.8	56%
025-0054	Skidaway Institute of Oceanography	7.8	3.6	46%
025 0062	Coastal Georgia Water Company - Ogeechee			
025-0062	Farms	37.2	0.9	2%
025-0063	Chatham Water Company - Parkersburg	60.7	-0.7	-1%
025 0064	South Atlantic Utilities - Scarborough Cove &			
023-0004	Talahi Island Community	47.1	6.4	14%
025 0065	Chatham Water Company - Burnside & Rio			
023-0003	Vista Community Water System	31.6	6.1	19%
025 0067	South Atlantic Utilities - Harbour Creek			
025-0007	Community Water System	9.3	4.3	46%
051-0001	Rincon, City of <sup>3</sup>	287.0	43.7	15% <sup>3</sup>
051-0010	Coastal Water & Sewerage Company	53.6	17.8	33%
051-0011	Effingham County Board of Commissioners	9.8	3.2	33%
051-0014	Lakeside Water Company, Inc.	28.6	0.8	3%
051-0016	South Atlantic Utilities - Azalea Point / Barrister			
051-0010	Crossing / Kingsley Plantation / Lonesome Oak	34.4	10.8	32%
051-0017	South Atlantic Utilities - Goshen Villas Water		_	_
	System	18.3	0.4	2%
Total		1,110.5	11,074.7	10%

Table 22. Additional Water Usage by Municipal Users during the 2015 Growing Season.

<sup>1</sup> Data for Thunderbolt is from 2016 because 2015 had incomplete data. <sup>2</sup> Monthly purchased surface water was not available to calculate the seasonal usage. <sup>3</sup> Purchased surface water not included, but it represents less than 3% of total water usage.

The same procedure for estimating additional water usage during the growing season was followed for "Other" users, and the results are presented in Table 23. Two golf course permits for the Upper Floridan aquifer were used almost entirely during the growing season. Two golf course permits for the Surficial aquifer were used mainly during the growing season, but they were also used some during non-growing season months as well.

Permit Number	Permit Holder	Aquifer Source	2015 Annual Usage (MG)	9-month Additional Usage (MG)	2015 Growing Season Excess, %
025-0010	The Landings Club, Inc Golf Course Well No. 1	Upper Floridan	6.8	6.9	101%
025-0044	The Landings Club, Inc Golf Course Well No. 2	Upper Floridan	32.3	31.6	98%
025-0058	The Landings Club, Inc North Well Field	Surficial	67.6	49.9	74%
025-0059	The Landings Club, Inc South Well Field	Surficial	50.2	23.3	46%
Total			111.6	156.8	71%

Table 23. Additional Water Usage by "Other" Users during the 2015 Growing Season.

Some irrigation systems are programmable based on soil moisture or rainfall conditions. These features will result in weather conditions impacting irrigation usage. Therefore, weather conditions for 2015 were explored. Data from a weather station at the Savannah International Airport (Station Name: WBAN 03822) were downloaded from NOAA's National Center for Environmental Information website. The following data were downloaded: hourly, daily, and monthly rainfall totals; monthly minimum, average, and maximum temperatures; and climate normal for a 30-year period from 1981-2010. Overall, 2015 was close to the normal climate conditions. Total annual rainfall was only 0.36 inches less than normal, but there were a few months with substantial departures from normal, as presented in Figure 9. Months with the largest departures from normal included: surpluses of 3.45 inches in April and 1.28 inches in August, and deficits ranging from 1.7-1.9 inches in March, May, September, and October. Monthly temperatures were close to normal during most of the growing season, as presented in Figure 10, but February was 5.7°F cooler and December was 12.5°F warmer than normal monthly average temperatures. Focusing on rainfall and irrigation usage, the 1.28-inch rainfall surplus in August and 1.75-inch deficit in May would explain why August, as the second warmest month, would have the fourth most groundwater usage (Figure 7) and have less usage than May, which was 7.7°F cooler. May ranked fourth for monthly average temperature but was only 0.3 MGD less than July, which had the second highest monthly groundwater usage (Figure 7).



*Figure 9. 2015 Monthly Precipitation Compared with Climate Normal for Savannah Airport Weather Station.* 



*Figure 10. 2015 Monthly Average Temperature Compared with Climate Normal for Savannah Airport Weather Station.* 

#### 2.6. Water Reuse

There are four municipal water pollution control plants (WPCPs) that actively used treated effluent as reuse water in the Red Zone. A summary of the permit information, 2015 reuse total, and percent of effluent utilized as reuse is provided in Table 24. Details on the monthly reuse total and days used per month are provided in Table 25 and monthly usage is presented graphically in Figure 11. A brief summary of each WPCP with reuse is provided below.

The City of Savannah's President Street WPCP has a separate permit for reuse flow than the WPCP effluent. This site reused 58.5 MG in 2015, which is an average of 0.160 MGD. Considering the average effluent from this site is 20.871 MGD, reuse only accounted for 0.8% of total flow. There was a total of 83 days with reuse flow, and at least one day for every month. Most of the reuse occurred in April, May and June. During this 3-month period, there were 48 days with reuse flow, totaling 41.9 MGD (72% of annual reuse). The golf course on Hutchinson Island, "The Club at Savannah Harbor," and Savannah Golf Club are known water users from this facility. The City of Savannah will soon construct a 0.5 MGD supply line from the President Street WPCP to Bacon Park recreational facilities to increase utilization.

The City of Rincon WPCP has its reuse flow under the same permit as the WPCP effluent, but it has a unique discharge number. This site only had 8.1 MG of reuse (0.022 MGD) in 2015. Based on a smaller WPCP effluent for this plant of 0.597 MGD, the portion utilized as reuse was 3.7%. There were only three months, totaling 21 days, with reuse from this facility – May, June, and August. This facility also had a golf course, "Lost Plantation Golf Club," utilizing reclaimed water.

The Pooler Bloomingdale Reg. WPCP has its reuse flow under the same permit as the WPCP effluent, but it has a unique discharge number. This site only had 15.7 MG of reuse (0.043 MGD) in 2015. Based on the WPCP effluent rate of 2.280 MGD, the portion utilized as reuse was 1.9%. Reuse occurred for six months from May to October, with a peak usage of 6.1 MG in August (39% of total reuse for 2015). Information was not available for daily usage or primary reuse customers for this facility.

The South Effingham-Urban Water Reuse Facility is a "No Discharge Land Application System/Reuse" facility. This facility does not discharge any treated effluent to a stream, river, canal, or lake. Treated effluent is discharged from plant to reuse customers or to spray fields. From the 0.301 MGD of treated effluent flow, 0.229 MGD (76%) was utilized as reuse and 0.072 MGD (24%) was discharged through the spray fields. Some of the reuse customers and their uses include: neighborhoods for irrigation, a car wash, a concrete plant for mixing concrete, and a pipe plant for making concrete pipe. Since there are dedicated users that have more than a seasonal demand, the reuse from this site can be utilized every day of the year. Reuse occurred every day, and the monthly usage ranged from 4.9 - 9.1 MG/month for a total of 83.6 MG. Flow to the spray fields occurred during 136 days for a total of 26.5 MG.

Three of the WPCPs had very limited reuse compared with total treated effluent from each facility. Their reuse efficiency ranged from 0.8–3.7%. Reuse customers for these facilities were mainly golf courses for irrigation, so they had seasonal needs, as shown in Figure 11. Without a regular need, most days and months had no reuse. Only one of the facilities, South Effingham, had a dedicated set of reuse customers, so it was able to distribute reuse water every day and consistently year-round. Since it had a dedicated area to use as a spray field, this facility was able to operate with zero discharge. Reuse water is highly-underutilized in the Red Zone. The total average daily reuse for 2015 was 0.454 MGD, which is less than 1% of the total groundwater used in the Red Zone from the Floridan aquifer (52.674 MGD). Therefore, this area needs to be prioritized when developing new strategies.

Site	Permit Information	2015 Reuse (MGD)	2015 WPCP Effluent (MGD)	% of Effluent Utilized as Reuse
City of Savannah President Street WPCP	Reuse has a separate permit (GAU02098) than WPCP (GA0025348)	0.160	20.8711	0.8%
City of Rincon WPCP	Reuse has the same permit (GA0046442) and Discharge Number (001 1) as the WPCP	0.022	0.597	3.7%
Pooler Bloomingdale Reg WPCP	Reuse is on the same permit (GA0047066) but has a different Discharge Number (00B-2) than WPCP (00B-1)	0.043	2.280 <sup>1</sup>	1.9%
South Effingham – Urban Water Reuse Facility	This is a "No Discharge LAS/Reuse" facility with permit (GAJ020-016)	Reuse: 0.229 Spray Fields: 0.072 Total: 0.301	0.301	Reuse: 76.0% Spray Fields: 24.0% Total: 100%

Table 24. Summary of WPCPs Actively Utilizing Reuse Water in 2015.

Table Source: Georgia EPD Coastal District Office (Brunswick).

<sup>1</sup> Average effluent flow is based on average of months available.

Month	Sava	nnah	Rin	con	Pooler		South Ef	fingham	
	2015 Bouss	Days with	2015 Bouss	Days with	2015 Bouse	2015 Bouse	Days with	Spray Fields	Days to
	(MG)	Reuse	(MG)	Reuse	(MG)	(MG)	Reuse	(MG)	Fields
January	0.2	1	0	0	0	6.6	31	1.9	6
February	0.3	1	0	0	0	7.2	28	0	0
March	1.5	5	0	0	0	7.6	31	0	0
April	9.7	13	0	0	0	6.0	30	3.4	14
May	18.7	19	1.8	4	2.9	7.3	31	1.5	6
June	13.5	16	4.3	10	2.6	5.9	30	1.7	10
July	2.5	6	0	0	2.5	6.3	31	2.4	12
August	3.7	6	2.0	7	6.1	5.3	31	5.1	25
September	0.2	1	0	0	0.8	4.9	30	5.5	26
October	5.2	8	0	0	0.7	9.1	31	1.4	9
November	2.5	6	0	0	0	8.8	30	2.5	19
December	0.5	1	0	0	0	8.6	31	1.1	9
Total	58.5	83	8.1	21	15.7	83.6	365	26.5	136

Table 25. Summary of 2015 Monthly Reuse Total and Frequency.

Table Source: Georgia EPD Coastal District Office (Brunswick).



Figure 11. Monthly Water Reuse.

### 2.7. Conservation Measures

#### 2.7.1. The Landings Association and Utilities, Inc.

As a result of the water withdrawal permit reductions in 2010 for Utilities Inc. of Georgia (Landings Subdivision), five primary actions were taken to conserve water. These included: (1) develop water committees, (2) implement a conservation-based tier-rate structure, (3) control utility water losses, (4) education programs, and (5) investigate alternate irrigation water supplies.

Once a better understanding about residential water use was developed, water rates for higher tier users became more aggressive. Residential meters were replaced with cellular automated meters so that the utility and customers can monitor daily usage and control water losses. The cellular meters would notify users with warnings and alerts when they approached high threshold usage. In an effort to control water losses, an increase in measures were taken for auditing, detecting leaks, and response. Leak detection devices were installed and linked to cellular systems. A conservation coordinator was also hired in September 2014 to work on water loss, conservation, and a communication plan for these issues. The educational programs included: winter water symposiums, educational articles, and engagement and presentations with Island Groups (Kiwanis, Rotary, Skidaway Audubon, CCA, and Garden Clubs). Lastly, the investigation for alterative irrigation water supply was studied and monitored for shallow wells.

The aggressive tier-rate structure has proven to be effective. From 2009 to 2014, the number of users for the highest tier (>25,000 gallons per month) has been cut in half. The two middle tiers have decreased slightly, and the lowest tier has increased by 45%, as shown in Figure 12.



*Figure 12. Number of Water Users by Tier in Landings Subdivision.* Source: Sean Burgess, Environmental Manager, The Landings Association

These conservation efforts have proven to be effective. With a 10% growth in population, per capita usage has decreased. From 2011 to 2015, outdoor irrigation consumption has also been reduced by 10% each year. The Landings Association Committees is continuing to evaluate additional alternate water sources for potable and irrigation sources. Some alternate potable water sources being explored include: water reuse of treated wastewater, install Cretaceous aquifer well and add reverse osmosis (RO) water treatment plant, purchase surface water from Savannah, and continue with more and new conservation measures.

#### 2.7.2. Vouchers for Water-Efficient Toilets

Toilets are one of the main sources of water use in the home. It wasn't until the last couple of decades that water-efficient toilets became available and were required in building codes for new construction. To promote conservation through replacing old, inefficient toilets, the City of Savannah started a program that offered vouchers for a free, water savings toilet to qualified applicants. To qualify, a single-family dwelling must have been built before 1993, and the applicant must replace a 3 gallon per flush or higher toilet and bring the old toilet to the Dean Forest Landfill for disposal. There is currently a limit of two toilets per water customer/account.

As another southeast regional example, the Southwest Florida Water Management District has cooperatively funded a high-efficiency toilet retrofit program. Participating local governments and utilities in the District offer up to a \$100 rebate when residents replace inefficient toilets with high-efficiency models, and the District splits the cost. Since 1991, the District has replaced approximately 250,000 toilets and 500,000 showers and fixtures, which now saves them 15 MGD (http://www.swfwmd.state.fl.us/conservation/toilet\_rebates/).

A lot of water conservation measures in the home are led by WaterSense, a program sponsored by U.S. Environmental Protection Agency. This program helps consumers identify high performance, water-efficient products and appliances, including toilets. There is a WaterSense Calculator on EPA's website to estimate potential savings based on replacing toilets and faucets with WaterSense labeled products. Some of the assumptions used in this calculator were followed to estimate potential water savings in the Red Zone for replacing inefficient toilets. The calculator assumes that toilets installed before 1980 use about 5 gallons per flush, those installed between 1980 to 1994 use approximately 3.5 gallons per flush, and those installed after 1994 use 1.6 gallons per flush. The average usage per person per day is assumed to be 5.05 flushes. Toilets installed after 1994 use only about 0.3 gallons per flush more than WaterSense labeled toilets and those in the City of Savannah's building codes since 2010 (1.28 gallons per flush), so water savings for replacement will only look at toilets installed before 1994.

The total number of housing units, percentage occupied, average household size, and year constructed for each municipality and county in the Red Zone were compiled from the most recent Census data. These data, as presented in Table 26, will be used to identify the potential number of customers that could benefit from replacing old, inefficient toilets.

Municipality/	Total	Percent	Average		Yea	ar Constru	ucted	
County	Housing Units	Occupied	House- hold Size	Prior to 1960	1960- 1980	1980- 1990	1990- 2000	2000- 2015
Chatham	121,877	86%	2.55	31,302	27,944	17,563	16,179	28,889
Unincorporated Chatham	38,202	90%	2.55 <sup>1</sup>	2,850	7,410	8,532	9,024	10,386
Bloomingdale	1,165	90%	2.62	211	282	216	186	270
Garden City	3,924	89%	2.56	1,248	968	751	608	349
Pooler	8,666	94%	2.61	335	923	681	721	6,006
Port Wentworth	3,005	87%	2.49	601	166	81	68	2,089
Savannah	62,335	85%	2.51	24,899	17,328	6,538	4,799	8,771
Thunderbolt	1,183	86%	2.42	346	326	198	158	155
Tybee Island	3,341	37%	2.39	779	532	561	612	857
Vernonburg	56	80%	2.80	33	9	5	3	6
Effingham	20,361	91%	2.95	1,710	2,656	2,996	5,400	7,599
Guyton	673	89%	3.29	169	80	72	84	268
Springfield	951	95%	2.87	131	213	231	221	155
Unincorporated Effingham	18,737	90%	2.95 <sup>1</sup>	1,248	1,873	2,256	4,354	7,176
Rincon <sup>2</sup>		90%	$2.95^{1}$	162	490	437	741	

Table 26. Age of Housing Units in Chatham and Effingham Counties.

Data Source: U.S. Census Bureau, American Community Survey 2011-2015.

<sup>1</sup> Average household size was assumed to be equal to the respective county's average.

<sup>2</sup> The most recent data available on total housing units and year constructed for City of Rincon in the U.S. Census data was 2000, so it was combined with Unincorporated Effingham County for total housing units and most recent data.

First, the total number of housing units constructed before 1980 and between 1980-1994 were calculated from the Census data. Since the year of construction was grouped by decade, it was assumed that half of the housing units constructed from 1990 to 1999 were prior to 1994. Next, total number of occupied housing units and their associated population during these two periods were calculated by multiplying total housing units by percentage occupied and average household size listed in Table 26. The potential savings by municipality was calculated for oldest toilets (pre-1980) and the next generation of toilets (1980-1994) by replacing them with the more efficient options available now. As only a portion of Effingham County is in the Red Zone, it was assumed that two-thirds of unincorporated Effingham County's population is in the Red Zone. Based on construction year, the maximum potential savings is approximately 3.0 MGD in Chatham County and 0.2 MGD in the Red Zone portion of Effingham County (Table 27). However, an unknown fraction of housing units has been renovated or had toilets replaced since 1994, so the maximum actual water savings is less than this estimate. Assuming the fraction is 50%, the water savings in the Red Zone would be about 1.6 MGD. This water savings represents almost 5% of Floridan usage from domestic and commercial users. More than half of the potential savings in the Red Zone is from housing units in Savannah, so the voucher program that they currently have in place is a good initial step. This type of program needs to be explored in other municipalities and whether more proactive measures should also be considered to replace inefficient toilets.

Municipality/	Housin	g Units Befo	re 1980	Housing Units 1980-1994			Combined
County	Occupied Housing Units	Estimated Popula- tion	Potential Savings (GPD)	Occupied Housing Units	Estimated Popula- tion	Potential Savings (GPD)	Potential Savings (GPD)
Bloomingdale	493	1,163	21,732	309	729	8,099	29,830
Garden City	2,216	5,069	94,708	1,055	2,413	26,810	121,517
Pooler	1,258	3,090	57,739	1,042	2,558	28,423	86,163
Port Wentworth	767	1,670	31,208	115	250	2,782	33,990
Savannah	42,227	89,774	1,677,423	8,938	19,001	211,101	1,888,523
Thunderbolt	672	1,397	26,097	277	576	6,396	32,493
Tybee Island	1,311	1,155	21,589	867	764	8,489	30,078
Vernonburg	42	95	1,766	7	15	162	1,928
Unincorporated Chatham	10,260	23,615	441,252	13,044	30,023	333,558	774,810
Rincon	652	1,739	32,485	808	2,153	23,922	56,407
Unincorporated Effingham <sup>1</sup>	1,561	4,161	77,750	2,217	5,910	65,664	143,413
Chatham	59,246	127,028	2,373,513	25,653	56,329	625,820	2,999,334
Effingham	2,213	5,900	110,235	3,024	8,064	89,586	199,820
Red Zone	61,459	132,927	2,483,748	28,677	64,393	715,406	3,199,154

Table 27. Estimate of Potential Savings from Replacing Inefficient Toilets.

<sup>1</sup> Assumed one half of Unincorporated Effingham County is in the Red Zone.

#### 2.7.3. Leadership in Energy and Environmental Design (LEED), Water Efficiency

Leadership in Energy and Environmental, or LEED, is one conservation strategy implemented in some recent new construction and redevelopment projects. Buildings can become LEED-certified based on achieving specific goals related to how it is designed, constructed, operated, and maintained. These goals aim for owners and operators to use resources efficiently, including water. "Water efficiency" is a specific category, and LEED offers credits for the following items: (1) outdoor water use reduction, (2) indoor water use reduction, (3) building-level water metering, (4) water metering, and (5) cooling tower water reuse. One strategy sometimes linked with outdoor water use is capturing rainwater/runoff for irrigation. If enough runoff from the site is captured, there is credit for rainwater management in the category "sustainable sites." Some of the specific requirements for these credits could be explored in future management strategies.

LEED practices and principles can be applied at all scales and settings. There are several LEEDcertified sites across the Savannah area, and they include all building types: commercial office, hospitality, industrial, institutional, mixed use, retail, residential, and affordable housing. Typically, approaches used to satisfy water efficiency credits include: (1) install high efficiency faucets, toilets, showerheads, chillers, and HVAC pumps and (2) follow xeriscape landscaping techniques and plant native landscaping that requires no watering and little maintenance. A few examples of large-scale water conservation projects and unique strategies are described below.

- One West Victory (OWV), a multifamily midrise project in midtown Savannah was designed to capture HVAC condensate in underground cisterns to use in place of potable irrigation.
- Abercorn Commons, a 180,000 ft<sup>2</sup> strip shopping center in southside Savannah was designed for 100% of irrigation needs to be met by collecting the roof runoff for irrigation, and this was expected to account for nearly 5 million gallons annually.
- One of the first LEED industrial projects in Savannah is Logistiport warehouses. Two separate buildings (689,400 ft<sup>2</sup> and 347,280 ft<sup>2</sup>) at this site were designed to have a 30% reduction in water consumption.
  - o Project description source: http://www.tridentsustainability.com/our-work/

## 2.8. Water/Sewer Rate Structures

Current water/sewer rate structures were compiled for all Red Zone jurisdictions and utilities, as well as utilities in neighboring coastal counties in Georgia and South Carolina to serve as a comparison. First, the changes in water rates for Chatham County since the *2006 Chatham County Plan* was last updated were analyzed. All rate structures in this plan were assumed to be valid for 2004. Average residential customers in the Southeast consume 4,000 to 5,000 gallons per month (Berahzer et al. 2016), so rate structures in 2004 and the most current rate structure were used to calculate the bill for a typical residential customer using 4,000 gallons per month. The changes in rates are presented in Figure 13 for nine systems in Chatham County. Jurisdictions with a separate rate for outside city limits is depicted with the same color but a dashed line. These nine systems reported an increase in water/sewer bill ranging from 31% (Pooler) to 204% (Thunderbolt). The

average increase was 85% (\$20.78) and median increase was 76% (\$19.59). These are substantial increases over a 12-year period. As permit limits are reduced and less groundwater is available, the rate structure in the future is bound to get more aggressive, so affordability is something to consider moving forward with developing new strategies.



Figure 13. Change in Water/Sewer Bill for Customer Using 4,000 Gallons/Month.

Water/sewer bills were also compiled with the most recent rate structures for the Red Zone and neighboring areas in coastal Georgia and coastal South Carolina for a residential customer using 4,000 gallons per month. These are ranked and presented in Table 28. This list includes 11 in the Red Zone (within city limits), 4 in coastal South Carolina, and 14 in coastal Georgia. Surprisingly, areas in the Hilton Head area ranked as the 3<sup>rd</sup> least expensive [South Island Public Service District (PSD)] and 11<sup>th</sup> least expensive (Hilton Head No. 1 PSD) out of 29. Of the two Island PSDs presented, only Hilton Head PSD had Upper Floridan wells directly impacted by saltwater intrusion. The cheapest Red Zone municipality was City of Savannah, ranked 2<sup>nd</sup> at \$33.46, and the most expensive Red Zone were the most expensive in the Red Zone. Consolidated Utilities, Inc. ranked 24<sup>th</sup> at \$60.80 and Utilities, Inc. of Georgia (Landings Subdivision) ranked 25<sup>th</sup> at \$61.29.

Table 28. Water/Sewer Bill Comparison for Red Zone and Neighboring Areas for Residential Customer using 4,000 Gallons/Month.

City/Town/Utility	Location	Residential Bill, 4,000 Gallons	Rank All	Year Updated
Hinesville	Coastal Georgia	\$29.56	1	2012
Savannah (City Limits)	Red Zone	\$33.46	2	2017
South Island Public Service District	Coastal SC	\$33.90	3	2014

City/Town/Utility	Location	<b>Residential Bill,</b>	Rank	Year
		4,000 Gallons	All	Updated
Rincon (City Limits)	Red Zone	\$34.00	4	2014
Riceboro	Coastal Georgia	\$35.00	5	2008
Springfield	Coastal Georgia	\$35.84	6	2012
Pooler	Red Zone	\$39.11	7	2016
Jekyll Island Authority	Coastal Georgia	\$39.36	8	2015
Tybee Island	Red Zone	\$40.98	9	2016
Kingsland	Coastal Georgia	\$42.34	10	2013
Hilton Head No. 1 Public Service District	Coastal SC	\$44.60	11	2016
Effingham County	Red Zone	\$45.24	12	2014
Ridgeland	Coastal SC	\$45.43	13	2014
Garden City (City Limits)	Red Zone	\$46.71	14	2016
Darien	Coastal Georgia	\$48.64	15	2014
Brunswick-Glynn County Joint Water and Sewer Commission - City of Brunswick	Coastal Georgia	\$49.04	16	2016
Port Wentworth (City Limits)	Red Zone	\$51.84	17	2016
Bloomingdale	Red Zone	\$53.25	18	2015
Brunswick-Glynn County Joint Water and Sewer Commission - Glynn County	Coastal Georgia	\$53.47	19	2016
Thunderbolt	Red Zone	\$54.76	20	2016
Beaufort-Jasper Water & Sewer Authority	Coastal SC	\$56.36	21	2017
Midway	Coastal Georgia	\$58.85	22	2016
Guyton	Coastal Georgia	\$60.35	23	2014
Consolidated Utilities, Inc.	Red Zone	\$60.80	24	
Utilities, Inc. of Georgia - The Landings	Red Zone	\$61.29	25	2016
Saint Marys	Coastal Georgia	\$63.78	26	2010
Pembroke	Coastal Georgia	\$64.45	27	2014
Richmond Hill	Coastal Georgia	\$66.60	28	2016
McIntosh County	Coastal Georgia	\$70.61	29	2013
Outside City Limit Rates in Red Zone		·		
Rincon (Outside)	Red Zone	\$49.25		2014
Savannah (Outside)	Red Zone	\$50.14		2017
Garden City (Outside)	Red Zone	\$58.59		2016
Port Wentworth (Outside)	Red Zone	\$77.73		2016

Data Source: Municipalities and GEFA & UNC-EFC Report.

The "Georgia Water and Wastewater Rates Dashboard," created by UNC-EFC, was also used to compare cost structures. This tool provides a cost, conservation signal (price per 1,000 gallons after 10,000 gallons of use), cost recovery (operating ratio, including depreciation), and affordability (percentage of median housing income), and compares results with 346 rate structures in Georgia. The results for the Red Zone and systems in Coastal Georgia are presented in Table

29 for a residential customer using 4,000 gallons. The rates presented are based on those from the dashboard, which were updated July 2016, so some cities/utilities that have been recently updated may not exactly match those in Table 28. The median bill for 346 systems in Georgia was \$47.78, and the median Conservation Signal was \$7.59. In comparing results for Conservation Signal, Port Wentworth's rate per 1,000 gallons after 10,000 gallons (\$2.69) was much lower than all others in the Red Zone and coastal Georgia, except Riceboro (\$2.50). Garden City had the second lowest, \$5.29, and the rest in the Red Zone were within \$1.60 of the median Conservation Signal in Georgia.

City/Town/Utility	<b>Bill Comparison</b>	Conservation	Cost	Affordability
		Signal	Recovery	
Red Zone				
Rincon	\$34.00	\$6.75	1.59	0.67%
Effingham County	\$45.24	\$6.06	0.57	0.85%
Tybee Island	\$40.98	\$7.66	1.30	0.90%
Thunderbolt	\$42.80	\$6.95	0.99	1.26%
Garden City	\$46.72	\$5.29	1.26	1.96%
Bloomingdale	\$53.25	\$6.00	0.71	1.32%
Port Wentworth	\$50.58	\$2.69	0.96	1.17%
Pooler	\$38.19	\$6.65	1.47	0.67%
Savannah	\$31.22	\$6.07	1.27	1.02%
Outside Red Zone, Coastal Georgia	•			
Brunswick-Glynn County JWSC-	\$42.00	\$7.52	1.17	1.18%
Brunswick				
Brunswick-Glynn County JWSC-	\$46.60	\$7.52	1.17	1.31%
Glynn County				
Jekyll Island Authority	\$39.36	\$6.50		0.71%
Richmond Hill	\$66.60	\$7.60	0.99	1.24%
Pembroke	\$64.45	\$4.60	1.07	2.14%
St. Marys	\$63.78	\$6.56	1.06	1.49%
Kingsland	\$42.34	\$4.94	1.22	0.89%
Darien	\$48.64	\$7.57	0.90	1.97%
Hinesville	\$29.56	\$4.68	0.92	0.79%
Midway	\$58.85	\$6.08	1.50	1.27%
Riceboro	\$35.00	\$2.50	1.00	1.11%
Guyton	\$60.35	\$8.15	1.68	1.26%
Springfield	\$35.84	\$5.62	1.30	0.86%
Georgia Median	\$47.78	\$7.59	NA	<b>1.85%</b> <sup>1</sup>

Table 29. Summary of Results from "Georgia Water and Wastewater Rates Dashboard" for 4,000 Gallons/Month.

Data Source: Georgia Water and Wastewater Rates Dashboard, UNC-EFC.

<sup>1</sup> Data is based on monthly bill of 5,000 gallons per month (Berahzer et al. 2016).

Cost Recovery is the operating ratio including depreciation. When it is above 1.0, revenues are more than expenses, and below 1.0, revenues are less than expenses. Four out of nine cities/utilities in the Red Zone were operating with more expenses than revenue. Two, Thunderbolt (0.99) and

Port Wentworth (0.96) were very close to 1.0. The other two were substantially less than 1.0 - Effingham County (0.57) and Bloomingdale (0.71). Rincon (1.59) and Pooler (1.47) had the highest operating ratios. Cost Recovery was compared with monthly bills in Table 29. The five highest bills in the Red Zone included the four cities/municipalities with operating ratios less than 1.0. One of the top five not below 1.0 was Garden City (1.26). The two highest operating ratios had the second and third least expensive bill after Savannah (1.27) which ranked fourth.

Based on the results for the factor, Affordability, Garden City's rates were the highest with respect to median housing income (1.96%). The next tier included: Bloomingdale (1.32%), Thunderbolt (1.26%), and Port Wentworth (1.17%). The most affordable were Pooler and Rincon, both tied at 0.67%. The median Affordability percentage for all utilities in Georgia based on monthly usage of 5,000 gallons per month was 1.85% (Berahzer et al. 2016). As the monthly bill and affordability percentage in Table 29 is based on 4,000 gallons per month, the affordability percentage will increase slightly (0.1-0.2%) for 5,000 gallons per month. Despite this difference, Garden City was the only city/utility in the Red Zone with a higher Affordability percentage than the median for all utilities in Georgia. In coastal Georgia, outside of the Red Zone, only 2 out of 13 were higher than the median value, so the cost for water and sewer compared with median housing income is less in coastal Georgia than across the state. However, this does not mean that affordability does not need to be addressed or considered.

Irrigation was highlighted earlier as a water use that needs to be given stronger emphasis for management strategies. In Georgia, there are 56 rate structures that included unique rates for irrigation, and at 15,000 gallons per month, 40 of the structures (71%) charged more for irrigation than water only (Berahzer et al. 2016). From Table 28, only Port Wentworth, Savannah, and Tybee Island, in the Red Zone, and Brunswick-Glynn County Joint Water and Sewer Commission and Richmond Hill, in coastal Georgia outside of the Red Zone, had unique rate structures for irrigation. Based on 15,000 gallons per month, the resulting bill for water, irrigation, and combined water/sewer is presented in Table 30 for these cities/utilities. Each city/utility had a premium for irrigation compared with water only. Four ranged from 18%-26%, Port Wentworth charged an additional 76% (\$36.64), and Savannah charged an additional 170% (\$48.30). Consistent with rate structures across the state, residential customers receive a price break for irrigation water compared with combined water and sewer bill (Berahzer et al. 2016). This makes sense since irrigation water will not enter the sewer after use and need to be treated. Unless irrigation water is metered separately and charged only for water, separate irrigation rate structures would decrease customer's bills and make conservation less enticing.

City/Town/Utility	Water Bill, 15,000 Gallons	Irrigation Bill, 15,000 Gallons	Premium for Irrigation Bill	Combined Water/Sewer Bill 15,000 Gallons
Red Zone				
Port Wentworth	\$48.25	\$84.89	76%	\$132.84
Savannah	\$28.45	\$76.75	170%	\$105.20
Tybee Island	\$53.99	\$63.86	18%	\$121.46

*Table 30. Irrigation Rate Structures and Comparisons to Water and Water/Sewer for 15,000 Gallons per Month.* 

City/Town/Utility	Water Bill, 15,000 Gallons	Irrigation Bill, 15,000 Gallons	Premium for Irrigation Bill	Combined Water/Sewer Bill 15,000 Gallons
Outside Red Zone, Coastal Geo	rgia			
Brunswick-Glynn County	\$34.92	\$42.64	22%	\$125.38
JWSC-Brunswick				
Brunswick-Glynn County	\$34.74	\$42.46	22%	\$129.98
JWSC-Glynn County				
Richmond Hill	\$72.30	\$91.00	26%	\$144.60

Data Source: Municipalities and 2016 Report "Water and Sewer Rates and Rate Structures in Georgia" (UNC-EFC and GEFA).

#### 2.9. Water Efficiency and Conservation Efforts for Groundwater Permit Holder

The 2006 Coastal Georgia Plan outlined several water efficiency and conservation efforts that were not included in the 2006 Chatham County Plan. The practices from the 2006 Coastal Georgia Plan are described in the list below. These practices, or slight variations, were later included as special permit conditions required by EPD for groundwater permit holders. Adoption, program implementation, study results, or a progress update for many of the special permit conditions were due to EPD in 2008 or 2009.

- Industrial Water Permittees
  - Conduct an audit of the facilities water system to identify practices to conserve water
  - Adopt an industrial leak detection and repair program
  - Adopt metering, meter calibration, and repair and replacement program
  - Conduct a reuse feasibility study for an alternate water source as substitute for groundwater used for operational practices
  - Maximize use of recycled or reclaimed water to supply internal operational needs as well as outdoor watering requirements
- Public and Private Water Providers (Municipal Water Permittees)
  - Develop a water conservation education program
  - Adopt and implement conservation-oriented rate structure
  - Adopt policy requiring compliance with outdoor watering schedule adopted by the Board of Natural Resources or approved by EPD
  - Submit a schedule for conducting a reuse feasibility study for alternative water sources as substitute for groundwater for outdoor purposes
  - Adopt a meter calibration, repair, and replacement program, including: (1) program and schedule for installing meters for all wells and connections not currently metered and (2) annual calibration for meters for the top 10% of water users.
  - Adopt ordinances requiring installation of purple pipe reuse lines in new developments
  - Adopt a water loss control program

- Golf Course Permittees
  - Conduct a feasibility study on using reclaimed water or other non-Floridan aquifer water for irrigation purposes
  - Establish a schedule for implementing Best Management Practices (BMPs)

## 2.10. Water Loss Audit Reports

A total of 15 public water systems in the Red Zone were required to submit water loss audit reports to Georgia EPD because their population served exceeded 3,300. The water loss audit reports are submitted as an Excel spreadsheet that was developed by American Water Works Association. This spreadsheet accounts for water supplied, authorized consumption, water losses (both apparent and real), non-revenue water, system data, cost data, and performance indicators. A few of the key statistics are presented below in Table 31. Authorized consumption, which is all of the billed and unbilled, metered and unmetered usage is presented, and the fraction of this that is billed metered is also presented. All systems have billed metered exceeding 95% of authorized consumption except Hunter Army Airfield (18%), Effingham County (86%), and Garden City (89%). Hunter Army Airfield is a military installation, so many facilities are not billed for water. In total, 45% is billed unmetered (only system with this category) and 37% is unbilled unmetered. Apparent losses, which are unauthorized consumption, customer meter inaccuracies, and systematic data handling errors, are reported. Larchmont Utilities (Consolidated Utilities, Inc.) had the most apparent losses (10%). This was followed by Savannah-Main, -Whitemarsh, and -Wilmington with 5% and Savannah-Georgetown with 4%. Real losses are the water supplied minus authorized consumption and apparent losses. Rincon had the most real losses, 31%, and this was followed by Hunter Army Airfield and Savannah-Georgetown, both at 17%. Non-revenue water is all of the water losses and unbilled consumption. This is an important characteristic to keep low to ensure that the water system is optimizing its income. The median non-revenue water was 15%. Five water systems exceeded 20%: Hunter Army Airfield (48%), Rincon (36%), Savannah-Georgetown (25%), Garden City (23%), and Larchmont Utilities (21%).

Water System	Water Supplied (MG)	Authorized Consumption	Authorized Consumption: Billed Metered	Apparent Losses	Real Losses	Non- Revenue Water
Garden City	315.9	87%	89%	2%	10%	23%
Port Wentworth	331.6	92%	95%	2%	6%	12%
Tybee Island	277.9	93%	98%	1%	6%	9%
Pooler	708.5	88%	98%	3%	9%	14%
Landings	462.6	90%	100%	2%	7%	10%
Hunter AAF	163.1	82%	18%	1%	17%	48%
Effingham County	894.1	99%	86%	0%	0%	14%
Rincon	261.4	67%	95%	2%	31%	36%
Larchmont Utilities	373.2	80%	98%	10%	10%	21%
Glen of Robin Hood	185.7	86%	98%	2%	12%	15%

Table 31. Summary of Key Results from 2015 Water Loss Audit Reports.

Water System	Water Supplied (MG)	Authorized Consumption	Authorized Consumption: Billed Metered	Apparent Losses	Real Losses	Non- Revenue Water
SAV-Wilmington	468.7	85%	99%	5%	10%	17%
SAV-Whitemarsh	214.8	88%	99%	5%	7%	14%
SAV-Sav Quarters	100.2	86%	98%	2%	12%	16%
SAV-Georgetown	665.2	78%	96%	4%	17%	25%
SAV-Main	6253.9	92%	96%	5%	3%	12%
Median	331.6	87%	98%	2%	10%	15%

Data Source: Municipalities and AWWA Water Loss Audit Reports (Georgia EPD Atlanta Office)

Other system characteristics from the water loss audit reports are presented in Table 32. A few points of interest are that Rincon has 1,380 miles of mains, which contributes to the large fraction of real losses. Tybee Island has the highest service connection density, and it also has the smallest fraction of non-revenue water and one of the smaller fractions of real and apparent losses. Infrastructure leakage index (ILI) is ratio of real losses divided by unavoidable real losses. The median ILI is 1.63, and the system with the highest ILI is Savannah-Georgetown, 4.30, followed by Hunter Army Airfield, 2.66. and Glen of Robin Hood, 2.58.

Water System	Length of Mains	# of Service Connections	Connection density	Average Operating	Score (out of	Infrastruc- ture Leakage
	(miles)	(active & inactive)	(conn/mile main)	Pressure (psi)	100)	Index (ILI)
Garden City	40.0	3,554	88.9	57.0	63	2.11
Port Wentworth	53.0	3,500	66.0	62.0	69	1.05
Tybee Island	33.9	3,585	105.8	62.0	71	1.00
Pooler	106.0	7,789	73.5	61.0	67	1.63
Landings	95.4	4,690	49.2	54.0	78	1.40
Hunter AAF	66.4	980	14.8	55.0	48	2.66
Effingham County	66.8	3,445	51.6	45.0	78	0.03
Rincon	1,380.0	4,759	3.4	65.0	67	0.42
Larchmont Utilities	59.0	5,112	86.6	49.0	47	1.89
Glen of Robin Hood	27.7	2,382	86.0	45.0	47	2.58
SAV-Wilmington	57.0	5,227	91.7	57.5	52	2.14
SAV-Whitemarsh	24.3	1,834	75.5	59.5	53	
SAV-Sav Quarters	23.0	1,044	45.4	53.6	53	
SAV-Georgetown	122.0	5,727	46.9	48.3	53	4.30
SAV-Main	678.0	57,259	84.5	64.2	53	0.68
Median	59.0	3,585	73.5	57.0	53	1.63

Table 32. Summary of System Characteristics from 2015 Water Loss Audit Report.

Data Source: Municipalities and AWWA Water Loss Audit Reports (Georgia EPD Atlanta Office)

## 2.11. Data Assessment Key Findings

A summary of the key findings from the Data Assessment are listed below.

- Without considering future growth or reallocation of usage from municipalities with multiple permits, 13 out of 44 permit holders utilizing the Floridan aquifer are currently exceeding their 2025 annual average permit limits (10 municipal, 2 industrial, and 1 other), so work is needed to explore alternate sources, conservation, and other management strategies to satisfy consumer demands and regulatory limits. An additional 6 municipal users are within 15% of the 2025 permit limits, so they also need to consider population growth as they plan for maintaining compliance.
- From 2004 to 2015, Chatham County's population increased by about 19% (46,138 people); however, total Floridan groundwater usage decreased by 10.94 MGD, from 58.56 to 47.62 MGD. Industrial users were responsible for about 60% (6.65 MGD) of the groundwater usage reduction.
- As a result of the water conservation programs and efforts, per capita water usage for domestic/commercial systems has shown tremendous reductions in Chatham County over the last decade. Per capita usage decreased from 135.5 GPCD in 2004 to 97.2 GPCD in 2015. Effingham County was comparable with per capita usage of 94.8 GPCD in 2015.
- The Savannah I&D surface water treatment plant is operating at 33.03 MGD, which is about half of its capacity (62.5 MGD), so there is a lot of capacity available.
- Several groundwater permit holders are currently purchasing treated surface water from City of Savannah to remain under their permit limits. The purchased volume and number of permittees purchasing will likely increase as populations continue to grow and permit limits are reduced.
- The higher-usage private systems (50,000 to 100,000 GPD) were less efficient with their water than those with groundwater withdrawal permits. Per capita usage for these 14 systems was 127.3 GPCD. They also accounted for 36% of the water for private systems in the Red Zone (0.936 MGD of 2.588 MGD).
- There was a strong seasonal trend for municipal users during the growing season. This was attributed to irrigation usage and inefficient irrigation practices. In total, 10% of municipal usage during the growing season (March to November) was above the baseline usage during the non-growing season months, and this accounts for an average of 3.04 MGD distributed across the year.
- Water reuse/reclamation is very underutilized in the Red Zone. The total average daily reuse for 2015 was 0.454 MGD, which is less than 1% of the total groundwater used in the Red Zone from the Floridan aquifer (52.674 MGD). In 2015, only four water pollution control plants (WPCPs) produced reuse water. One facility in Effingham County is a no discharge, land application/reuse system, and it produced 76% of its effluent as reuse through delivery to year-round, dedicated customers. The remaining 24% was discharged as spray irrigation.

- A few examples of conservation measures were presented from The Landings Association and Utilities, Inc., which included conservation-based tier-rate structure, metering upgrades, real-time notifications, and education programs.
- The City of Savannah operates a voucher system for water efficient toilets. Based on age of housing units in the Red Zone, and assuming at least half of the toilets match the housing age, replacement of these less efficient units could save 1.6 MGD.
- There are conservation strategies being implemented through Leadership in Energy and Environmental, or LEED, design, which includes efficient fixtures as well as utilizing cooling tower water reuse and capturing rainwater/runoff for irrigation.
- In general, water rates in the Red Zone are comparable to coastal Georgia and South Carolina. Water rates in Chatham County have increased by an average of 85% (\$20.78) in the last decade. Rates will continue to increase in the future to address capital projects, maintenance, and additional costs for treated surface water. Irrigation water rates were also reviewed for cities with separate rate structures. With separate metering, rates for irrigation only are cheaper than combined water/sewer rates.
- The 2006 Coastal Georgia Plan outlined several water efficiency and conservation efforts that later became the foundation for the special permit conditions required by EPD for groundwater permit holders. Adoption, program implementation, study results, or a progress update for many of the special permit conditions were due to EPD in 2008 or 2009. These practices included water conservation education; facility audits; leak detection and repair program; metering, meter calibration, and repair and replacement program; reuse feasibility study; outdoor watering requirements; conservation-oriented rate structure; water loss control program; and install purple pipe reuse lines in new developments. These practices as well as the previous permit limit reductions by EPD were a major driver for reductions in groundwater withdrawals from the Floridan aquifer.
- The results of the Water Loss Audit Reports were presented for municipal water systems. These include water losses and non-revenue water, which are important factors to address to avoid waste and maximize revenue.

# **3. POPULATION TRENDS AND PROJECTIONS**

This chapter describes historical population trends and future projections in the Red Zone. Both Chatham and Effingham counties have experienced tremendous growth in recent decades and this growth rate is projected to continue. Population projections are important to consider when planning for future water demand and water supply system distribution. The 2025 population projections are especially important for this Plan because Georgia EPD has established a reduction in groundwater withdrawal permit limits by 2025. In order to maintain compliance with the new 2025 permit limit reductions, municipal water suppliers must consider current usage as well as account for a growing population.

## 3.1. Historic Population Trends

Population trends since 1960 are presented in Table 33 for Chatham and Effingham counties. The net change in total population per year is presented instead of the rate of change because the population difference between the two counties is large. In 1960, Chatham County was 19 times more populated than Effingham County, and by 2015, this difference decreased to fivefold. The net change in population per year has been greater in Chatham County for each period presented; however, Effingham County had a larger growth rate. Effingham County has grown by 463% (46,962 people) since 1960, while Chatham grew by 52% (98,657 people). In Chatham County, the net growth since 2000 has exceeded the growth for the late 20<sup>th</sup> century. In Effingham County, the net change per year steadily increased from 1960 to 2010. Since 2010, the net change per year decreased, but Effingham County has continued to experience growth. During the 11-year period since the *2006 Chatham County Plan* was last updated, 2004-2015, the Chatham County's population grew by 46,138 (19%).

	Chatham County		Effingham County			
Year	Population	Net Change per Year	Population	Net Change per Year	Source	
1960	188,299		10,144		Decennial Census	
1970	187,767	-53	13,632	349	Decennial Census	
1980	202,226	1,446	18,327	470	Decennial Census	
1990	216,935	1,471	25,687	736	Decennial Census	
2000	232,048	1,511	37,535	1,185	Decennial Census	
2004	240,818	2,193	43,674	1,535	County Intercensal Datasets	
2010	265,128	4,052	52,250	1,429	Decennial Census	
2015	286,956	4,366	57,106	971	American Community Survey 1-Year Estimates, U.S. Census Bureau	

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Table 33.	Historical	Population	Trends.

<sup>1</sup> 2006 Chatham County Plan listed 250,192 based on data from MPC Comprehensive Planning Dept. Data Source: U.S. Census Bureau

## 3.2. Population Projections

Chatham and Effingham counties have experienced tremendous growth in recent decades, so it is important to consider future growth as planning efforts are conducted and coordinated for this water supply management plan. The Georgia Governor's Office of Planning and Budget (OPB) provides population projections at the state and county levels through 2050, and the most recent projections were completed in 2013. These projected populations are presented in Table 34, and the historical and projected populations are combined from 1960-2050 in Figure 14.

Year	Chatham County		Effingham County		Source
	Population	# Change	Population # Change		
		per Year		per Year	
2015	286,956		57,106		Annual Estimate, Census
2020	304,482	3,505	62,989	1,177	GA Governor's OPB, 2013
2025	322,197	3,543	69,511	1,304	GA Governor's OPB, 2013
2030	339,092	3,379	76,320	1,362	GA Governor's OPB, 2013
2040	371,973	3,288	90,918	1,460	GA Governor's OPB, 2013
2050	405,573	3,360	108,029	1,711	GA Governor's OPB, 2013

Table 34.	Projected	<b>Population</b>	Trends	thru 2050.
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Data Source: Georgia Governor's Office of Planning and Budget



Figure 14. Historical and Future Population Trends (1960-2050).

One important short-term goal for groundwater withdrawal permit holders is to satisfy Georgia EPD's reduced 2025 permit limits. When planning for the reduced permit limits in 2025, it is important to consider the future growth expected over this period. From 2015-2025, the population in Chatham County is projected to grow by 35,241 (12%) and in Effingham County's by 12,405

(22%). The smallest available scale of the population projections is at a county level, so the actual growth will vary by municipality. It is also important to note that the growth for Effingham County is for the entire county, but only about half of the county (currently the more populated portion of the county) is located in the Red Zone.

As population projections are available to 2050, this year was identified by the Task Force as a long-term goal. From 2015-2050, the population in Chatham County is projected to grow by 118,617 (41%) and in Effingham County's by 50,923 (89%). Based on this projected growth and saltwater intrusion, the Task Force also decided that another long-term goal is to determine what to do when the Floridan aquifer is no longer viable as a drinking water source.

The population projections are simply a prediction, so the actual 2025 and 2050 populations may be very different. However, the most recent projections are predicting considerable growth that would mirror the growth experienced in the early 2000s (Figure 14).

# 3.3. Population by Municipality / Population Served

Current populations for jurisdictions in Chatham County and the number of people served as part of each jurisdiction's SDWA permit in 2004 and 2015 are presented in Table 35. These results show that Savannah, Garden City, Pooler, Thunderbolt, and Tybee Island provide water service that is available to nearly all their citizens. There are still some areas and residents without municipal water service in Bloomingdale and Port Wentworth. The Town of Vernonburg is serviced fully by individual wells. Tybee Island's SDWA population served is nearly 5,000 larger than the Census population due to temporary residents and visitors who are not counted in the Census. The SDWA population served by the City of Savannah is almost 60,000 larger than the Census population because Savannah provides service for several large community systems outside of its city limits. The groundwater withdrawal permit for City of Savannah (025-0018), includes the following SDWA permits (population served in parentheses): Savannah-Main (168,958), Wilmington Island (13,652), Georgetown/Gateway (13,504), Whitemarsh Island (4,215), Savannah Quarters (3,350), and Dutch Island (1,207).

Jurisdiction	tion U.S. Census		SDWA Permit		
	2015	2004	2015		
Chatham County	286,956	245,001 <sup>1</sup>	319,401 <sup>1</sup>		
Bloomingdale	2,764	1,714	1,690		
Garden City	8,999	7,753	8,141		
Pooler	23,133	10,217	21,187		
Port Wentworth	7,637	2,480	5,500		
Savannah	145,674	169,610	205,091		
Thunderbolt	2,622	2,624	2,668		
Tybee Island	3,102	4,093	8,047		
Vernonburg	131	Serviced b	Serviced by individual wells		
Other <sup>2</sup>	92,894	46,510	67,077		

Table 35.	Census Population d	and Population	Served for	Jurisdictions	in Chatham	County.
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<sup>1</sup> Total listed is population served for entire county, excluding individual private wells.

<sup>2</sup> Includes remaining groundwater withdrawal permittees and private systems with a SDWA permit.

#### 3.4. Summary

From 2015-2025, the countywide populations are projected to grow by 12% in Chatham County and 22% in Effingham County. Coinciding with this period, Georgia EPD has reduced the groundwater withdrawal permit limits by about 22%. Since a larger population will increase demand, municipal water suppliers, especially those in areas with rapid growth, will need to take additional steps to reduce groundwater usage. Some jurisdictions may need to increase dependency on treated surface water, which comes at a higher cost, to maintain compliance. Addressing year 2025 reduced groundwater permit limits in light of the projected population increases represents the immediate, short-term goal, for permittees within the Red Zone. However, long-term planning for year 2050 projects that populations will grow by 41% in Chatham County and 89% in Effingham County from 2015-2050. In order to sustain this growth rate, regional water planning must consider alternative and redundant sources, especially as saltwater intrusion continues to threaten the Floridan aquifer.

# 4. WATER SUPPLY MANAGEMENT STRATEGIES, RECOMMENDATIONS, & RESOURCES

This chapter presents water supply management strategies that can be implemented to reduce groundwater usage. Section 4.1, "Background," outlines the process used to develop this list. A list of 43 specific water supply management strategies, grouped into 10 categories, is presented in Section 4.2, "Management Strategies." Many of these strategies apply to municipal users but not every strategy is applicable to all municipalities, and some strategies are applicable to industrial users and private systems. Section 4.3, "Considerations for Regulatory Government Agencies," presents a list of strategies over which permit holders have no direct control; therefore, they cannot officially adopt and implement these strategies. The remaining strategies either did not fully meet the definition of a management strategy or did not have enough interest from the Task Force, and are therefore presented as "Resources" in Section 4.4. The final section, Section 4.5, "Estimating Management Strategy Impacts," summarizes the potential savings of specific management strategies or groups of management strategies.

# 4.1. Background

The 2006 Chatham County Plan was used as the baseline for developing the management strategy list. The Task Force reviewed this list of 28 strategies at the project kickoff meeting. During the 2<sup>nd</sup> Task Force Meeting, Task Force members voted whether each strategy should be kept, removed, or edited. Task Force members not in attendance participated using an online survey. The existing strategy list was modified according to these results and comments. The results and comments are presented in Appendix A.

Some strategies from the 2006 Chatham County Plan addressed EPD regulatory functions. Since the permit holders in the Red Zone have no direct control over these matters, these strategies were separated to avoid confusion. These items are in a new subsection, Section 4.3, "Considerations for Regulatory Government Agencies."

Based on the results from the Data Assessment, a set of new strategies was also created. The new strategies were presented in a survey both after the 2<sup>nd</sup> Task Force meeting and online. Task Force members then prioritized these strategies and also identified any strategies they opposed. In addition, several ideas were discussed that did not meet the definition of a management strategy, and these ideas are listed in Section 4.4, "Resources."

# 4.2. Management Strategies

As a note, not all management strategies apply to every groundwater withdrawal permit holders.

#### Plan Adoption

• All participating stakeholders, in a cooperative effort to conserve a regional public source, shall consider the implementation of these strategies, where appropriate and applicable, and adopt a resolution of support.

#### Data Management & Evaluation

- Identify funding source and responsible entity/organization to continue to update regional Red Zone water use data annually and the Water Plan on a five-year rotating basis.
- Coordinate data collection, evaluation, and future updates with the Coastal Georgia Regional Water Council to share resources and avoid duplication of efforts.

#### Planning / Master Planning

- The City of Savannah is updating the Source Water Protection Plan (SWPP) for the source watershed of the Savannah I&D Plant (Abercorn Creek). All applicable entities shall consider the recommendations of the SWPP.
- Coordinate efforts of Red Zone Plan with Coastal Regional Water Council, and implement strategies of the 2017 Coastal Georgia Regional Water Plan.
- Based on the results of the Sound Science Initiative, future strategies to use the Miocene aquifer shall be determined and implemented.
- Plan for resiliency as it relates to water and wastewater infrastructure and sea level rise.
- Develop a West Chatham Surface Water Strategy with City of Savannah and other local permittees to plan for long-term needs for surface water delivery and efficient connections with the City of Savannah's I&D Plant.
- Consider best planning practices to reduce the need for expanding water infrastructure (e.g., compact land development which reduces the need for irrigation).
- Link water supply master planning to future land use planning and development approval process.
- Consider a program where all permittees agree to pay a small fee (e.g., a fraction of a cent per gallon) for withdrawing groundwater from the Floridan aquifer in order to raise money to support water management strategies identified as part of a water supply masterplan.

#### Irrigation Conservation

- Expand education and outreach on WaterWise landscaping and irrigation conservation and encourage/incentivize users to switch to non-Floridan sources. One opportunity is for Cooperative Extension to adapt and promote WaterSmart or other landscape water conservation programs within the Red Zone area.
- All county and municipal facilities utilizing the Floridan aquifer for irrigation shall instead utilize an alternative irrigation source such as treated wastewater effluent, stormwater, or water from the surficial aquifer. A report on the evaluation of the alternative sources and the utilization or unavailability of the alternative sources for each county and municipal park and square shall be prepared and submitted to the water plan update entity.
- All municipal governments shall use WaterWise principles (water efficient landscaping) when maintaining or upgrading their squares, parks, landscaped areas, and recreation facilities.
- Adopt local ordinance to require rain sensors for new and existing irrigation systems.
- Adopt local ordinance or add to building code to prohibit use of groundwater from the Floridan aquifer as the *primary* irrigation source for *new* residential and commercial development.
- Assess water use data at the local level to identify and target large irrigation users for further education and outreach on water conservation methods.
- Require separate irrigation meters for those using municipal groundwater for irrigation, and develop rate structure to discourage usage (i.e., irrigation rate should exceed water plus sewer rate) and encourage finding an alternate source.

Note: There are several strategies listed under "Water Reclamation" and "Stormwater Capture and Reuse" that promote alternate sources, which would reduce the demand from irrigation on the Floridan aquifer.

#### Water Reclamation

- Identify who treats to reuse standards & map potential customers (e.g., industrial, commercial, and institutional users) to expand customer base with existing infrastructure (or minimal new infrastructure).
- Encourage water reclamation by linking reuse water producers and potential consumers.
- Encourage on-site water reclamation/reuse for large institutional facilities (hospitals, universities, board of education, etc.) to address water loss through cooling tower/boiler.
- Review local plumbing code regulations to ensure that there is nothing preventing the use of graywater. Consider City of Savannah's graywater ordinance as a template if State Plumbing Code is not referenced.
- Address water reclamation in the Service Delivery Strategy so that facilities producing reuse water may be able to serve potential customers outside of their municipal limits.
- Maximize the use of reclaimed or recycled water to supply internal operational needs as well as outdoor watering requirements

#### Water Rate Structures

- Implement a more rigorous conservation-based rate structure.
- Water rate should include stable and adequate funding for maintenance of distribution system and capital upgrades. Review rate structure to balance between base rate and usage rates so that the impact of water usage variability is reduced and the disincentive to promote water conservation at the municipal level is eliminated.
- Seek funding/grant to hire an economist (e.g., UNC Environmental Finance Center) to review rate structures in Chatham County and make recommendations, based on local conditions, for rate structures that will encourage water conservation and also provide funding to successfully operate the water system.
- Consider Development Impact Fees to fund capital upgrades needed to support new development.
- Local municipalities to continue discussions about the bulk/wholesale rate for surface water for domestic water suppliers.

#### Water Conservation (General/Incentives)

- A regional public education and awareness program for water conservation should be implemented. All public and private water suppliers in the Red Zone should either participate by providing funds for the Regional Water Conservation Program or develop their own water conservation education and awareness program as required by the special permit conditions associated with their groundwater withdrawal permits.
- Municipal and community water suppliers should consider implementing the following strategies to promote water conservation and efficiency:
  - Create incentives for industrial, commercial, and institutional water users to reduce groundwater usage.
  - Implement a low-flow toilet retrofit program based on the actual year the home was built.
  - In conjunction with meter replacement, install real-time monitoring hardware and software to allow for customer notifications regarding water use. Deploy a mobile app for real-time monitoring to include email and web-based notifications.
  - Offer water use audits for large customers (commercial, multi-family, HOAs, irrigation systems), or supplement a regional entity (e.g., UGA Cooperative Extension) to conduct audits at the municipal level.
- Update and implement the Water Conservation Plans that were required by EPD in permit or special permit conditions for both Industrial and Municipal permittees.

#### Stormwater Capture & Reuse

- Promote practices that allow for the reuse of stormwater, i.e. cisterns, stormwater retention ponds, rain barrels.
- Consider working with the warehouses, logistics community, and other large retail rooftops to determine the potential for stormwater capture and reuse from rooftops, especially for irrigation uses.
- Adopt a local ordinance to require parking lot landscape islands in new development and redevelopment to capture stormwater runoff and eliminate the need for irrigation. Variances could be included to allow parking lot landscape islands that do not include an irrigation system or if they utilize reclaimed water or stormwater as their *primary* source
- Review local codes/ordinances to determine if any codes/ordinances block or restrict stormwater reuse (a checklist to be developed to review codes/ordinances).
- Determine feasibility of municipal or county-wide cistern and/or rain barrel program, and consider possible incentive or stormwater fee credit (where applicable).

#### Water Quality Protection

• Local governments with identified groundwater recharge areas in their jurisdictions shall develop local regulations protecting the groundwater recharge areas according to EPD's Environmental Planning Criteria. Local governments shall implement the Groundwater

Recharge Area requirements in their jurisdiction. This should be incorporated into zoning and connect with stormwater management and BMPs for water quality protection.

• All participating stakeholders in the Red Zone will assess risk to the quality of surface water supplies and will coordinate watershed protection and source water protection programs within the Savannah River Watershed. Local governments in the Red Zone shall work cooperatively with other counties; the Savannah-Upper Ogeechee and Coastal Georgia Regional Water Councils; and the State to develop plans to protect this water supply watershed.

#### Legislative Action

• Consider the potential for EPD to establish a program that will compensate permittees to voluntarily reduce their permitted groundwater usage within and near the cone of depression and switch to surface water. This strategy can only be created through a Legislative Act.

### 4.3. Considerations for Regulatory Government Agencies

Examples of regulatory agencies considered include: Georgia EPD, U.S. Army Corps, Georgia Department of Public Health (DPH), USGS, and outside agencies.

#### Governance and Regulation (EPD)

- EPD and State Legislature: EPD should remove any disincentive for reductions in groundwater use because of concern by permittees that currently permitted limits will be reduced if not used.
- EPD and State Legislature: Develop incentives that encourage large groundwater users to conserve water or switch to surface water to the extent that surface water resources are not adversely impacted.
- EPD: Do not issue new Floridan aquifer permits for golf courses.
- EPD: Continue to enforce special permit conditions required of groundwater permit holders.
- EPD: Either target high-usage community systems (systems that serve more than 15 connections or 25 people but withdrawal less than 100,000 GPD) for water conservation requirements, *or* reduce the threshold for a groundwater withdrawal permit in the Red Zone to 50,000 GPD.
- EPD: Set targets for municipal systems to improve percentages of losses and non-revenue water through water loss audit reporting.
- EPD, DPH, UGA (via DPH contract): Request well and septic data from permit holders and municipalities and continue to identify water wells and septic tanks through GPS and GIS inventories.
- EPD: Enforce requirement for all municipal and industrial permittees required to update Water Conservation Plans every five years.

#### Monitoring

- EPD/USGS: Continue to collect and analyze data trends related to the chlorides, potentiometric head, and average water level in wells in the Floridan aquifer.
- EPD/USGS/SCDHEC: Update the Sound Science Initiative modeling forecast.

### 4.4. Resources

This section provides information and links to resources, examples, and case studies for water conservation and efficiency topics and programs used across the country.

- Alliance for Water Efficiency An online Resource Library is available at the website below that contains case studies and guidance related to all aspects of water efficiency and conservation.
  - o <u>http://www.allianceforwaterefficiency.org/resource-library/default.aspx</u>
- San Antonio Water System (SAWS) The website below contains information and details about the following SAWS programs and rebates to encourage conservation: (1) Residential Outdoor Programs and Rebates, (2) Residential Indoor Programs and Rebates, (3) Commercial Programs and Rebates, and (4) Case Studies.
  - o <u>http://www.saws.org/conservation/</u>
- Southwest Florida Water Management District The website below contains information about programs, rebates, and case studies for homeowners, businesses, and utilities. A few example programs include: (1) 50/50 cost-share program for conservation projects, (2) water conservation for hotel and motel program (Water CHAMP<sup>SM</sup>), and (3) certification program for builders, developers and homeowners (Florida Water Star<sup>SM</sup>). There are a lot of resources and information available in the 2<sup>nd</sup> link for water reclamation. This District has been very successful with utilizing reclaimed water, as they reuse more than 44% of their wastewater.
  - o http://www.swfwmd.state.fl.us/conservation/
  - o <a href="http://www.swfwmd.state.fl.us/conservation/reclaimed/">http://www.swfwmd.state.fl.us/conservation/reclaimed/</a>
- "Turf Swap" is a turf replacement program offered in Alachua County, FL, where irrigation systems are removed and replaced with xeriscaping. This opportunity may provide an opportunity to seek funding through grants. Cooperative Extension could be a resource to seek funding and offer classes.
  - http://www.alachuacounty.us/Depts/epd/WaterResources/myyardourwater/TurfS WAP/Pages/default.aspx
- "Adaptation Strategies Guide for Water Utilities," report by U.S. EPA. This report provides drinking water and wastewater utilities with (1) a basic understanding of how climate change can impact utility operations and missions, and (2) examples of different actions utilities can take (i.e., adaptation options) to prepare for these impacts.
  - <u>https://www.epa.gov/sites/production/files/2015-</u>
    <u>04/documents/updated\_adaptation\_strategies\_guide\_for\_water\_utilities.pdf</u>

- "Climate Change and Water Resources: A Primer for Municipal Water Providers," Guidebook from Water Research Foundation that summarizes the best available scientific evidence on climate change. It focuses on what is known about the implications of climate change for the water cycle and the availability and quality of water resources and provides guidance on planning and adaptation strategies.
  - o <u>http://www.waterrf.org/Pages/Projects.aspx?PID=2973</u>
- "Financing Sustainable Water" This is an initiative of the Alliance for Water Efficiency. It was created to provide practical information to guide utilities from development through implementation of rate structures that balance revenue management, resource efficiency and fiscal sustainability. Specific resources and tools include: (1) Handbook ("Building Better Rates for an Uncertain World"), and (2) Sales Forecasting Rates Model.
  - o http://www.financingsustainablewater.org
- Several WaterSmart and general landscape water conservation programs have been adapted and used by UGA Cooperative Extension. Local county agents in the Red Zone can adapt these programs and begin to offer them locally. A couple publications are referenced below.
  - <u>https://secure.caes.uga.edu/extension/publications/files/pdf/C%20930\_3.PDF</u>
    "Developing a WaterSmart Landscape"
  - <u>http://caes2.caes.uga.edu/commodities/turfgrass/georgiaturf/Water/Articles/B132</u>
    <u>9.pdf</u> "Best Management Practices for Landscape Water Conservation"
- On-site water reclamation systems at district-scale (e.g., universities/educational facilities, hospitals/health care facilities, industrial parks). The example provided in the link below is for an on-site water recycling system on the Emory University campus which utilizes eco-engineering processes to clean wastewater for non-potable uses (e.g., process water for steam and chiller plants and toilet flushing in residence halls). It describes the project being funded entirely through an innovative water purchase agreement between Emory University and the water reclamation technology provider.
  - o <a href="http://www.campserv.emory.edu/fm/energy\_utilities/water-hub/">http://www.campserv.emory.edu/fm/energy\_utilities/water-hub/</a>
- Real-time, forecast-based stormwater storage systems to store rainwater for irrigation and release it before major rain events is an example of a new, active stormwater management technique used for irrigation conservation and flood control.
- Extraction of water from humid ambient air (e.g., atmospheric water generator, air well, aerial well, fog collectors) and from dry air (e.g., metal-organic frameworks) are other examples of technologies used to supply water. Some of these systems are passive and others require varying levels of energy, but at the current time, many of these are small-scale and utilized primarily in developing countries.

### 4.5. Estimating Management Strategy Impacts

The strategies listed above were reviewed to estimate the potential groundwater withdrawal savings. The impact and potential savings for some strategies were easier to estimate than others, and in several cases, the savings was easier to present based on a group of strategies instead of an individual strategy. When the impact and potential savings for a strategy or group of strategies was not quantifiable, they were rated as high, medium, or low potential savings and whether the impact could be realized short-term, intermediate-term, or long-term. The potential savings is presented below from largest impact to smallest, with non-quantified strategies presented last.

- Irrigation Conservation
  - <u>Strategies</u>: Entire group, 7 strategies identified
    - <u>Action Needed</u>: All irrigation users switch to a non-Floridan aquifer source or remove irrigation completely,
    - <u>Potential Savings</u>: 3.0 MGD
    - <u>Notes</u>: Savings is on an average daily basis, but it would be distributed with greater savings in the summer months and less savings in the winter months.
- Water Conservation (General/Incentives)
  - <u>Strategy</u>: "Implement a low-flow toilet retrofit program"
    - <u>Action Needed</u>: Based on housing age, replace 50% of toilets with low-flow retrofits
    - <u>Potential Savings</u>: 1.6 MGD (assuming 50% replacement based on age of housing unit)
    - <u>Notes</u>: Based on total number of units and age, the estimated savings is 59% from City of Savannah (0.94 MGD), 24% Unincorporated Chatham County (0.39 MGD), 4.5% Unincorporated Effingham County (0.07 MGD), 3.8% Garden City (0.06 MGD), 2.7% Pooler (0.04 MGD), and the rest were 0.9-1.8% (0.015-0.023 MGD).
  - <u>Strategies</u>: Remaining 5 strategies.
    - <u>Potential Savings</u>: Medium, Short/Intermediate-Term
    - <u>Notes</u>: If general conservation through education, large customer audits, conservation plans can provide a 10% reduction in per capita usage, Municipal users could save 2.9 MGD.
- Governance and Regulation (EPD)
  - <u>Strategy</u>: Either target high-usage community systems for water conservation incentives and requirements, or reduce the threshold for a groundwater withdrawal permit in the Red Zone to 50,000 GPD
    - <u>Action Needed</u>: implement water conservation requirements such that these systems reduce usage to a comparable per capita rate as the average municipal user (97.2 GPCD)
    - <u>Potential Savings</u>: 0.22 MGD
  - <u>Strategy</u>: Set targets for municipal systems to improve percentages of losses and non-revenue water through water loss audit reporting
    - <u>Potential Savings</u>: 0.20 MGD (assuming a 10% reduction in Real Losses)

 <u>Notes</u>: For the 15 public water systems required to submit water loss audit reports to Georgia EPD, the total Real Losses is 1.97 MGD, and the total Non-Revenue Water is 4.75 MGD. Total Water Supplied is 31.99 MGD for these public water systems.

• Water Reclamation

- <u>Strategies</u>: Entire group, 6 strategies identified
  - <u>Action Needed</u>: Find dedicated customers and search to make connections
  - <u>Potential Savings</u>: High, Short-Term
  - <u>Notes</u>: The Data Assessment showed that this was a very underutilized alternative water source. If the 3 reuse WPCPs with discharge could utilize up to 10% of effluent, this would provide additional savings of 2.2 MGD. If the right customers and connections are found and made, this value will increase greatly.

• Water Rate Structures

- <u>Strategies</u>: Entire group, 5 strategies identified
  - <u>Potential Savings</u>: Medium, Short-Term
  - <u>Notes</u>: One of the strategies that could have the largest impact is related to purchasing surface water from City of Savannah
- Stormwater Capture and Reuse
  - <u>Strategies</u>: Entire group, 5 strategies identified
    - <u>Potential Savings</u>: Medium, Short-Term
    - <u>Notes</u>: The strategy with the largest potential impact is tied to irrigation conservation by switching to an alternate source
- Planning / Master Planning
  - <u>Strategies</u>: Entire group, 8 strategies identified
    - <u>Potential Savings</u>: Medium, Long-Term
    - <u>Notes</u>: Many of these are longer-term strategies

Of the strategies quantified or estimated, the potential savings could be over 10 MGD, which is about a 20% reduction from the 2015 usage from the Floridan aquifer by Red Zone Users (51.577 MGD). This did not even account for the conservation by industrial users. Assuming conservation efforts by industrial users matches that experienced over the previous decade, which was about a 25% reduction, the next decade could see another 4 to 5 MGD reduction in groundwater usage from the Floridan aquifer by industrial users. The projected population growth should increase water demand by about 4 MGD. This would offset the additional savings from industrial users, so the Red Zone could experience a net 10 MGD reduction in groundwater pumping from the Floridan aquifer by 2025 through implementation of the strategies outlined in this plan.

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## **Appendix A – Materials for Developing Management Strategies**

Group	Strategy	Keep	Remove	Split Vote	No Opinion	Commented	Action
Ad	1	18			1	1	Update/Merge
Ad	2	19				2	Update/Merge
EPD	4	16			3	4	Remove
EPD	18	12	1		6	2	EPD Consideration
EPD	21	15	1		3	4	Remove
EPD	23	16		1	2	5	Remove
EPD	24	15	2	1	1	4	Remove
EPD	26	7	4		8	2	Remove
Ind	15	8	6	1	4	11	EPD Consideration
Ind	17	12	4		3	8	EPD Consideration
Plan	16	14	1	1	3	6	Completed/Update
Plan	25	16	2		1	6	Remove
Plan	27	13	2		4	7	Completed/Update
Plan	28	16	1		2	6	Update
Ed	12	18	1			5	Update/Merge
Ed	13	18			1	3	Update
Golf	9	16		1	2	3	EPD Consideration
Golf/Mun	7	14				2	Update/Merge
Mun	3	16			3	3	Keep
Mun	5	10	2		7	5	Update
Mun	6	17	2*		1	0	Remove
Mun	8	17	2			3	Update
Mun	10	15	2		2	4	Update
Mun	11	15	2		2	3	Update/Merge
Mun	14	13	1		5	4	Completed/Update
Mun	19	16	1		2	3	Update & EPD/DPH Consideration
Mun	20	19				3	Update
Mun	22	14	4		1	6	Remove

Survey Results for 2006 Management Strategies

\* = additional write-in vote

In general, most of the voting indicated that people were in favor of keeping these strategies. The comments provided were used to update these strategies, as well as shift some from being a specific strategy in the Red Zone Plan to an item for EPD to consider or continue to enforce.

#### Notes/Comments/Recommendations from 2006 Management Strategy Questionnaire

The comments from the questionnaire at the Task Force Meeting are summarized in the sub-bullet, and a recommendation is provided below each (or group of two) strategy(ies).

#### Administrative

- Ad#1: Annual Reporting / Annual Meeting.
  - $\circ$  One comment was for there to be more frequent data that is open/accessible.
- Ad#2: Update Plan at 5-year intervals.
  - Comments included: (1) sync the update with comprehensive planning/SDS, and
    (2) update with EPD plan goals.

<u>Recommendation Ad#1 & Ad#2</u>: **UPDATE/MERGE**. Everyone is in favor of keeping both these strategies on annual reporting/meeting and updating the plan every five years. For the Chatham County Plan, these activities ended in 2006, which coincided with the timing of EPD releasing the "Coastal Georgia Water and Wastewater Permitting Plan for Managing Saltwater Intrusion." These two strategies were merged and the focus was shifted to identifying a funding source and designated entity/organization to complete these regular updates because the current update is being funded as a one-time only update through a Coastal Incentive Grant through DNR-CRD and NOAA.

#### **EPD/Regulatory**

- **EPD#4**: Regional long-term water supply plan.
  - This has been completed. Some comments for updating this strategy were: (1) coordinate with the Coastal Regional Water Council, and (2) update with EPD Plan goals.

Recommendation: **REMOVE**. This strategy has been completed with the development of the "2006 Coastal Georgia Water and Wastewater Permitting Plan for Managing Salt Water Intrusion." An initial Regional Water Plan was created for Coastal Georgia in 2011, and an updated plan was released in 2017.

- **EPD#18**: Permittee fears permit will be reduced if not used; encourage State Legislature & EPD to develop incentives to encourage conservation and switch to surface water.
  - The comments for this strategy were: (1) there needs to be more alternative sources than just surface water, (2) successful permit reductions have positioned industries well to consider other alternatives to meet future reductions, and (3) this would be a good time for legislative incentives than can have major impact.

Recommendation: Shift to Consideration by EPD. This strategy has more of a governance/ regulatory characteristic since it involves making suggestions to EPD and State Legislature.

- **EPD#21**: Protect GW recharge areas outside of County (EPD).
  - The comments for this strategy included: (1) is this feasible for EPD, (2) this is other host jurisdiction's responsibility through land use, (3) include municipalities

and opportunities of Savannah River Clean Water Fund, and (4) investigate inclusion of freshwater injection.

Recommendation: **REMOVE.** This is a regulatory item that EPD already has in place.

- **EPD#23**: Permittees to follow EPD reporting requirements under SDWA and Groundwater Use rules.
  - There was only one vote to exclude this strategy. However, it is already a permit requirement, so it seems redundant. A couple suggestions for updates include adding data on groundwater depth and water quality parameters.

Recommendation: **REMOVE**. This is a regulatory item that EPD already has in place.

- **EPD#24**: EPD to enforce metering requirements.
  - There were three votes to remove this strategy. It is also already a requirement, so it seems redundant. A couple comments were: (1) add agricultural users, and (2) EPD is missing an opportunity for reduction measures for systems with more than 10 connections and serving more than 25 people (EPD Permit, <100,000 gpd).</li>
    Recommendation: REMOVE. This is a regulatory item that EPD already has in place.

Recommendation: **REMOVE**. This is a regulatory tiem that EPD already has

- **EPD#26**: Fair allocations of water banks in County.
  - There were four votes to remove this strategy. Comments included: (1) there is no water available, and (2) revisit this strategy and remind of the process. *Recommendation: REMOVE. This strategy is complete and no longer in use.*

### Industry:

- Ind#15: Implement conservation programs to reduce groundwater usage by 5% from 2000-2005.
  - There were seven votes to remove this strategy and numerous comments. Frequent comments were that this reduction has been achieved, as evidenced in the Data Assessment, the 5% reduction seemed arbitrary and does not give credit for reductions already achieved, and the reductions should match the EPD permit reduction requirements only. Other comments included: (1) require for new users, (2) update to reflect new permit limits and capture site-specific conservation plans, (3) update to obtain realistic and practical reduction strategies, and (4) provide clarification on quantifying targets based on revised targets in the permits.

Recommendation: Shift to Consideration by EPD. This strategy has been completed and future reduced usage is addressed with new regulatory limits. EPD has set reduced groundwater usage permit limits for all industrial users by 2025. As a note, the Data Assessment shows all industrial users have decreased groundwater usage since 2004.

- Ind#17: Reduce GW usage through conservation, then by exchanging for surface or non-Floridan sources; issue reports every 3 years on progress of efforts.
  - There were four votes to remove this strategy and numerous comments. As with Ind#15, many felt that this has been completed and should be permit driven. One

commented that required updates through EPD are in place and water conservation plans are being updated. Other comments included: (1) require for new users, (2) provide clarification on quantifying targets based on revised targets in the permits, (3) combine #15/#17, (4) set a limit/threshold for exchange, and (5) who would enforce this.

Recommendation: Shift to Consideration by EPD. This strategy is covered under the new permit requirements by EPD, which include water conservation plans, reuse feasibility studies, and reduced groundwater usage permit limits.

#### Planning:

- **Plan#16**: Expand Savannah I&D plant as necessary, & develop Source Water Assessment Plan (SWAP).
  - There were two votes to remove this strategy, and several comments on how it could be updated. One industrial user commented that they do not have a close connection available and would like the pipeline expanded to increase connection options; otherwise, groundwater is their only source. Other comments included (1) expand Effingham County usage, and (2) expand only if long-term regional management plan is in place for this resource.

Recommendation: **COMPLETED/UPDATE.** The SWAP was completed in 2003, but the City of Savannah recently posted an RFP to update their Source Water Protection Plan (SWPP). The continuation of this strategy is to express support for development of the SWPP and implementation of its recommendations. A new strategy on planning for redundancy and developing a surface water masterplan could help to address future expansions, but as of 2015, the I&D Plant is operating at about 53% of capacity, so the need for future expansion is not urgent.

- **Plan#25**: Develop drought contingency plan (municipalities).
  - There were two votes to remove this strategy, and three comments indicated that this has been completed. Two individuals commented that the plans should be discussed with the end users and get their input.

Recommendation: **REMOVE**. This strategy has been completed.

- **Plan#27**: Local gov'ts to work with State to develop long-term regional water supply plan.
  - There were two votes to remove this strategy, and several comments on how it could be updated. The specific activity mentioned has been completed, but there were suggestions to do the following: (1) coordinate efforts with the Coastal Regional Water Council, (2) update this strategy to tie more directly into implementation of the Regional Water Plan, (3) develop a plan to cease the use of groundwater and switch to 100% surface water on a planning horizon that is greater than 50 years. Another comment was to include industrial users and all vested partners/users in process.

Recommendation: **COMPLETED/UPDATE.** This strategy has been completed with the development of the 2011 Coastal Georgia Regional Water Plan and planned update for 2017. However, based on these recommendations, a new strategy was developed to tie more directly into implementation of the Regional Water Plan.

- **Plan#28**: Local gov'ts to work with other counties and State to develop plans to protect upstream water supplies (Savannah & Ogeechee Rivers).
  - There was only one vote to remove this strategy but several comments on how to update it. The suggestions were to coordinate with multiple Regional Water Councils as well as include industrial users in the planning efforts. It could also be updated to include opportunities offered through Savannah River Clean Water Fund.

Recommendation: **UPDATE.** The updates to this strategy include the recommendations to coordinate planning efforts with other multiple Regional Water Councils and include opportunities offered through the Savannah River Clean Water Fund.

#### **Education/Outreach**:

- Mun#11: Develop incentives to encourage xeriscaping.
  - There were two votes to remove this strategy. Comments included: (1) how to implement the incentives (state water regulations), and (2) develop incentives for utilizing stormwater collection systems.
- **Ed#12**: Public information programs to encourage xeriscaping and residential irrigation conservation.
  - There was only one vote to remove this strategy. Other comments were to identify if these topics are still a priority and add to the list. Another comment was to allow stormwater reuse in new developments.

Recommendation Mun#11 & Ed#12: UPDATE/MERGE. Both of these fit with the suggested new management strategy, "Expand education/outreach on xeriscaping/irrigation and encourage/incentivize switch to non-Floridan sources," which is under the topic, "Irrigation Conservation."

- **Ed#13**: Public education and awareness program for water conservation (self, MPC, or funds to MPC).
  - While there was a unanimous selection to keep this strategy, there were a couple comments about how this should be updated. Suggestions included: redefine the funding agency and implementation strategy to be a regional approach, consider if City of Savannah would be better suited to lead/administer a centralized outreach/education program since they currently provide water for most of the Red Zone, and consider expanding the programs by municipalities.

Recommendation: **UPDATE.** The water conservation program should be updated to be throughout the Red Zone and be administered with a regional approach. The entity to run this program should be evaluated to consider either the MPC or City of Savannah as

options. While the MPC ran the countywide program in the past, the City of Savannah provides water for about two-thirds of the Red Zone's population, so they might be in a good position to lead/administer the effort.

#### **Golf Courses**:

- **Golf#9**: No new Floridan aquifer permits for golf courses (users: aggressive conservation, search for alt. sources, & report every 3 years).
  - While only one individual voted to remove this strategy, there were a couple comments about this being complete (except for The Landings). Another comment was to review of sub criteria well takes, i.e., 4" wells using less than 100,000 GPD.

Recommendation: Shift to Consideration by EPD. The only golf course still utilizing the Floridan aquifer is The Landings, Inc., but they have implemented aggressive conservation efforts as well as use of alternative sources (Floridan usage is only 12% of annual irrigation total). EPD continues to reduce their permit limits and will control future reductions. Because of this, the recommendation is for EPD to continue these efforts as well as not issuing any new Floridan aquifer permits to golf courses.

#### Municipal:

- **Golf/Mun#7**: Golf courses and local gov'ts: report on availability of utilizing treated WW for irrigation (every 3 yrs).
  - This strategy has unanimous support. The only comments were to expand to others besides golf courses, and that who are they reporting to.

Recommendation: **UPDATE/MERGE**. A new strategy was developed to expand this strategy beyond local governments and golf courses because the Data Assessment shows limited utilization of this resource.

- Mun#3: Adopt Plan & implement strategies.
  - This strategy had unanimous support. The comments included: (1) make this a permit requirement with EPD, and (2) if it needs to be said, there are bigger problems.

Recommendation: **KEEP**.

- **Mun#5**: Implement policies (local gov't resolutions) on use of Miocene & Lower Floridan based on SSI.
  - The Upper and Lower Floridan were determined to be connected, so the Lower Floridan is no longer an option. Other comments included: (1) update the Sound Science Initiative modeling forecast, and (2) implement these policies only if they are enforceable.

Recommendation: **UPDATE.** Reevaluate potential for policies to use the Miocene since the SSI showed that the Lower Floridan is not a suitable alternative.

- **Mun#6**: Allow surficial aquifer for irrigation (ordinances).
  - There were two in opposition to this strategy. One commented that encouraging surficial aquifer for irrigation would lead to reducing the water table in areas classified as wetlands, and management practices should be focused on proper and alternative landscape practices incentives. As a note, the 2006 Chatham County Plan stated that all municipalities in Chatham County allow this except City of Savannah.

Recommendation: **REMOVE.** Savannah is the only city to not allow this practice. Those opposed to this strategy had strong concerns. An alternative is to encourage stormwater reuse, reclaimed wastewater reuse, and alternative landscape practices.

- **Mun#8**: Parks/squares irrigating w/ Floridan aquifer shall utilize an alt. source & report on status.
  - There were two votes to remove this strategy. A suggestion was made to add stormwater to the list of alternative sources, and there was a concern to check with Savannah to see how they feel about this strategy.

Recommendation: **UPDATE.** Several of the parks in Chatham County were still using the Floridan aquifer, so this strategy should be revisited by each jurisdiction within the Red Zone to determine applicability. Another alternative source to explore is stormwater.

- **Mun#10**: Xeriscape practices in squares/parks; meter irrigation; utilize rain/moisture sensors.
  - There were two votes to remove this strategy. One comment was that there was a concern about how to check/regulate this.

Recommendation: **UPDATE.** Part of the existing strategy was to meter all parks and then for the MPC to prepare a report on economic savings of xeriscaping. Since there is not funding to do this and does not appear to have been completed, this portion was removed. The strategy was edited for county and municipal governments to continue using xeriscape practices in squares/parks.

- Mun#14: Water Rates: increase rates as usage increases.
  - There was one vote to remove this strategy. It has been completed, but it could be reevaluated and updated.

Recommendation: **COMPLETED/UPDATE.** The conservation rate structure has been implemented, but a more rigorous one should be considered. As another conservation measure, separate irrigation meters should be installed and the irrigation rate should exceed the water/sewer combined rate.

- **Mun#19**: Develop & Implement Wellhead Protection Ordinance; ID water wells & septic systems.
  - There was one vote to remove this strategy. This might be completed already through Public Health and UGA. A couple comments were: (1) compare with current data to see if relevant, and (2) keep wells and septic part but delete wellhead protection ordinance.

Recommendation: **UPDATE/Shift to Consideration by EPD and DPH.** While portions are complete, it is important to continue to identify and inventory water wells and pollution sources. This is currently being done by EPD, DPH, and UGA (via DPH contract). Per the recommendation, the Wellhead Protection Ordinance portion was removed.

- Mun#20: Protect GW recharge areas w/in jurisdiction.
  - This strategy had unanimous support. A couple comments included: (1) Part V has been adopted but this needs to be better incorporated into zoning, and (2) connect with stormwater management strategy and BMPs for water quality protection.

Recommendation: **UPDATE.** It was noted in the 2006 Chatham County Plan that most of the groundwater recharge areas are within Savannah and Chatham County's jurisdictions, and they do a good job following protocols, so this will need to be reviewed for the expansion into Effingham County. It could be reviewed for connecting with stormwater management and BMPs for water quality protection, and incorporating into zoning.

- Mun#22: Implement NPDES Stormwater Permit programs.
  - There were four votes to remove this strategy. Three participants commented that this is redundant and not necessary to duplicate what EPD already has in place. Another two felt that this is an action that is already underway/completed. One suggestion was to update this strategy to encourage compliance with the Coastal Stormwater Supplement.

<u>Recommendation</u>: **REMOVE**. This is a regulatory item that EPD already has in place.

#### **Other Recommendations/Comments**

- Make sure strategies are jurisdiction-specific or EPD is on board.
- Identify shallow aquifers to be used for irrigation purposes.
  - *Note: there was some opposition for this recommendation.*
- Require new subdivisions to install irrigation systems based upon non-GW source, such as stormwater retention ponds, shallow aquifer, or wastewater reuse system.
  - Note: this suggestion was incorporated into a new strategy, which referenced the Floridan cannot be used as the primary irrigation sources for new projects.
- Use stormwater collection for irrigation on new projects.
  - Note: this suggestion was incorporated into one of the new strategies.
- Change "Xeriscape" to "Waterwise" throughout
- No regulatory redundancy Do not list a strategy that is something EPD is already requiring.

Rank	New Management Strategy (Brief Description)	Total Points	1st	2nd	3rd	Oppose
1	Water Reclamation: Municipal WPCPs	102	8	6	4	
2	Stormwater Reuse: Passive Systems	69	5	5	2	
3	Expand Irrigation education/outreach programming	67	4	5	5	
4	Add incentives for reducing usage for industrial users	63	7	1	1	
5	High usage Community Systems: Regulatory	62	6	2	2	
6	Water Rate: More rigorous conservation- based structures	59	5	3	2	
7	Advanced metering (real-time notifications)	52		8	6	
8	Implement Compact Land Development Practices	48	3	4	2	
9	Ordinance to prohibit Floridan as <i>primary</i> irrigation source	43	2	5	1	
10	Water Loss Audits: Numerical Targets	42	5		1	
10	Water Reclamation: on-site	42	2	4	3	
12	Planning: Water use with planning staff, zoning/land use	35	3	1	3	
13	Water Loss Audits: offer to large customers	33	2	3	1	
14	Water Rates: Fund to implement upgrades	29	1	3	3	
15	Redundancy of water sources (masterplan)	28	3		2	
16	Continue monitoring/modeling/forecasting GW status	24	3			
17	Survey to ID large irrigation users of Floridan aquifer	21		3	3	
18	Not Listed (Update water use data annually and Water Plan on a 5-year cycle	20	1	2	1	
19	Incentives: toilet/fixture replacement	17		5	1	1
20	Stormwater Reuse: real-time forecast- based approaches	11		1	3	
21	High usage Community Systems: Outreach programming	10	1		1	
22	Incentives: irrigation removal	1	1	1	3	1
23	Target large institutional and commercial users	0				
24	Regionalization	-8		2	1	2

### New Strategies – Summary of Survey Results

Notes:

- 1A & 1B were listed separately in the survey, but were merged in the meeting
- 18 was not presented in the meeting
- 21 & 23 were not presented in the online survey
- 1<sup>st</sup>, 8 pts; 2<sup>nd</sup>, 5 pts; 3<sup>rd</sup>, 2 pts; Oppose, -10 pts

- Tiers: 1-6 (High), 7-10 (Medium), 12-19 (Low), 20-24 (Very Low)
- In Person: 12
- Online: 8
- Top 5 in person (in order): 3, 6, 1, 2/10
- Top 5 online (in order): 4, 2, 1B, 1A/5, 16
- Some of the lower strategies can be recommended as options to consider but not a specific strategy for municipal governments to adopt.

#### New Management Strategy – Detailed Description (Rank from Survey)

#### Rank from Table above included before detailed description

Data & Monitoring

- 16: Continue to collect and analysis data trends related to the chlorides and potentiometric head in the Floridan aquifer.
- 18: Continue to update water use data annually and the Water Plan on a five-year rotating basis.

Planning / Master Planning

- 15: Plan for redundancy of water sources and how/where connections happen (Savannah I&D)
- 12: Link water supply master planning to future land use planning.
- 8: Promote more compact land development to reduce the need for expanding water infrastructure.

Irrigation Conservation

- 9: Adopt local ordinances to disallow the Floridan aquifer as *primary* irrigation source (residential/commercial).
- 17: Assesses water use data at the local level to identify and target large irrigation users
- 3: Expand education/outreach and encourage/incentivize switch to non-Floridan sources

Water reclamation

- 1A: Encourage water reclamation by linking reuse water producers and potential consumers.
- 1B: Identify who treats to reuse standards & map potential customers to expand customer base with existing infrastructure (or minimal new infrastructure)
- 10: Identify best practices, including WaterHub, for large institutional facilities (hospitals, universities, etc.) to address water loss through cooling tower/boiler.

Water Rate Structures

- 6: Conservation-based structure (more rigorous).
- 14: Water rate should include stable and adequate funding capital upgrades.

#### Water Loss Audits

- 10: Set numerical targets to improve percentages of losses and non-revenue water
- 13: Offer water use audits for large customers (commercial, multi-family, HOAs, irrigation systems)

Incentivize Conservation

- 7: Install real-time monitoring hardware and software to allow for customer notifications regarding water use.
- 19: Implement a low-flow toilet retrofit program
- 22: Implement a turf replacement program, such as Turf Swap, that includes irrigation system removal and xeriscaping.
- 4: Create incentives for industrial water users to reduce groundwater usage.

Stormwater Capture & Reuse

- 2: Promote the installation of practices that allow for the reuse of stormwater, i.e. cisterns, stormwater retention ponds, rain barrels.
- 20: Consider the installation of real-time, forecast-based stormwater storage systems that store rainwater for irrigation and release it before major rain events to allow for stormwater storage.

Governance and Regulation

- 24: Consider a regional decision-making body such as an Authority or a Commission to manage water supply.
- 5: Target high-usage community systems (systems that serve more than 15 connections or 25 people but withdrawal less than 100,000 GPD) for water conservation incentives or requirements.

Not in Online Survey

- 21: High Usage Community Systems: Outreach Programming
- 23: Target large institutional and commercial users

## Appendix B – 2006 Chatham County Plan Management Strategies

The following pages include the strategies from the 2006 Chatham County Plan. Italic text below each strategy describes its status in the current plan.

*Strategy 1*) MPC, with input from the Water Supply Task Force, shall be the designated entity to track and evaluate the implementation of the plan and will report annually on the status of plan implementation. The Water Supply Management Plan Annual Report shall include a concise assessment of the status of each strategy and shall be provided to EPD, each municipality, and members of the Task Force and the Chatham Environmental Forum by February 28th of each year beginning in 2002. An annual Task Force Meeting shall be held each year by January 31 to review the findings of the Annual Report. Recommendations for a report card program shall be presented to the Task Force at the 2002 Annual Meeting. The Annual Report shall be available to the public upon request.

• Updated strategy under "Data Management & Evaluation"

*Strategy 2*) At five-year intervals an update of the Water Supply Management Plan shall be prepared. The first update shall be completed in 2000. Subsequent updates shall follow in 2005, 2010, 2015, etc. Each five-year update shall include an update of the data, a status report on the implementation strategies, evaluation of and modifications to the strategies, and additional requirements by EPD. MPC staff shall prepare the update with the assistance of the Task Force and the Environmental Forum. Each five-year update shall be presented to the Chatham County Commission and the other municipal governments for adoption and submitted to EPD for approval. This strategy will be implemented through an intergovernmental agreement between local governments and the MPC.

• Updated strategy under "Data Management & Evaluation"

*Strategy 3*) The local governments, in adopting this plan, concur with the strategies and shall implement them within their jurisdictions. This strategy will be implemented through local government resolutions adopting the Plan.

• Keep as is.

*Strategy 4*) EPD, as stated in the interim strategy, should develop a regional long-term water supply plan. This regional plan should adopt elements from the 23 county plans. Through its water withdrawal and discharge permitting authority, EPD should implement the regional plan. This strategy will be implemented through EPD's development of a regional plan and Final Strategy.

• This strategy has been completed with the development of the "2006 Coastal Georgia Water and Wastewater Permitting Plan for Managing Salt Water Intrusion." An initial Regional Water Plan was created for Coastal Georgia in 2011, and an updated plan was released in 2017.

*Strategy 5*) The Sound Science Initiative should address the availability and the effects of use of the Miocene aquifer and the Lower Floridan aquifer in Chatham County. Further strategies to use the Miocene aquifer and the Lower Floridan aquifer shall be determined when these studies are conclusive. This strategy will be implemented through local government resolutions containing policies related to use of the Miocene aquifer and Lower Floridan aquifer.

• Updated strategy under "Planning / Master Planning."

*Strategy 6*) The surficial aquifer may be utilized for landscape irrigation, wherever possible in compliance with local, state, and federal regulations. Local ordinances will be revised to allow for use of the surficial aquifer for irrigation purposes by 2005. This strategy will be implemented through local ordinances modified to allow for use of the surficial aquifer.

• Everyone in Chatham County has adopted an ordinance to allow this except the City of Savannah (unknown about southern Effingham County). The opposition commented that encouraging surficial aquifer for irrigation would lead to reducing the water table in areas classified as wetlands, and management practices should be focused on proper and alternative landscape practices incentives.

*Strategy 7*) Treated wastewater effluent shall be utilized for landscape irrigation according to EPD guidelines, wherever possible. All golf courses and local governments shall issue a report on the availability of utilizing treated wastewater for landscape irrigation by December 2001 and every three years thereafter. This strategy will be implemented through local ordinances adopted to require golf courses and local governments to issue reports.

• Updated strategy under "Water Reclamation."

*Strategy 8*) All county and municipal parks and squares utilizing the Floridan aquifer for irrigation shall utilize an alternative irrigation source such as treated wastewater effluent or water from the surficial aquifer. A report on the evaluation of the alternative sources and the utilization or unavailability of the alternative sources for each county and municipal park and square shall be prepared by the county and municipal staffs by January 2004. This strategy will be implemented through local government resolutions.

• Updated strategy under "Irrigation Conservation."

*Strategy 9*) No new ground water (Floridan aquifer) permits shall be issued for any golf courses in the County. All existing golf courses utilizing the Floridan aquifer shall investigate alternative irrigation sources and submit a finding report to the local entity and EPD by the December 2001. Whenever a golf course finds another reliable irrigation source, then efforts to reduce Floridan usage shall begin. Golf courses utilizing the Floridan aquifer are expected to employ aggressive conservation measures until an alternate irrigation source is located. For Golf Courses continuing to use the Floridan aquifer at the time of the June 2001 report, another finding and progress report shall be prepared by those golf courses and submitted to the local entity and EPD every 3 years. This strategy will be implemented through local government resolutions, local government ordinances regulating golf courses, and enforcement by EPD.

• The only golf course still utilizing the Floridan aquifer is The Landings, Inc. EPD continues to reduce their permit limits and will control future reductions. Because of this, the recommendation is for EPD to continue these efforts as well as not issuing any new Floridan aquifer permits to golf courses.

*Strategy 10*) The County and all municipal governments shall begin to utilize Xeriscape principles (water efficient landscaping) in maintaining the squares and park areas. Efficient irrigation methods and techniques such as moisture sensors shall be utilized by December 2002. All local government park and square irrigation systems shall be metered by December 2002 in order to measure the progress of this strategy. A report on the economic savings accrued by utilizing xeriscaping principals shall be prepared by MPC staff by October 2002. This strategy will be implemented through local government resolutions and language contained in the intergovernmental agreements between the local governments and MPC.

• Updated strategy under "Irrigation Conservation."

*Strategy 11*) Public information encouraging the use of xeriscape principles shall be made available to all local government offices related to development of new or existing residential and commercial sites. Local governments shall develop incentives to encourage the use of xeriscape principles by October 2001. This strategy will be implemented through intergovernmental agreements between MPC and local governments and local ordinances that encourage or require the use of xeriscape.

• Updated strategy under "Irrigation Conservation."

*Strategy 12*) Public information programs that encourage the use of xeriscape principles and other efforts to reduce water loss from residential irrigation shall continue to be developed and implemented. The MPC Water Conservation Program shall coordinate and document efforts under this strategy. This strategy will be implemented through local government resolutions and inclusion in intergovernmental agreements between MPC and local governments.

• Updated strategy under "Irrigation Conservation."

*Strategy 13*) The public education and awareness program for water conservation at MPC shall continue to be implemented Countywide. All public and private water suppliers in Chatham County shall either participate by providing funds for the MPC Water Conservation Program or develop their own water conservation education and awareness program by July 2001. Funding for the MPC Water Conservation Program shall be based on the number of customers for each water supply system. This strategy will be implemented through intergovernmental agreements between MPC and local governments and local ordinances for private water suppliers

• Updated strategy under "Water Conservation (General/Incentives)."

*Strategy 14*) Rate increases which increase the charge per gallon of water as usage increases shall be considered and implemented in all water systems to result in and maintain a per capita reduction. A base or minimum gallon usage rate shall be established and rate increases shall focus on users above the minimum. Beginning in December 2002 and every year thereafter, each municipality and public water system shall report its monthly usage and rate structure to MPC to determine whether the reduction is being achieved. Adoption of a strategy to implement seasonal or other types of conservation rate structures shall be considered by the Task Force in 2005. This strategy will be implemented through local government resolutions. Any reporting requirements for private water suppliers would be implemented by local government ordinance.

• A new strategy to continue this effort has been added under "Water Rate Structures."

*Strategy 15*) Industries shall implement water conservation programs to reduce by five percent current groundwater usage for the years 2000-2005. Water usage means actual withdrawals of water, not merely amounts of water allowed through permits. This strategy will be implemented through local government ordinances.

• This strategy has been completed and future reduced usage is addressed with new regulatory limits. EPD has set reduced groundwater usage permit limits for all industrial users by 2025.

*Strategy 16*) Surface water treatment capacity at Savannah's I & D plant shall be expanded as necessary. All expansions would meet the Safe Drinking Water Act requirements. This strategy will be implemented through a City of Savannah resolution. A Source Water Assessment Plan (SWAP) for the Savannah I & D system will be developed to help protect the water supply watershed, to ensure quality drinking water that meets all state and federal regulations, and to assist in the promotion and implementation of a Source Water Protection Plan. The SWAP will be completed by May 6, 2003.

• A new strategy to continue this effort has been added under "Planning / Master Planning."

*Strategy 17*) Industries shall reduce their ground water usage first through conservation efforts and then by exchanging ground water capacity for surface water or other sources found to be appropriate through the Sound Science Initiative. The "exchanged water" will remain in the aquifer. Industries shall issue reports every 3 years, beginning in December 2001, on the progress of water conservation efforts and the feasibility of exchanging groundwater capacity for surface water capacity. This strategy will be implemented through local government ordinances and a Chatham County resolution.

• This strategy is covered under the new permit requirements by EPD, which include water conservation plans, reuse feasibility studies, and reduced groundwater usage permit limits.

Strategy 18) Water users should encourage EPD to revise its groundwater use permit review process. The disincentive for reductions in groundwater use because of permittee fears that permitted amounts will be reduced if not used, should be removed. Water users should encourage the State legislature and EPD to develop incentives that encourage large groundwater users to conserve water or switch to surface water to the extent that surface water resources are not damaged. This strategy will be implemented through local lobbying of the State legislature.

• This strategy has more of a governance/regulatory characteristic since it involves making suggestions to EPD and State Legislature.

*Strategy 19*) All local governments shall develop and implement Wellhead Protection Ordinances using the model passed by Chatham County. The ordinances shall require identification of water wells and all possible pollution sources, including septic tanks within wellhead protection zones. Inventories using Global Positioning System (GPS) and Geographic Information Systems (GIS) shall be completed by February 2005. Local governments shall provide annual reports to the MPC on the progress of wellhead protection inventories. This strategy will be implemented through local government ordinances and resolutions.

• Updated and shifted strategy to "Governance and Regulation;" this is addressed by Georgia EPD, DPH and UGA (via DPH contract).

*Strategy 20*) Local governments with identified groundwater recharge areas in their jurisdictions shall develop local regulations protecting the groundwater recharge areas according to EPD's Environmental Planning Criteria. Local governments shall implement the Groundwater Recharge Area requirements in their jurisdiction. This strategy will be implemented through local government ordinances.

• Updated strategy under "Water Quality Protection."

*Strategy 21*) Local governments shall encourage EPD to strictly enforce existing protections for significant groundwater recharge areas which are located outside of Chatham County but may influence the quality of groundwater in Chatham County. EPD should follow and enforce its rules to protect those areas where the Floridan aquifer is most susceptible to contamination. EPD should also strictly enforce protections for surface water resources which are upstream from Chatham County including the Savannah River Watershed and Ogeechee River Watershed.

• This is a regulatory item that EPD already has in place.

*Strategy 22*) All local governments shall implement their NPDES Stormwater Permits and comply with the federal and state rules for stormwater management. This strategy will be implemented through implementation of programs already developed by all local governments in Chatham County except Vernonburg.

• This is a regulatory item that EPD already has in place.

*Strategy 23*) Accurate assessment of water usage by local governments depends upon compliance by all water systems with EPD reporting requirements under the Safe Drinking Water and Groundwater Use rules. The municipalities shall comply with the reporting requirements and EPD should enforce the requirements of all water users and suppliers.

• This is a regulatory item that EPD already has in place.

*Strategy 24*) EPD is encouraged to enforce metering requirements so that Chatham County can accurately access the usage rates and evaluate the implementation status of its Water Supply Management Plan. This strategy will be implemented through EPD's enforcement of existing state rules.

• This is a regulatory item that EPD already has in place.

*Strategy 25*) All public water systems shall develop drought contingency plans for their municipal water supplies and implement those plans when necessary. This strategy will be implemented through local government resolutions and ordinances.

• This strategy has been completed.

*Strategy 26*) Chatham County shall utilize the remaining water allocated to the Chatham County water bank according to the criteria set forth in the Chatham County Water Supply Management Plan, Section 8.5. Should EPD increase the amounts available to the county water banks, the water use reductions achieved in Chatham County since 1995 and further reductions from 2000 to 2005 shall not be unfairly reallocated to other groundwater users in Chatham County or groundwater users in other counties.

• This strategy has been completed and is no longer in use.

*Strategy* 27) The local governments of coastal Georgia shall work cooperatively among themselves and with the State to develop a long-term regional water supply management plan. This regional management plan should fairly allocate the costs associated with reducing groundwater usage and should address the need for incentives that may be needed at the state level in order to implement some of the strategies in the Chatham County plan. Strategies in the Chatham County plan concerning water reductions by industry, changes in the permit evaluation process, and allocation of water will be reevaluated in 2005 based on the regional long-term management plan developed by EPD.

• A new strategy to continue this effort has been added under "Planning / Master Planning."

*Strategy 28*) MPC and local governments in Chatham County will assess risk to the quality of surface water supplies and will coordinate watershed protection program with upstream counties within the Savannah River and Ogeechee River Watersheds. Local governments in Chatham County shall work cooperatively with other counties and with the State to develop plans to protect these water supply watersheds.

• Updated strategy under "Water Quality Protection."

# **Appendix C – Detailed Summary of Private Water System Usage**

SDWA	Water System Name	Type <sup>1</sup>	County	Population	Avg. Usage	Per Capita
Permit #			~		(GPD) <sup>2</sup>	(GPCD)
GA0510008	SAVANNAH CHRISTIAN PREP.SCHOOL	NTNC	Chatham	990	5,803	5.9
GA0510011	GOLDEN ISLES SUBDIVISION	С	Chatham	555	44,077	79.4
GA0510012	GROVE HILL SUBDIVISION	C	Chatham	286	21,836	76.3
GA0510014	AZALEA MOBILE HOME PLAZA	С	Chatham	300	67,794	226.0
GA0510015	WATER`S BLUFF MOBILE HOME PARK	C	Chatham	109	10,615	97.4
GA0510017	CROSBY MOBILE ESTATES	C	Chatham	130	6,614	50.9
GA0510021	COTTONVALE ESTATES	C	Chatham	255	12,036	47.2
GA0510022	MIDDLEGROUND MOBILE ESTATES	С	Chatham	210	17,124	81.5
GA0510023	EAST PINES SUBDIVISION	C	Chatham	348	72,452	208.2
GA0510024	ESTILL HAMMOCK/SPANISH HAMMOCK	С	Chatham	374	44,295	118.4
GA0510026	GARDEN ACRES ESTATES	С	Chatham	525	54,180 (Est.)	N/A
GA0510028	GRAYS SUBDIVISION	С	Chatham	715	57,442	80.3
GA0510031	HOLIDAY MOBILE PARK	С	Chatham	94	9,304	99.0
GA0510035	NORTONS TRAILER PARK	С	Chatham	138	10,919	79.1
GA0510040	PINE BARREN ACRES	С	Chatham	138	19,719	142.9
GA0510042	PLANTATION INN MOBILE ESTATES	С	Chatham	229	8,447	36.9
GA0510046	RIVER OAKS SUBDIVISION	C	Chatham	541	51,321	94.9
GA0510047	SKIDAWAY MOBILE ESTATES	С	Chatham	497	72,332	145.5
GA0510049	SOUTHSIDE MOBILE ESTATES	С	Chatham	224	22,079	98.6
GA0510050	SOUTHWINDS COMMUNITY	C	Chatham	572	85,121	148.8
GA0510051	SAVANNAH PINES MHP	С	Chatham	632	51,935	82.2
GA0510054	THE BLUFF SUBDIVISION (HOA)	С	Chatham	55	20,233	367.9
GA0510055	VICKS MOBILE HOME PARK	С	Chatham	182	9,830	54.0
GA0510060	SAVANNAH YACHT & COUNTRY CLUB	С	Chatham	239	44,913	187.9
GA0510073	USA-HUNTER AF 702 RADER # 4-4A	NC	Chatham	28	1,700 (Est.)	N/A
GA0510079	MORGAN MOBILE HOME PARK	C	Chatham	148	11,498	77.7
GA0510085	OLIVER PINES	C	Chatham	26	2,268	87.2

SDWA	Water System NameType1		County	Population	Avg. Usage	Per Capita
Permit #	DND OLD FODT LLOVGON	NG		100	(GPD) <sup>2</sup>	(GPCD)
GA0510087	DNR-OLD FORT JACKSON MUSEUM	NC	Chatham	100	417	4.2
GA0510088	DNR-SKIDAWAY IS. STATE PARK	NC	Chatham	347	4,991	14.4
GA0510089	NASSAU WOODS MOBILE HOME PARK	С	Chatham	772	74,260	96.2
GA0510091	COMMODORE POINT	С	Chatham	302	50,645	167.7
GA0510092	DERENNE PLAZA CONDO	С	Chatham	175	9,332	53.3
GA0510094	WHITEMARSH ESTATES	С	Chatham	390	34,189	87.7
GA0510095	OATLAND ISLAND EDUCATION CNTR.	NTNC	Chatham	120	7,997	66.6
GA0510098	ENNIS MOBILE HOME PARK	C	Chatham	33	3,285	99.5
GA0510100	BETHESDA HOME FOR BOYS	С	Chatham	126	13,003 (Est.)	N/A
GA0510103	PARKWAY MOBILE ESTATES	С	Chatham	86	5,107	59.4
GA0510104	WHITFIELD PARK SUBDIVISION	С	Chatham	676	59,272	87.7
GA0510110	FOSS MOBILE HOME PARK	С	Chatham	221	16,521	74.8
GA0510111	LIVE OAK MOBILE HOME PARK	С	Chatham	55	3,956	71.9
GA0510112	SHADY ACRES MOBILE HOME PARK	С	Chatham	138	929	6.7
GA0510113	GROVE POINT MOBILE EST.	С	Chatham	206	17,219	83.6
GA0510114	BELLAIRE VILLAGE SUBDIVISION	С	Chatham	57	4,230	74.2
GA0510121	BEAULIEU VILLAGE SUBDIVISION	С	Chatham	143	31,282	218.8
GA0510123	DERRICK SUBDIVISION	С	Chatham	114	10,551	92.6
GA0510124	LITTLE NECK PLANTATION	С	Chatham	111	8,447	76.1
GA0510126	MILLER PINES MOBILE HOME PARK	С	Chatham	96	8,737	91.0
GA0510128	MODENA ISLAND	С	Chatham	98	38,545	393.3
GA0510134	WILMINGTON ISL. WS, INC.	NC	Chatham	100	6,073 (Est.)	N/A
GA0510137	BARNWELL GARDENS SUBDIVISION	С	Chatham	97	3,732	38.5
GA0510138	BASHLORS MOBILE HOME PARK	С	Chatham	55	3,573	65.0
GA0510139	HEATHCOTE FARMS SUBDIVISION	С	Chatham	68	3,112	45.8
GA0510141	WHITFIELD MOBILE ESTATES	С	Chatham	86	6,162	71.7
GA0510144	RIVERVIEW MOBILE INN	С	Chatham	179	11,596	64.8
GA0510145	SAVANNAH RV RESORT	С	Chatham	307	9,404	30.6
GA0510157	RIVERSIDE ESTATES	С	Chatham	75	8,286	110.5

SDWA	Water System Name	Type <sup>1</sup>	County	Population	Avg. Usage	Per Capita
Permit #		0	<u>(1)</u>		(GPD) <sup>2</sup>	(GPCD)
GA0510163	SEABREEZE MOBILE HOME PARK	С	Chatham	83	10,666	128.5
GA0510168	THUNDERBIRD MOTEL	NC	Chatham	35	2,126 (Est.)	N/A
GA0510188	`FLYIN` SQUIRREL PROPERTIES	NTNC	Chatham	40	726	18.2
GA0510189	SASSER`S SEAFOOD INC.	NC	Chatham	50	3,482	69.6
GA0510206	THE TRAVELER`S INN	NC	Chatham	66	1,919	29.1
GA0510207	SANDMAN MOTEL	NC	Chatham	25	1,291	51.6
GA0510215	LOVE`S FISHING CAMP RESTAURANT	NC	Chatham	229	5,849	25.5
GA0510216	SAVANNAH YACHT CLUB	NC	Chatham	175	77,579	443.3
GA0510223	CROSBY MOBILE ESTATES II	С	Chatham	65	3,115	47.9
GA0510224	FORT PULASKI NATIONAL MONUMENT VIS CTR	NC	Chatham	912	55,385 (Est.)	N/A
GA0510225	FT. PULASKI NATL. MONT. PICNIC	NTNC	Chatham	133	1,533 (Est.)	N/A
GA0510231	USA-HUNTER AF LOTTS ISL WELL 7	NC	Chatham	25	1,518 (Est.)	N/A
GA0510232	USA-HUNTER AF REC AREA #3	NC	Chatham	30	1,822 (Est.)	N/A
GA0510235	DEAN FOREST ROAD TRAILER PARK	С	Chatham	65	12,752	196.2
GA0510240	ISLANDS EXPRESSWAY REC. PARK	NC	Chatham	50	127	2.5
GA0510249	ARGYLE VILLAGE SUBDIVISION	С	Chatham	57	3,275	57.5
GA0510251	T.E. SHURLING REAL ESTATE INC	NC	Chatham	250	200	0.8
GA0510253	FORT ARGYLE-RIVER BLUFF	C	Chatham	442	39,267	88.8
GA0510255	AIRPORT OFFICES & INDUST. PARK	NTNC	Chatham	32	860	26.9
GA0510260	PILOT #72	NC	Chatham	200	1,966	9.8
GA0510265	SAVANNAH BEND MARINA	NC	Chatham	25	16,710	668.4
GA0510266	<b>B`DETTE MOBILE BLUFF</b>	C	Chatham	68	4,428	65.1
GA0510267	SANDY BLUFF SUBDIVISION	C	Chatham	62	5,828	94.0
GA0510270	WRENNDOROSA, INC.	С	Chatham	49	5,057 (Est.)	N/A
GA0510271	ALPHA & OMEGA MINISTRIES	NTNC	Chatham	400	401	1.0
GA0510273	D HOFFMAN SUBWAY RESTAURANT	NC	Chatham	50	1,275	25.5
GA0510275	DEAN FOREST RD.TP-NORTH	С	Chatham	39	1,369	35.1
GA0510277	CHATHAM COUNTY – TOM TRIPLETT PARK	NC	Chatham	250	470	1.9
GA0510278	DEAN FOREST INDUSTRIAL PARK	NTNC	Chatham	26	2,748	105.7

SDWA Bormit #	Water System Name	Type <sup>1</sup>	County	Population	Avg. Usage	Per Capita
<b>Permit</b> #	CARDEN CITY TOWN	C	Chathan	25	(GPD)-	(GPCD)
GA0510280	GARDEN CITY – TOWN CENTER	C	Chatham	25	6,838	273.5
GA0510283	SWAMP FOX WATER SYSTEM	NC	Chatham	100	142	1.4
GA1030005	MARLOW LEARNING CENTER	NTNC	Effingham	90	960	10.7
GA1030007	INTERFOR U.S. INC. – MELDRIM DIVISION	NTNC	Effingham	110	18,862	171.5
GA1030011	MELDRIM LAKES	С	Effingham	203	18,902	93.1
GA1030016	FOXBOW FARMS	С	Effingham	570	47,289	83.0
GA1030017	FOXBOW NORTH SUBDIVISION	С	Effingham	497	31,999	64.4
GA1030018	PECAN GROVE S/D	С	Effingham	182	13,770	75.7
GA1030028	PINEORA SYSTEM	С	Effingham	94	4,905	52.2
GA1030030	WHISPERING PINES CAMPGROUND-MH EST.,LLC	С	Effingham	340	11,862	34.9
GA1030031	LAKE CHERIE MOBILE HOME PARK	С	Effingham	44	5,288	120.2
GA1030033	TWIN OAKS MOBILE HOME PARK	С	Effingham	36	3,321 (Est.)	N/A
GA1030036	RED GATE MOBILE HOME PARK	С	Effingham	80	6,861	85.8
GA1030067	NEW EBENEZER RETREAT CENTER	NC	Effingham	125	277	2.2
GA1030079	PADDLEFORD PLANTATION S/D	C	Effingham	192	14,940	77.8
GA1030082	AURIGA FARMS	С	Effingham	585	48,737	83.3
GA1030083	GOSHEN APARTMENTS	С	Effingham	52	2,066	39.7
GA1030084	HUNTS MOBILE HOME PARK	C	Effingham	32	3,735	116.7
GA1030087	SOUTH EFFINGHAM WOODS WATER CO	C	Effingham	340	31,364 (Est.)	N/A
GA1030088	HAWK HAMMOCK	С	Effingham	86	7,220	84.0
GA1030090	CREEKWOOD FARMS SUBDIVISION	С	Effingham	71	6,279	88.4
GA1030092	COACHWOOD ESTATES	С	Effingham	83	7,719	93.0
GA1030093	SADDLEBROOK SUBDIVISION	С	Effingham	398	35,398	88.9
GA1030095	CONIFER CROSSING/PINE HILL	С	Effingham	759	67,835	89.4
GA1030097	LEE VILLAGE SUBDIVISION	С	Effingham	310	19,815	63.9
GA1030099	EDWARDS MOBILE HOME PARK	C	Effingham	38	1,946	51.2
GA1030100	HICKORY KNOB SUBDIVISION	С	Effingham	745	80,704	108.3
GA1030101	DEERWOOD S/D-GREEN PEACE RV PK	C	Effingham	133	5,652	42.5

SDWA Permit #	Water System Name	Type <sup>1</sup>	County	Population	Avg. Usage	Per Capita
GA1030102	RIVER ROAD FARMS	С	Effingham	239	32,709	136.9
GA1030103	WATERFORD PLANTATION SUBDIVISION	C	Effingham	182	14,404	79.1
GA1030104	CYPRESS LAKES SUBDIVISION	C	Effingham	44	6,217	141.3
GA1030105	ROSEWOOD WATER SYSTEM	С	Effingham	52	3,690	71.0
GA1030106	COVENTRY PLANTATION	С	Effingham	122	8,922	73.1
GA1030107	SOUTH POINTE SUBDIVISION	C	Effingham	491	48,880	99.6
GA1030108	LAKEWOOD SUBDIVISION	С	Effingham	291	85,130	292.5
GA1030109	HUNTERS MILL SUBDIVISION	C	Effingham	114	8,473	74.3
GA1030110	MILL CREEK SUBDIVISION	С	Effingham	242	30,876	127.6
GA1030111	SANDHILL ELEMENTARY	NTNC	Effingham	600	7,222	12.0
GA1030112	ROYAL OAKS PLANTATION	С	Effingham	252	29,448	116.9
GA1030113	BUCKNELL TOWN HOMES	С	Effingham	39	2,819	72.3
GA1030115	TWENTY-ONE CENTER	NTNC	Effingham	44	0	Not in Use
GA1030116	HAMPTON CREEK SUBDIVISION	С	Effingham	146	10,805	74.0
GA1030117	CLEARVIEW-WARNER FIELDS	C	Effingham	252	17,811	70.7
GA1030119	HUNTINGTON STATION	C	Effingham	382	39,276	102.8
GA1030120	BARRINGTON SUBDIVISION	С	Effingham	75	5,243	69.9
GA1030122	SANDY WOODS SUBDIVISION	C	Effingham	36	2,431	67.5
GA1030124	OETGEN`S MOBILE HOME PARK	C	Effingham	60	5,535 (Est.)	N/A
GA1030127	HIDDEN LAKES	С	Effingham	42	4,100	97.6
GA1030128	LOWGROUND FARMS SUBDIVISION	С	Effingham	91	8,260	90.8
GA1030129	BUCKFIELD PLANTATION/PLEASANT HILL S/D	С	Effingham	190	16,669	87.7
GA1030130	RAHN STATION SUBDIVISION	С	Effingham	49	3,530	72.0
GA1030132	WALNUT GROVE SUBDIVISION	C	Effingham	55	4,036	73.4
GA1030133	STILLWOOD SUBDIVISION	C	Effingham	49	3,755	76.6
GA1030134	JAMESTOWN SUBDIVISION	С	Effingham	187	11,280	60.3
GA1030136	EAGLE POINTE	С	Effingham	195	14,541	74.6
GA1030138	MALLARD POINTE/DRAKE LANDING	C	Effingham	56	4,144	74.0
GA1030142	CASTLEWOOD SUBDIVISION	С	Effingham	127	11,878	93.5

SDWA	Water System Name	Type <sup>1</sup>	County	Population	Avg. Usage	Per Capita
Permit #					(GPD) <sup>2</sup>	(GPCD)
GA1030143	SHADOWBROOK	С	Effingham	224	16,320	72.9
	SUBDIVISION					
GA1030144	STONEGATE SUBDIVISION	C	Effingham	198	24,428	123.4
GA1030145	GRIFFIN LAKES	NC	Effingham	95	1,836	19.3
	CAMPGROUND		C			
GA1030146	HUNTER`S CHASE / ABBY	С	Effingham	211	19,733	93.5
	LANE		Ū.			
GA1030147	EAGLE`S LANDING	С	Effingham	26	1,757	67.6
	SUBDIVISION WATER		_			
	SYSTEM					
GA1030149	LONG ACRES RD	С	Effingham	26	10,137	389.9
	SUBDIVISION					
GA1030152	BERRYVILLE (FKA INDIGO	С	Effingham	26	2,216	85.2
	WOODS)					
GA1030154	COURTHOUSE ROAD	NTNC	Effingham	26	675	26.0
GA1030155	MELDRIM APRTMENTS	C	Effingham	65	5,193	79.9
GA1030157	PENNINGTON ESTATES	С	Effingham	49	3,954	80.7
	SUBDIVISION					
GA1030159	EFFINGHAM CO IDA I-16	NTNC	Effingham	25	839 (Est.)	N/A
	INDUSTRIAL PARK					
GA1030161	SOUTHBROOK SUBDIVISION	C	Effingham	47	4,309	91.7

Data Source: Georgia EPD Coastal District Office (Brunswick) & <u>http://gadrinkingwater.net/DWWPUB/</u><sup>1</sup> System Type Abbreviation: C = Community, NC = Transient Non-Community. and NTNC = Non-Transient Non-Community System.

<sup>2</sup> "(Est.)" notes that data was not available and daily usage was estimated with average per capita usage from other systems with similar Types.

## Appendix D – Red Zone Water Supply Management Plan Task Force

The following individuals identified below based on the organization they were representing participated in the Task Force.

	ן	Task Force Members and Affiliations
Last Name	First Name	Organization
Drewry	Robert	Chatham County
Helmholdt <sup>1</sup>	Nick	Chatham County - Savannah Metropolitan Planning Commission
Akridge	Charles	City of Bloomingdale
Feldner	Ron	City of Garden City
Jackson <sup>1</sup>	Jackie	City of Garden City
Williams	Mark	City of Pooler
Claxton	Phillip	City of Port Wentworth
Kelly	LeMeisha	City of Rincon
Lloyd	Heath	City of Savannah
Sawyer	John	City of Savannah
Walker	Laura	City of Savannah
Shaw	George	City of Tybee Island
Abbott	Tony	Consolidated Utilities
Abbott	Logan	Consolidated Utilities
Allen	Toss	Effingham County
Corbitt	Wesley	Effingham County
Edwards	Gene	EMD Millipore Corp. / EMD Chemicals Inc.
Reeves	Kory	EMD Millipore Corp. / EMD Chemicals Inc.
Denion	Deatre	GA Dept. Community Affairs
Simpson	Ebony	GA Dept. Community Affairs
Moorer	Hope	Georgia Ports Authority
Nease	Brian	Georgia Power Company - Plant McIntosh
Liotta	Michelle	Georgia-Pacific Consumer Products, LP
Frazier	Veronica	Hunter Army Airfield
Thomas	Stanley	Hunter Army Airfield
Burcham	Wade	Integrated Science & Engineering
Katula	Donna	International Paper - Savannah Plant
Rusnak	Ashley	International Paper - Savannah Plant
Burdett	Jay	Memorial Medical Center
Blackmon	Joe	Savannah Acid Plant, LLC
Alexander	Terry	Savannah Chatham County Public School System
Ralston	Kevin	Savannah Chatham County Public School System
Oblander	Jacob	Savannah Riverkeeper
Meland	Kevin	Savannah Sugar Refinery

Task Force Members and Affiliations				
Last Name	First Name	Organization		
Waller	Jarrod	Savannah Sugar Refinery		
Hartman	Chuck	Skidaway Institute of Oceanography		
Bass	Mel	Solenis LLC		
Jones	Todd	Southern States Phosphate and Fertilizer		
Steigelman	Chris	The Landings Club, Inc.		
Medders	Ron	The Landings Club, Inc. (Subdivision & Golf Course)		
Hankins	Caroline	Town of Thunderbolt		
O'Neill	Ray	Town of Thunderbolt		
Deloe	Katherine	UGA CAES Coastal Area Extension Center		
Winter	Norman	UGA CAES Coastal Area Extension Center		
Davis	Tim	UGA Cooperative Extension, Chatham County Agent		
Cantrell	Ben	UGA Cooperative Extension, Effingham County Agent		
Brown	Jessica	UGA Marine Extension-Georgia Sea Grant		
D'Aguillo	Tony	Water Utility Management		
Smith	Mark	Water Utility Management / Chatham Water Company / Utilities Inc. of GA		
Keyes	Alice	100 Miles		
Edenfield	Tom	Attorney & Counselor at Law		

<sup>1</sup> These individuals also served on the Red Zone Water Supply Management Plan Project Team.

## Appendix E – Meeting Summaries/Sign-In Sheets for Quarterly Task Force Meetings

- 1. Kickoff Meeting February 2, 2017
- 2. 2<sup>nd</sup> Meeting May 23, 2017
- 3. 3<sup>rd</sup> Meeting August 8, 2017
- 4. 4<sup>th</sup> Meeting December 14, 2017



Red Zone Water Supply Management Plan Task Force Kick-off Meeting February 2, 2017, 10:00 AM – 11:45 AM

Arthur A. Mendonsa Hearing Room 110 E. State St, Savannah, GA

### Meeting Summary

#### I. Introductions

Nick Helmholdt, of the MPC, brought the meeting together and introduced the consultant, Ecological Planning Group.

#### II. Presentation

Courtney Reich and Robert Brown of Ecological Planning Group gave a presentation to the group that generally included:

- o Summary of "2006 Chatham County Comprehensive Water Supply Management Plan"
- Summary of Preliminary Data Analysis comparing 2004 groundwater usage to 2015.

This presentation will be provided via email to meeting attendees and Task Force Members.

#### III. Discussion of Individual Goals

Attendees were asked to introduce themselves and give a statement regarding their goals were related to the project or what they would like to get out of their participation. Responses were as follows:

- See where the project is going.
- See what the plant needs to do.
- What do we need to do to get ready for the reductions coming in 2025 and then what will be the next set of goals for predecessors?
- Find out what the planning process is about.
- Look to see what others are doing and have done.
- Brainstorm ideas with others.
- Find out how to meet regulations.
- Interested in seeing what is and what is not working.
- $\circ$   $\;$  How to better serve communities and be of assistance in the process.
- To determine what the next steps are.
- To utilize water as a resource to the highest value possible.
- To work with the group to come up with best strategies.
- To maintain fiscal/economic sustainability of water utilities. In an area with stagnant household incomes and rising water costs, this is a concern.
- To account for population increase.

• Concerned if something were to happen to groundwater source and there not being a backup in place.

#### IV. General Discussion on 28 Strategies

Attendees were provided a summary of the 28 strategies included in the 2006 Chatham County Water Supply Plan and asked to discuss their experiences and thoughts with these strategies. The following is a summary of that discussion.

- There should be more comprehensive (total) water management practices adopted that includes more than just drinking water and wastewater. Add in stormwater, and broaden BMPs (especially for the coastal region), rainwater harvesting, sewer reuse (graywater / purple pipe).
- $\circ$   $\;$  Which of the 28 Management Strategies had the biggest impact?
  - #14 Conservation block rate structure. Rates structures should be updated to further encourage conservation and provide for future upgrades.
  - A lot of the strategies with Xeriscaping and Landscaping have worked and are completed, but still some more to do based on the monthly water usage data from 2015.
- EPD can help by being a liaison between this process and the Coastal Water Plan update process and work to coordinate strategies.
- There is going to be large capital costs in meeting the 2025 permit reductions and future water supply needs. It is important to start early in the process to address these upfront capital costs.
- There needs to be a future pool of money for alternate water sources.
- There needs to be redundancy in our water supply sources. Everyone can't depend on the same groundwater or surface water resources.
- Municipalities don't want to end up with all their SPLOST money going entirely to water and sewer.
- Memorial Medical Center commented that during the summer they lose about 75,000 gallons per day by evaporation from cooling towers. They are still paying sewer rates on this even though it is not sent to the sewer. This presents an opportunity for BMPs to be retrofitted to limit losses.
- International Paper is in the process of trying to start some new projects to get usage below the 2025 limits. They have environmental engineers looking for options to reduce groundwater usage. They will be looking to treat and reprocess for reuse where practical. They are looking to cheaper alternatives than reverse osmosis.
- Education campaign is to put water bills into perspective for residents by comparing with Comcast or Cell Phone Bill. They will easily pay \$200 for these, but complain with small water increases.
- Based on the monthly (seasonal) usage graph, municipal seasonality showed that irrigation is a use to target moving forward.
- Look at Strategies used across the country (especially California and out west in general) to see how they ratcheted down on conservation.
- Investigate cost-benefit of either offering incentives to residential homes or older hotels with inefficient systems (toilets, showers, etc.). What is the timeframe to pay off? Does it make sense for the City to help pay some up front to protect permit capacity? Hotels and residents might not be aware of these issues – provide education.
- One municipality said they saw households using the same ~300 gallons per day for the past 16 years.
- Full costing of water and depreciating assets because not all communities do this.
- The final plan should be inclusive and address needs of municipal and private water supplies as well as industries. It must also be presented to both local governments and industries. For Industry, LEPC is a good option but it only includes Chatham County industry so Effingham industries must also be addressed.
- EPD suggested that it would be good to identify specific volume reductions associated with specific BMPs and address cost-benefit. Potentially create a list of 7-8 BMPs where the return on investment is calculated.
- Consider capital cost recovery fees.

# V. Goal Setting

There was a discussion about setting a list of goals for the Red Zone Water Supply Plan:

- Meet 2025 Permit Limits
- Be good stewards of our groundwater resources moving forward
- o Sustainability of groundwater resources
  - This led to a question about what sustainability means. Does sustainable mean stop movement of saltwater. If so, the model showed greater than 90% reductions were needed.
- Create long-term goals (2025 is the Short-Term Goal)
- EPD also commented that it is important to get on paper in this plan what the long-term goals are (e.g., regionalization, desalination, etc.). They don't necessary have to be costed but if they can start looking at management practices and feasibility analysis.
  EPD has some cost slides that they can share. It is important to be vocal about these goals on paper to allow for potential future funding or to get political support on board.

### VI. Action Steps

For Task Force Members:

- EPG requested data from water audits, but it was raised that this should be publicly available information. EPD said that the 2015 data should be posted online shortly and it should include the entire spreadsheet.
- EPG also requested that municipal water supplier provide

### For EPG:

• Look to update population projections with more recent study. While it is expected to increase, the current projections should be a little less dramatic.

- Would be nice to see not only what current rate structures are but where they have been, and to present for the region. Georgia Water Rates Dashboard (from UNC-CH) is a good resource to look at and include:
  - <u>http://www.efc.sog.unc.edu/reslib/item/georgia-water-and-wastewater-rates-dashboard</u>
  - Invite Stacey from UNC-CH to participate in the next meeting.
- International Paper was a large user that has made drastic cuts in the past that it would be great to hear from them (about anything that is not proprietary) about how they made these cuts. What did they find to be the most effective? What was something that they invested a lot in but did not get the return expected? EPG will follow up to see if they are willing to provide this information.
- A comment was made that The Landings has done a lot with conservation that was not well publicized. The attendees were interested in hearing from the Landings on what worked best and did not work. EPG will follow up with the Landings contact.
- Contact South Island Public Service District regarding R/O in Hilton Head.
- Several people requested a copy of the PowerPoint, so it will be shared via e-mail.

# I. Next Steps / Homework

- EPG to gather and perform analysis on data usage type (municipal, industrial, commercial) as well as information from Water Audit reports for Calendar Year 2015.
- Review summary of 28 strategies from the Chatham County Water Supply Plan.
  Come to the next meeting prepared to discuss what worked and what didn't work.
- Next Meeting to be determined. Late April/Early May.



Red Zone Water Supply Management Plan Task Force Kick-off Meeting May 23, 2017, 10:00 AM – 12:00 PM Garden City, City Hall

Garden City, City Hall 100 Central Ave., Garden City, GA

# MEETING NOTES

# I. General Introductions/New Participants

**a.** Because there were several new participants, Rob reintroduced the project background and those in attendance introduced themselves.

# II. Review Highlights from "Data Assessment" Document

- a. Rob presented a PowerPoint presentation on a summary of the data analysis from the Data Assessment document. A copy of the presentation was attached in this email for those unable to attend the meeting or those wanting to view the data more in depth (almost everything came from the "Data Assessment").
- b. A copy of the Data Assessment was also attached again for the Task Force's review. <u>The</u> <u>deadline for providing comments or adding additional data, is Friday, June 16<sup>th</sup>.</u>

# III. Initial Development of Management Strategies List

- The Task Force members were given 10-15 minutes to review Existing Management Strategies from 2006 Chatham County Plan and give their opinions on a handout provided. They were given the option to vote to Keep / Edit / Remove the strategy. There was also a section to provide Suggestions/Comments on handout.
- b. New Management Strategies which emerged from the "Data Assessment" were presented at the end of the meeting, and Task Force members were given three dots of three different colors to prioritize their top 3, second 3, and third 3 strategies.
- c. Because some people had to leave early and to offer this input to those not in attendance, a Survey Monkey survey was created and distributed.
- d. The results will be summarized at the next meeting.

# IV. Next Steps / Homework

- a. Schedule one-on-one meeting with Project Team.
- b. Next Meeting August 2017.



# Red Zone Water Supply Management Plan Task Force Kick-off Meeting

August 8, 2017, 10:00 AM – 12:00 PM Sunset Room, The Landings 1 Marina Drive, Savannah, GA 31411

# Meeting Notes

# I. Guest Presentations on Water Management Strategies

- 1) Water Conservation at The Landings / New Metering Technology, Ron Medders, Regional Manager for Georgia Operations, Utilities, Inc. of Georgia, rrmedders@uiwater.com
- 2) *"The Newton Model,"* Mike Hopkins, Executive Director, Newton County Water & Sewerage Authority, mah@ncwsa.us
- "Sustainable Water and the Emory WaterHub A Different Approach to Reducing Potable Water Consumption," Matt McCormack, Vice President, Business Unit Leader – Water Resources, Reeves Young, MMcCormack@reevesyoung.com

Copies of Presentations #1 & #2 are attached with this email. A factsheet describing the technology presented in Presentation #3 is included with this email since the presentation file was too large. If you would like a copy of Presentation #3, please email me directly (it was too large to email together).

# II. Review Management Strategies List

1) Results of Survey/Dot Exercise

Summarized in attached PowerPoint "3rd Meeting PPT.pdf."

# 2) Open discussion on new strategies that have emerged since last discussion

The following notes summarize the open discussion portion of the meeting.

- Adopt graywater ordinance by using the City of Savannah's ordinance as a template.
  - There was a questions and discussion on the strategy for a gray water ordinance. The City of Savannah adopted this ordinance in 2010, and it requires disinfection of the gray water. The City allows for certain types of reuse depending on the source. The State Plumbing Code was also updated to allow for graywater use and if local codes just refence the State code there is no need for adoption of a separate ordinance. Local government will have to check to see if there is something in their code that prevents graywater use, and if so address that. This strategy will be amended to: "Review local plumbing code regulations to ensure that there is nothing preventing the use of graywater."
- Continue discussions with the City of Savannah on a bulk/wholesale rate for surface water for domestic water suppliers.

- There was support for this strategy amongst the municipal buyers of surface water, and the City representative stated that the City is always open to meeting with other municipalities and water users to discuss the rates for purchasing surface water.
- Update the Water Conservation Plans that were required as special permit conditions in 2008 for both Industrial and Municipal permittees.
  - The comment was to change strategy to address implementation, not just updates. This strategy will be amended to: "Update and implement the Water Conservation Plans that were required as special permit conditions in 2008 for both Industrial and Municipal permittees."
- Look at local codes/ordinances to determine if any block or restrict stormwater reuse
  - There was a question regarding the need for this, and if any local government currently restrict stormwater reuse. The Landings Association currently does not specifically allow it, although there are a few that are in place. They are looking to address this in their design standards update.
- Consider a groundwater permitting system that would allow "trading" of permitted groundwater use capacity ... to maximize efficiency of water delivery and reduce migration of saltwater intrusion.
  - There was discussion and general support for this concept. EPD stated that they don't have the authority to establish this program, so it would have to be done through a Legislative Act, similar to the Flint River Drought Protection Act. EPD may be the authority that would be tasked with operating such a program, as they did in the Flint River basin.
  - As a result, this strategy was shifted to be a Management Strategy under the topic "Local Lobbying." This revised strategy states, "Water users should encourage and lobby to local State Legislature to create a Legislative Act that would revise EPD's groundwater permitting system in the 'Red Zone.' The suggested revision would allow 'trading' of..."
- Update the Sound Science Initiative modeling forecast.
  - There was a question if this included updating the information from the Regional Water Plan, and the answer was that this strategy really focused on updating the Sound Science Initiative.
- Create incentives for industrial, commercial, institutional water users to reduce groundwater usage. The Stakeholder group was asked to provide direction on what these "incentives" might be, and the comments are summarized below:
  - In general, incentives are built in to conservation because of the cost of treating or buying surface water is reduced. No other specific types of incentives were suggested.
  - Georgia Pacific commented that they are not "pro-incentive" because it interferes with the free market economy. However, they would take advantage of incentives put in place.
  - The WaterHub model, highlighted in the 3<sup>rd</sup> presentation, has an incentive that there is no upfront cost for users and then water rates are at a reduced cost.
  - The group was in favor of a program where all permittees agreed to pay a small fee for withdrawing groundwater from the Floridan Aquifer, i.e. some fraction of a cent per gallon, and this money could be put into a fund that would be used to purchase permits, build in redundancy, etc. It could be administered by a local authority. The group felt that this should become its own strategy, so it was added as such to the category "Masterplanning/Planning."

# III. Next Steps

- 1) EPG will provide a summary of the meeting and updated strategy list to the Stakeholder Committee for their review and feedback.
- 2) EPG will prepare a draft of the plan and email it to the Committee for their review prior to the final Stakeholder meeting (this Fall).
- 3) At the final Stakeholder meeting, the group will discuss the draft and final steps for implementing/adopting the plan.
- 4) Contact EPG or MPC if you are interested in scheduling a one-on-one meeting with Project Team to discuss anything related that you would like to be sure is included in the Red Zone Water Supply Management Plan.



Task Force Meeting #4

December 14, 2017, 9:00 AM – 11:00 AM Port Wentworth City Hall 305 S. Coastal Hwy, Port Wentworth, GA 31407

Meeting Notes

# I. Summary Presentation of Red Zone Water Supply Management Plan

A .pdf of the PowerPoint presentation is attached.

# II. Open Discussion/Comments on Draft Plan & Presentation

- Plan Adoption
  - Local governments should adopt a resolution of support or provide a letter of support. There was a recommendation that we present at Chatham Municipal Association on March 7<sup>th</sup> in place or in addition to presenting individually to each local government permittee. There was also a request that we present to Chatham County.
  - Meet with the EPD Director to present plan.
  - Meet with Coastal Regional Council to present plan.
- Data Management & Evaluation
  - There was a general discussion about potential grant opportunities to continue this work.
    - Coastal Incentive Grant would compete well for a continuation study.
    - 319 Funding would be an option for the Water Quality segments
    - Seed Grant through Coastal Regional Water Plan. Each council has about \$100K available, so the Red Zone Task Force should prioritize the top projects and submit, since the current year's deadline is too close. Be prepared to submit in late 2018.
  - There was a comment that in order to be successful that the data management and evaluation needs to be a self-funded initiative. This group would be responsible for keeping everyone active with annual updates and communication.
- Planning/Master Planning
  - Add a strategy a plan for resiliency as it relates to water infrastructure and sea level rise (relate to AWWA standard).
  - Promote more compact land development should be expanded to include a whole suite of planning best practices that could reduce the need for infrastructure. There was a suggestion to list a target density. "Consider Best Planning Practices to reduce the need for infrastructure expansion."
  - Expand and be more specific about "Link water supply master planning to future land use planning and development approval process."

- Develop a West Chatham Surface Water Strategy with the City of Savannah and other local permittees to plan for long term needs for surface water delivery and efficient connections with the City of Savannah's I&D Plant.
- Water Reclamation
  - Several permit holders mentioned that they have reuse quality water and purple pipe in new developments but no way to distribute.
  - Add a strategy to address water reclamation in the Service Delivery Strategy so that facilities producing reuse water may be able to serve potential customer outside of their municipal limits.
- Water Rate Structures
  - Add a strategy to hire an economist (potentially with the UNC Finance Center) to review rate structures in the Chatham County area and make recommendations for rate structures, based on local conditions, that will encourage water conservation and also provide sufficient funding to successfully operate the water system. This might be an option for the Coastal Regional Water Plan Seed Grants.
- Water Conservation
  - There was general discussion about success rates of different communities getting customers to sign up for online Portals. Communicating leaks or overuse is important. At this time, several only notify the water department and not the customer.
- Stormwater Capture & Reuse
  - Consider working with the warehouses, the logistics community, and other large retail rooftops to investigate the potential for stormwater capture and reuse at warehouses, especially for irrigation uses.
  - Require parking lot landscape islands to capture stormwater runoff and eliminate the need for irrigation.
- Legislative Action
  - This strategy needs to be rewritten to remove the term "permit trading" and focus more on EPD and providing compensation that would reduce the financial impact of purchasing surface water.

"Consider the potential for EPD to establish a program that will compensate permittees to voluntarily reduce their permitted groundwater usage within and near the cone of depression and switch to surface water." This strategy can only be created through a Legislative Act, similar to the Flint River Drought Protection Act. In that case, EPD was the authority tasked with operating a similar program to purchase groundwater permit capacity in the Flint River basin.

- Considerations for Regulatory Government Agencies
  - Investigate potential to provide Statewide incentives for reducing usage from non-municipal users. There may have been something similar for Power Plants. Also consider the impacts of sea level rise and climate change on water infrastructure and sources.
  - $\circ$   $\;$  Coordinate this planning process with the Coastal Regional Water Plan process.

- Under Monitoring, there was a question if we meant potentiometric head instead of piezometric head. The two terms are synonymous, but we will replace the term.
- Resources
  - Alice to provide the San Antonio Incentives link and other relevant links to include here to expand the Resources Section.
- General comments
  - Be sure to link the Red Zone Plan to the Regional Water Plan. Coordinate data collection to avoid duplication. There needs to be a reference in the Red Zone Plan about general coordination with the Regional Water Council.
  - Laura asked that we provide more detail in the introduction regarding where the 16 MGD reduction came from. This was included in previous plans but not mentioned in this one.

## III. Next Steps / Homework

- Comments on Draft Plan due Tuesday January 2, 2018
- Finalize Plan Early January
- Presentations
  - MPC. Target date January 30<sup>th</sup>
  - Municipal Permittees. It was suggested to present at Chatham Municipal Association on March 7<sup>th</sup> to cover most, but offer presentations to individual municipalities who are interested.
  - **Director of EPD**. Talk through results of the plan.
  - **Coastal Regional Water Plan Council**. They are not likely to meet before March 31<sup>st</sup>, but we should contact Shayne.
  - Other permittees. Upon request.
- Grant Closes on March 31, 2018
- Continue to monitor usage annually and update the plan in 5 years.

Task Force Kick-off Meeting, February 2, 2017, 10:00 AM Red Zone Water Supply Management Plan RON FELDNER Name ESACA BROWN Michelle Liotta genetdwards Lary Keeves avid Lyle 1025 andforden Wir / Jaisy Frechette ache MUN AL ALLEN ATVA 10XFar Indiet 4 MADIN achan Canden Cite UGA MARINE VISION/ SEASIANT GA EPD (MA. TIPD EFFINGHAM COUNTY かセラ Organization HAAAF C05 Strorgia-Pacific Menucia 60 コタセ EMD Junit 9112-238-7054 912-767-2010 964-4379 **Phone Number** 429-1794 DOLLA: KAWA @ PAPER COM Veroni acuq etra zier . civ (e muitim) Sene, & dwards @ emdgrdup.com 2 arton O city fortunder un Kury, reeves@emdsidy p.com **Email Address** TRBEOWN QUGA. EAU

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Task Force Kick-off Meeting, February 2, 2017, 10:00 AM **Red Zone Water Supply Management Plan** Tett Larson Name Ebony Simpson DCA Tidd Jords Mel Bass DR Part Server (1115 (212) 262 - 4139 Organization Solenic OVEDO 910-966 6201 912 463 9865 **Phone Number** 912658-5227 404 308-8062 Sharky Romad, CU RINA, Jack Jeff. Larson 2 dar. ga.gov Chass & silenis con Jones allong ind. con Ebony. simps in Odca.ga.gov **Email Address** 



Task Force 2<sup>nd</sup> Meeting, May 23, 2017, 10:00 AM, Garden City, GA BILL 1 Name Wichelle Liotta Katherine Delse Miccl Mel Ba Nick Helmhald guing ubally leatre Denion HANLEY /hown LP CNON ann Trechette M. Keves ANTREN JUUC iurdott SA Francer SW05t Organization One Hundred Milles Water U Solerils MP Ĩ GAWATEr Board VGA Par J-S castal Georgia Botanical Garden GA JCA Georgia EPD Georgia- Pacific 11 Runohial 1++ to of Savannah 912-6572221 Juallenia Swanggin WINNach od/er 2122306494 912-355-6400 912-210-2028 mwillism @pooler-gs gov 912 856 8997 **Phone Number** 912-166.6201 912-767-2010 112 621 14201 (912)767-2010 474-1744 912.826.9120 912-921-5460 234-1568 edentiel tom #1340 Bellow wer X Starley, thomas, ave wit, mil helinhaldtige the unperioren Veronice. of trazier . cir ( reil-mil benjamin cantrell@uga.edv. alice perchadredmites. Er MAN DWATERGAICOM **Email Address** michelle. Liotta gapac, com 15urdesose Mendial Aprilta COASS & Salanis - Com Kadoca uga. edu

Task Force 2<sup>nd</sup> Meeting, May 23, 2017, 10:00 AM, Garden City, GA

Name Todd pover Churchettartman UGA-Skidaway 912-598-2442 ChurtsTeuga.edu Churchettartman UGA-Skidaway 912-598-2442 ChurtsTeuga.edu EBSICABEONN UGA MARGNELERTÉANT 9121264 7341 JARBEONNEUGA.EDU Jachie Hackson Row FEDNER OSept Bliedman Sevennet Acid VIen7 Organization Wany Ind. Conden Cit GC Ald-652 - (15) Joseph Hackmon & Signalaciels com 912-944-3740 **Phone Number** tjones@duknyind.com **Email Address** 

Task Force 3<sup>rd</sup> Meeting, August 8, 2017, 10:00 AM, The Landings, Savannah, GA thely clarton SEN Deatre Name Alice Keves "had raceod Mel Bros MART MCORMACK KEEVES YOUNG Dive Frechette CAN . Ich Helmhold Kelly ony Abnot vthay hom ANTRELL J. ist te Hach tie One Hundred Miles REVES Loung CERSO Lide ted Willities 94233-472 fort Wentworth Organization DOL MPC STATE Bard Jolenis GA DNP VOA 6002 62 EPD 1 678-414-9875 mmcconnect creevesyoung.com 912 856 8997 412 230 64 94 8088 064044 9126561316 964-6201 912 651 1454 **Phone Number** 014-437 912-2341568 912,826,9120 704-4136 edonticle tom A 134 Bellow actanta City of orther works alice ( cnetrundrechilles.org destre denion of dea. ga. gar michelle Liotter anciero @ Reevestoura.com banjamen Cantrelleugered Kelly, Hill edning a. Sov Chass & Solenii . com **Email Address** Powtwey Ocolos ralplanning helmholdta Othemper or Mabe Dealogical panningrad



**Red Zone Water Supply Management Plan** 

Task Force 3<sup>rd</sup> Meeting, August 8, 2017, 10:00 AM, The Landings, Savannah, GA Name Kos RELONGA a wa wad ionica trader achiel tha helly Sackmon simpson Sm th hadys. rown May Keg 4 Organization City of hincon 912 826 5976 theley Ocityofrincon.com Ethlyhan Co. 8 2 Garden ( Savanah Heid Vanz FS/HAAF Afen Uti CROE hunderbo CPC 1 yher SOU ) ( A ctro-とし San JUNY -Idaler omn 5h52-2h2-216 912 - Cold - 8109 jough, blackmon Osix unabacides con 912-651-2221 912 - 748-4800 MW. 117ms & Doller - 57.901 912-767-2010 9/2-766-7777 Jacking Contendy: pr. or 912-966-7777 **Phone Number** 912 003 9805 912-659-1694 912-484-7821 912-355-6400 617 - NN- A132 roweilla thunder Bolton org wearb. Acensulting o small cond Veronica. q. trazicr. cive mail. mil ebony, simpsin(adca.ga.go) manderiaterap . 10 m Iwell he a schonneh ge **Email Address** Appan a city of typee, org Starly, thomas an i Call @ Monthing! ON TILE

**Red Zone Water Supply Management Plan** 



Red Zone Water Supply M	Ianagement Plan		AN COUNTY SAN
Task Force 4 <sup>th</sup> Meeting, Do	ecember 14, 2017, 9:00 AM, Ci	ity Hall, Port Wentwort	th, GA
Name	Organization	Phone Number	Email Address
Tom A. Edenfield	STATE WAter Board	912 234-1568	& denfiel drown A134 P Bell Santh it
Michelle Liste	G-P & Coastal Resional Water Council Resional	9112.826.9120	Michelle, Lister 2 gaparicon
Veronica Frazier	DPW Env.	912-767-2010	Veranica.q. frazier.cv Oneuil.m.1
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Stroky Thomas	DAN EN	6/22-2010	Starley. Thame 2. Gov Count. unit
Chuck Hartman	UBA-Skidaway Inst	thre 345 210	churts70 ugared
Kevir Kalston	Sccpss	912-675-1816	Levin, ralster @ Sicpss, com
WADE BURGHAM	ISE	5260 094 216	WBURCHAM@ INTSE.com
Nick Helmholdt	MPC	621 1454	beline ist and the up a son
Ashley Rusnak	International Paper	912-856-0205	ASNey, Rusnelce ipeper. com
Jarrod Waller	Savariah Sugar 120%.	5806-126-216	Jarrod. Waller Olde.com
Logan Abbott	Consolidated utilities Inc.	112-429-2964	Logan Oconsolidated utilities . Cou
Phillip Clarton	Port WEntworth	912-964-4379	Octavium Deity & aturtante con
Sen ANTRELL.	U6A,	92856 8797	Benjamin. Centre/10 uga. Osu
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Red Zone Water Supply Management Plan

Task Force 4th Meeting, December 14, 2017, 9-00 AM 2 

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Name	Organization	Phone Number	Email Address
Sucoh Oblande	Savannah Risekeeps	912-454-8049	i acodo Savamah Rivertanez. an
AliceLeyes	Crethnored Miles	2122306 day	dice crehediesnies.or
Mark Williams	City of Pooler	912-210-2028	parcial isons @pecker-9 8.50
David Lyle	GA EPD	912-262-3296	david. He connarion
Icura wealle	Nos	912-1057-222	1 walker Buannah
Ebony Simpson	DCA	912 UU 3 9845	AND BURGER AND MULLE
TONYILLANA	t Conselidated Utilitie	0 912-235-325	
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