ROSWELL
GEORGIA
SINCE 1854

City of Roswell, Georgia

WATER SYSTEM MASTER PLAN

July 2010

Prepared by

GRESHAM
SMITH AND
PARTNERS

27395.04

LIST OF TABLES Page No.

LIST OF FIGURES

APPENDICES

Table of Contents

1.0 Introduction

In February 2010, the City of Roswell retained Gresham, Smith and Partners (GS&P) to assist the City with developing a Water System Master Plan. The purpose of the Plan is to analyze the existing Roswell Water System and its future growth potential, and then identify system improvement options to meet its future needs. Goals identified for the planning project were as follows:

1. Provide reliable supply during peaks and droughts;
2. Provide cost effective service;
3. Diversify and expand water sources to meet projected service area demand;
4. Work towards targets of 3 million gallons per day (MGD) surface water and 2 MGD groundwater; and,
5. Stakeholder acceptance.

The Plan presents options to satisfy the anticipated growth of the Water System. Additionally, preliminary planning level cost estimates have been developed for each of the improvement options. The options address improvements and/or expansions of supply sources, water treatment facilities, storage facilities, and the distribution system.

The City of Roswell is part of the Metropolitan North Georgia Water Planning District (the District) whose primary purpose is to provide plans for the management of stormwater, wastewater treatment, and water supply and conservation within the District. These three management plans were created to protect water quality and public water supplies in and downstream of the region, protect recreational values of the waters in and downstream of the region, and minimize potential adverse impacts of development on waters in and downstream of the region. Local government and utilities hold the responsibility for implementation of these plans.

In May 2009, the Metro Water District released the 2009 update of the Water Supply and Water Conservation Management Plan (Metro Water Supply Plan). In Section 9 of the Metro Water Supply Plan, Action Item 9.1 calls for local water providers to develop their own local water master plans. Section 9 also provides guidance for the development of these local master plans. The Roswell Water System Plan was developed in accordance with this guidance.

The Metro Water Supply Plan also proposed specific local water supply expansions to meet future demands of the District. The proposed expansion for the Roswell Water System is to increase production capacity to 3 MGD by 2010 and to 5 MGD by 2015. The Roswell Water Master Plan provides options to meet these supply expansion goals.

2.0 Existing Water System

2.1 Existing Water Demand

Water system records for 2008 and 2009 were evaluated for the Roswell Water System to determine the average raw water withdrawn and treated water pumped to the distribution and storage systems. A summary of the System's water use is provided in Table 1.

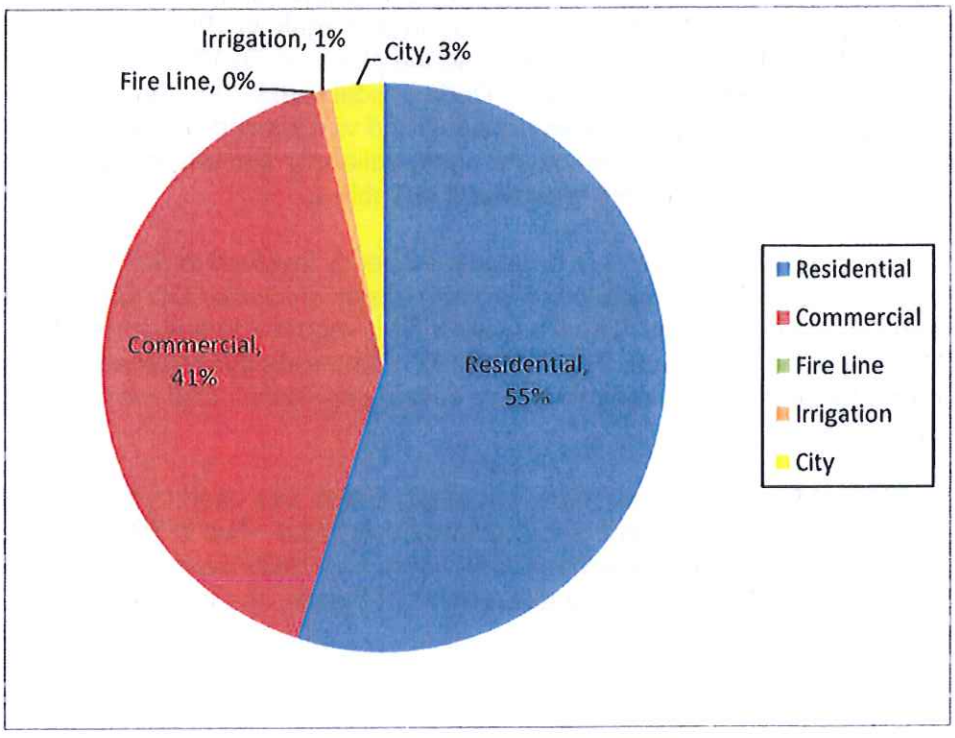
Table 1 Summary of 2008 -2009 Water Use

	2008	2009
City of Roswell Water Production (Daily Average, MGD)	0.94	1.00
Purchased from Fulton County (Daily Average, MGD)	0.59	0.57
Total System Use (Daily Average, MGD)	1.53	1.57
Peak Month/Annual Average	1.51	1.19

In 2009, the Roswell Water System served 14,100 customers (5,500 meters). The per capita water use for 2009 was 111 gallons per day. The percentage of the different types of water users of the Roswell Water System are shown in Figure 1.

It is important to note that during the period evaluated, Georgia was under an extreme drought, and water use was limited. Under normal conditions--non-drought years--the City of Roswell's normal usage pattern for consumption is approximately 2.0 MGD during the winter months and between 2.5 and 2.7 MGD during the summer months.

Figure 1 Water Consumption by Type of User



2.2 Water Supply

The City of Roswell has an EPD approved permit to withdraw raw water from Big Creek (Permit number #060-1209-01, effective date October 31, 2001, expiration date November 1, 2011). This permit allows withdrawals from Big Creek for municipal water supply purposes of up to 1.2 MGD while not exceeding 1.2 MGD in any 24 hour period. The raw water is pumped from the intake on Big Creek to the Roswell Water Treatment Plant (WTP). The location of the raw water intake and Roswell WTP are shown in Figure 2.

The Roswell Water System purchases additional water needed to meet its demand from Fulton County which withdraws water from the Chattahoochee River through the Atlanta-Fulton county Water Resources Commission. In 2008, the City purchased an average of 0.59 MGD (39% of its daily demand) and 0.57 MGD (36% of its daily demand) in 2009 from Fulton County. The City uses two main interconnections with the Fulton County System located at 10489 Alpharetta Highway and 800 Pine Grove Road. The locations of the two main interconnections are shown in Figure 2. Additionally, the City maintains four additional interconnections with the Fulton County Water System to provide an emergency back-up supply of water.

2.3 Water Treatment

The existing Cecil B. Wood WTP is a conventional technology water treatment plant including chemical addition, rapid mixing, flocculation, sedimentation, filtration, disinfection, and pumping into the distribution system. Solid treatment lagoons are used to recover waste solids for periodic disposal and discharge decant water to Hog Waller Creek via a National Pollutant Discharge Elimination System Permit. The plant was originally constructed in 1935 with a rated capacity of 0.3 MGD. The plant was upgraded again in 1955 to a rated capacity of 0.6 MGD. The last major upgrade to the plant was in 1990 when it reached its current rated capacity of 1.2 MGD. During fiscal years 2007 through 2009, a variety of major equipment was replaced and various improvements were made to the Roswell WTP to enhance the plants reliability and efficiency. A list of these recent improvements is provided in Table 2.

The Roswell WTP has seven employees directly involved in daily plant operations: a Water Operations Manager, Assistant Water Operations Manager and five plant operators. The Roswell WTP is required to have one Class I State Water Certified Operator. The Roswell WTP exceeds this requirement. There are currently three Class I operators, two Class II operators, and two Class III operators.

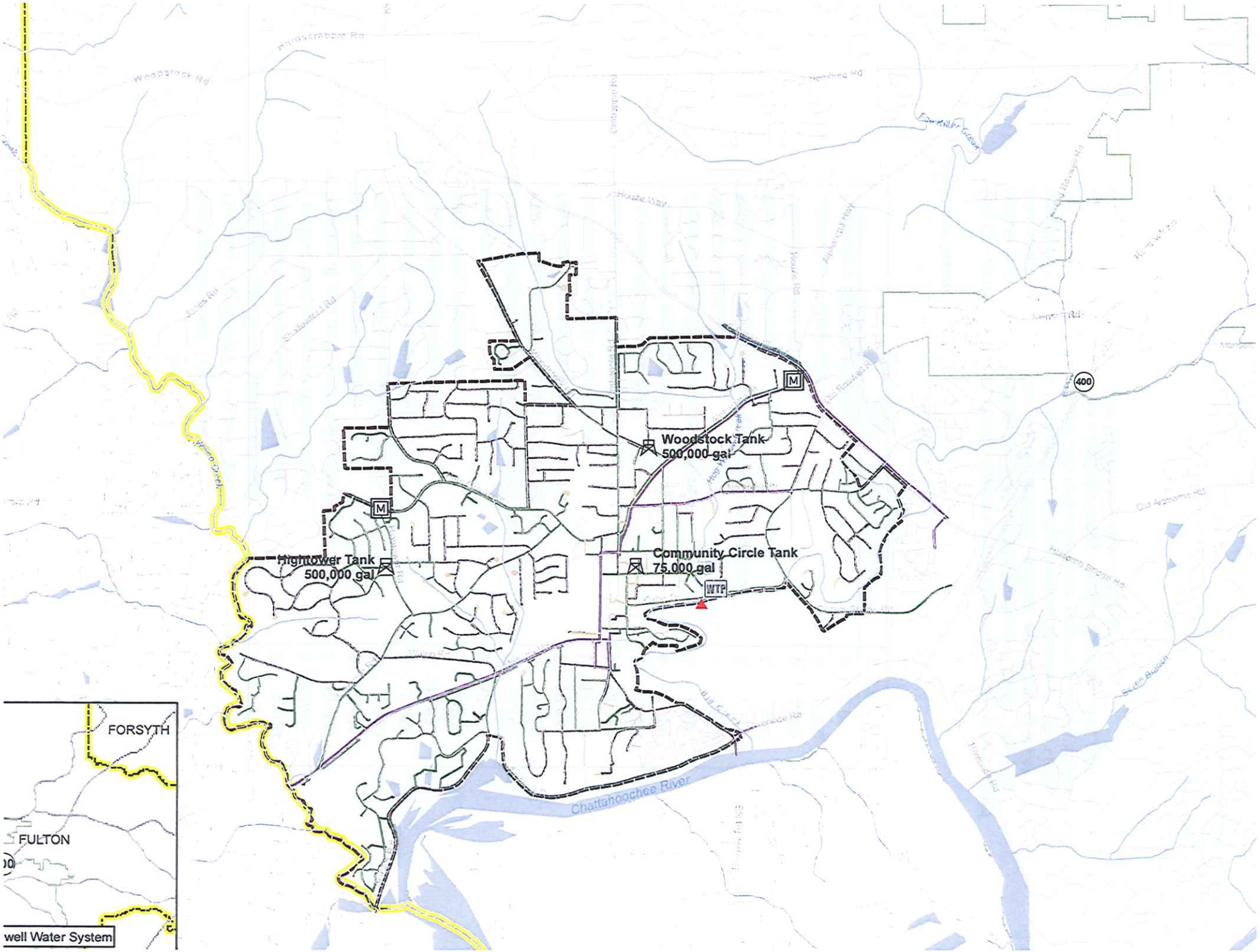
In 2009, 4.5% of water withdrawn from Big Creek was used by the WTP. Most of the water used at the plant is for backwashing filters. The WTP operators monitor the number of filter backwash hours on a daily basis. Other in-plant water uses include laboratory use, chemical feeder, and lavatory.

Table 2 Water Treatment Plant Improvements in Fiscal Years 2007 through 2009

Improvement	Cost
Two new Soda Ash Dry Chemical Feeders	$ 37,500
Two new Fluoride Dry Chemical Feeders	$ 37,500
One new KMNO4 Dry Chemical Feeder	$ 17,600
Clearwell level indicator replacement	$ 4,800
TracVac Sludge System Replacement	$ 69,960
Painting of pipe gallery and raw water intake	$ 18,925
Raw Water Intake dredging	$ 58,500
Raw Water Intake Security Fencing	$ 2,970
Laboratory floor replacement	$ 3,966
Flocculator Baffle replacement	$ 120,687
Filter media replacement	$ 14,000
New roof	$ 12,150
New heating/air conditioning unit for control room	$ 5,200
New heating/air conditioning unit for laboratory	$ 4,890
New water plant security camera system	$ 19,547
Concrete repairs to clearwell #1	$ 17,900
Five new 1720E Turbidimeters	$ 14,280
Two new chlorine analyzers	$ 7,958
Two new raw water pumps	$ 59,720
Chlorine manifold controller replacement	$ 1,837
New raw water meter	$ 5,730
Maintenance building heating/air conditioning unit	$ 1,176
New post-flash motor	$ 970
Laboratory Incubator	$ 2,389
Laboratory Turbidimeter	$ 1,760
Laboratory Spectrophotometer	$ 3,012
Total	**$ 544,927**

2.4 Water Distribution

The City of Roswell Public Works/ Environmental Department uses a GIS based system to maintain and update the water distribution system maps. The GIS data maintained by the City includes the size, material, and length of water distribution pipes, valves, fire hydrants, fittings, meters, structures, and vaults. The data is continually updated with new information regarding details of pipe, valve and meter location and installation/repair dates of facilities. The pipe network of the Roswell Water System is shown in Figure 2.


Woodstock Tank
500,000 gal
Hightower Tank
500,000 gal
Community Circle Tank
75,000 gal
WTP
M
400
Chattahoochee River
FORSYTH
FULTON
well Water System

As of September 14, 2009, the total length of pipeline in the distribution system was 432,188 feet or approximately 82 miles. The pipes range in size from 1" to 12" as summarized in Table 3.

Table 3 Pipe Size and Length throughout System

Pipe Size	Pipe Length (linear feet)
2.5" or less pipe all classes	23,137
4" pipe all classes	8,487
6" Ductile Iron	29,336
6" Cast Iron	117,945
6" AC	24,398
6" GS	15
6" Unknown material	1,037
8" Ductile Iron	153,748
8" Cast Iron	40,790
8" AC	1,245
8" Unknown material	1,957
10" Unknown material	217
12" Ductile Iron	29,873
12" Unknown material	3
TOTAL	**432,188 (82 miles)**

2.5 Water Loss Reduction Program

The City initiated an aggressive water loss reduction program during 2007 that has substantially reduced water loss from the distribution system. From 2004 through 2006, the City's non-revenue water averaged 21.2%. In 2007, the total water loss was determined to be 16.2%. In 2008, using AWWA water audit procedures, water lost from the system was determined to be 16.0%. In 2009, water lost from the system was 12.8%.

2.6 Finished Water Storage

The Roswell Water System currently has three elevated finished water storage tanks:

Community Circle	75,000 gallons
Woodstock	500,000 gallons
Hightower	500,000 gallons

The locations of these tanks are shown in Figure 2. The water levels in these tanks are monitored through the City's supervisory control and data acquisition (SCADA) system. The SCADA system notifies the WTP operators when the tanks levels are too high, and they can make adjustments to prevent tank overflows.

2.7 EPD Sanitary Survey

A sanitary survey of the Roswell Water System was conducted on February 22, 2010 by the GA EPD. The System's overall score was 93.9% which is the category of "Outstanding Performance". The results of the GA EPD Sanitary Survey are provided in Appendix D.

3.0 Future Needs

3.1 Population Projection

The growth rate of the population served by the Roswell Water System was estimated based on the Atlanta Regional Commission's (ARC) census tract level population projections published in 2006. The Roswell Water System serves customers in census tracts 114.05, 114.06, and 114.07. The percentage of each tract served by the Roswell System was estimated as shown in Table 4. The ARC's projections were only made through 2030. The 2025-2030 growth rate from the ARC data was used to project the population from 2030 to 2060. The highlighted column in Table 4 provides the projected population served by the Roswell Water System through 2060.

Table 4 Population Projections

Year	Census Tract 114.05		Census Tract 114.06		Census Tract 114.07		Total Estimated Population Served by Roswell Water System	Notes
	Total Population	Estimated Population Served By Roswell Water System in Tract (55% of Tract)	Total Population	Estimated Population Served By Roswell Water System in Tract (85% of Tract)	Total Population	Estimated Population Served By Roswell Water System in Tract (29% of Tract)		
2000	6,493	3,571	7,771	6,605	9,456	2,742	**12,919**	Population data from ARC GIS data set
2009	7,369	4,053	8,269	7,029	10,401	3,016	**14,098**	
2010	7,498	4,124	8,017	6,814	11,666	3,383	**14,321**	Population data from ARC E6 population forecasts done in 2006
2015	7,926	4,359	7,828	6,654	11,836	3,432	**14,446**	
2020	8,431	4,637	7,921	6,733	12,201	3,538	**14,908**	
2025	9,030	4,967	8,538	7,257	12,978	3,764	**15,987**	
2030	9,501	5,226	8,611	7,319	13,585	3,940	**16,485**	
2035	9,997	5,498	8,685	7,382	14,220	4,124	**17,004**	Projections developed using % change in population from 2025 to 2030 of ARC projection data
2040	10,518	5,785	8,759	7,445	14,885	4,317	**17,547**	
2050	11,615	6,388	8,909	7,572	16,278	4,721	**18,681**	
2060	12,827	7,055	9,061	7,702	17,801	5,162	**19,919**	

3.2 Water Conservation

The implementation of water conservation measures has become extremely important in the State of Georgia due the recent drought (2007-2009) and the tri-state water wars. Additionally, the City of Roswell is part of the Metro North Georgia Water Planning District (MNGPD) and could be subject to drastic water conservation requirements should the withdrawals from Lake Lanier be limited by Judge Magnusson's ruling. The specifics of these potential requirements are outlined in the Water Contingency Planning Task Force – Findings and Recommendations Report (Task Force Report) dated December 2009.

The City of Roswell has adopted a Water Conservation Plan which identifies on-going and future measures to reduce the per capita use of water. The Roswell Water Conservation Plan meets the requirements laid out in the Task Force Report. The effect of implementation of water conservation measures was estimated as a percentage reduction in per capita water use and incorporated into the water demand projections. (See Section 3.3)

3.3 Water Demand Projections

The future water demand for the Roswell Water System was estimated based on the population projections in Section 3.1 and the per capita water use with the incorporation of reduction of water use due to conservation. Water conservation measures are estimated to result in a cumulative reduction in per capita consumption of 40% from 2005 to 2060. Table 5 shows the projected water demand for the Roswell Water System for 2010 to 2060.

Table 5 Projected Water Demand for Roswell Water System

Year	Population Served	Demand Reduction Due to Water Conservation, % [3]	Per Capita Water Use, GPD	Average Water Demand, MGD	Average Withdrawal, MGD [2]	Peak Water Demand, MGD [1]	Peak Withdrawal, MGD [1],[2]
2005	13,751		169	2.33			
2007	13,956		133	1.85			
2009	14,100		111	1.57	1.64	2.51	2.62
2010	14,321		111	1.59	1.66	2.55	2.66
2015	14,446	2%	109	1.58	1.64	2.52	2.63
2020	14,908	2%	107	1.59	1.66	2.55	2.66
2025	15,987	1%	106	1.69	1.76	2.71	2.82
2030	16,485	1%	105	1.73	1.80	2.76	2.88
2035	17,004	1%	104	1.76	1.84	2.82	2.94
2040	17,547	1%	103	1.80	1.88	2.88	3.00
2050	18,681	1%	102	1.90	1.98	3.04	3.17
2060	19,919	1%	101	2.00	2.09	3.21	3.34

Notes:

[1] Peaking factor of 1.6 used.

[2] Assume production efficiency of 96%

[3] Percentage reduction due to water conservation achieved during the preceding time period (5 or 10 years).

Sections 4 through 7 of the Plan discuss options for the City of Roswell to consider for expanding its water supply to meet the growing demand of its System and for improving the System's operation and management. An economic analysis of five scenarios of the most viable improvement options is provided in Section 8.

4.0 Expansion of Surface Water Supply

The City is currently working with the Georgia Environmental Protection Division (EPD) to increase its permitted withdrawal from Big Creek from 1.2 MGD to 3 MGD. The permit modification process is expected to be lengthy, and it is uncertain if the requested permit modification will be approved.

5.0 Development of Groundwater Supply

5.1 Development of Deep Wells

In 2007, the City of Roswell retained the services of Emery & Garrett Groundwater, Inc. to perform a groundwater exploration and development program. Since that time, the City has pursued a multi-phased groundwater development program.

Phase I - Identify groundwater development zones within a one-mile radius of the existing Roswell water distribution system that have a moderate to high potential for providing significant groundwater supplies.

Phase II - *Conduct geophysical surveys to identify exploratory well sites within the groundwater development zones identified in Phase I.*

Phase III - *Conduct exploratory test well drilling at sites identified in Phase II to determine preliminary yields.*

Phase IV - *Convert the wells identified as the highest yielding in Phase III to production wells.*

Phase V - *Perform sustainable yield and quality testing on the production wells developed in Phase IV.*

Phase VI - *Prepare Final Hydrogeologic Report which defines a Groundwater Use Management Program*

Phase I of this program was completed in October 2007 and identified 13 potential ground water development zones within the one-mile radius of the Roswell distribution system. Phase II of this program was completed in November 2008. Thirty-five potential exploratory test well sites were identified in Phase II. Of the thirty-five potential test well sites, sixteen sites were recommended to be considered for exploratory test well drilling in Phase III. The exploratory test well and yield and quality phases have been performed for one of these recommended sites which is discussed in Section 5.1.1 below. Work past Phase II has not yet been performed at any of the other recommended sites. These additional sites are discussed in Section 5.1.2 below.

5.1.1 Initial Deep Well Development

The City of Roswell has decided to develop one of the well sites identified as a viable water supply source. There are two wells at this site. The

location of these well is shown on Figure 3. Sustainable yield and quality testing has been performed on these wells. It was determined that these wells will not provide a constant supply. However, the wells could supply water in a given thirty day period at 250 gpm (0.36 MGD) for fifteen days and would need to be allowed to recharge for fifteen days. The water quality testing of the well water indicates that all treatment could be performed at a well house on site and then distributed to the system.

The Army Corps of Engineers (ACOE) has agreed to provide financial assistance for development of these two wells as part of its Atlanta Environmental Infrastructure Program. The ACOE has proposed a cost share ratio of 75% Federal (ACOE) and 25% non-Federal (City of Roswell).

5.1.2 Additional Deep Well Development

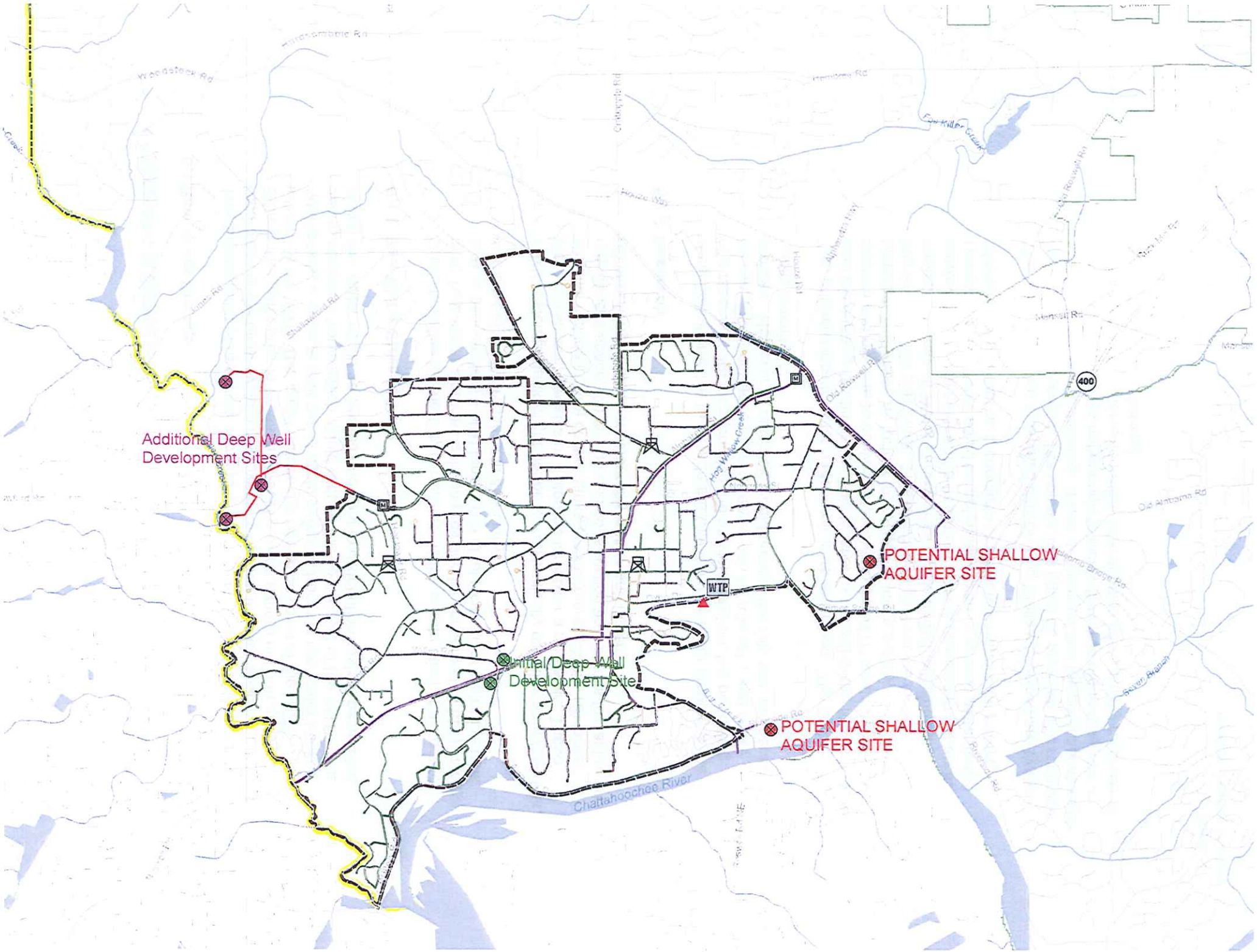
Phase II of the groundwater exploration program identified additional well sites with potential to serve as production wells. Exploratory test wells will need to be installed to determine the potential productivity of these well sites. The locations of these additional deep well sites are shown in Figure 3. These sites are on private property which poses a problem for access. If these wells proved to be productive, the City would have to purchase easements or the entire site from the existing landowner to use these wells. Additionally, some of these sites are a significant distance away from the exiting distribution system. Transmission lines would have to be installed to connect to the system which adds to the cost of developing these wells. Because of these factors, the City has decided to postpone exploratory test well drilling at these sites and pursue other water supply sources. Additional deep well development may be reconsidered in the future, particularly if the City's service area expands, or if alternative sources do not yield adequate supply.

5.2 Acquisition of Additional Deep Wells

The City of Roswell is investigating the feasibility of acquiring existing well sites to supplement its groundwater supply resources.

5.3 Development of Shallow Aquifer Wells

The City is just beginning to explore two shallow aquifers as part of its ground water investigations and the feasibility and cost associated with this potential resource cannot be determined at this time. Further investigation is required to determine whether this option is cost effective as a potential additional water supply resource. Results in Forsyth County suggest that local shallow aquifers have the potential to yield useful quantity and quality ground water. This option warrants preliminary investigation to assess its feasibility, including potential quantity, quality, regulatory requirements, and costs to develop shallow ground water.


Additional Deep Well
Development Sites
POTENTIAL SHALLOW
AQUIFER SITE
WTP
Initial Deep Well
Development Site
POTENTIAL SHALLOW
AQUIFER SITE
Chattahoochee River
400

6.0 Expansion of Storage Capacity

6.1 Raw Water Storage

The development of raw water storage is a priority for the City of Roswell, regardless of the other system improvement options the City decides to pursue. Storing raw water prior to treatment would provide a more uniform quality of influent to the WTP. This could reduce the operation costs of the WTP. Additionally, a storage tank would allow pumping from the raw water intake during non-peak hours which would reduce the power cost of the WTP. The stored raw water would be treated and sent to distribution system as needed.

6.1.1 Raw Water Storage Tank

One alternative for the City to consider is the construction of a storage tank. Raw water storage could be provided by one large (10 MG) storage tank or two smaller (5 MG) tanks. The ideal location for a storage tank would be at the WTP site or in its vicinity.

While a storage tank might not be as aesthetically pleasing as a reservoir, there are several benefits of a storage tank over a reservoir. These benefits include (1) the cost of tanks are more predictable, (2) tanks require less space, (3) design and construction time is less for tanks, and (4) permitting of tanks considerably easier and faster.

6.1.2 Reservoir

A second alternative to provide the City with raw water storage is the use of a reservoir. As mentioned in the previous section, the permitting, design, and construction of a reservoir can be a lengthy and costly process. However, a reservoir would provide the City with the benefit of a public amenity.

Two potential locations for a reservoir were examined. The first location was the existing Martin Lake. This location is not within the Roswell Water System and pipeline to convey raw water to the WTP would have to be installed. Therefore, no further investigation into a supply reservoir at Martin Lake was performed. This location might become more feasible should the Roswell Water service area be expanded to include the area surrounding Martin Lake and a treatment plant is provided in the area. However, Martin Lake could be potentially used to release water to the Chattahoochee River as a condition of a Roswell withdrawal permit.

The second location examined was on Hog Wallow Creek where Waller Park is currently located. The volume that could be provided at a reservoir at this location was estimated. It was determined that the potential storage volume at this site was not enough to justify the costs of the reservoir development. Therefore, no further investigation into a supply reservoir at Waller Park was performed.

6.1.3 Aquifer Storage and Recovery (ASR)

ASR would involve either infiltration ponds or injection wells to store water in a subsurface aquifer during wet periods, which can then be used during dry periods. The feasibility of ASR depends on a number of factors, beginning with local aquifer hydrogeology and their proximity to available ground water and surface water sources. ASR feasibility may warrant consideration in areas where hydro-geologic conditions are favorable, if identified during the City's ground water exploration and development program.

6.2 Finished Water Storage

The City currently has the three finished water storage tanks which provide a total of 1.075 MG of storage. If the City expands its water supply from surface water and/or groundwater, additional finished water storage should also be considered. Finished storage facilities provide many benefits to a water system. Finished storage can supply water for the peak hour demands, provide water in emergency situations such as interruptions in supply due to power outage or maintenance, provide additional water for fire flows, and stabilize water pressures in the system.

Prospective elevated storage tank locations should be determined based on distribution system modeling to maximize system operating benefits. For example, locations near the edge of the existing system would help to stabilize system pressure, while locations near the water treatment plan or future production wells make tank fill operations easier. A location already owned by the City to avoid the purchase of additional property. A project definition statement and a cost estimate for the construction of 1 MG elevated storage tank are provided in Appendix B, and cost analysis for the project is provided in subsequent sections of the Plan.

7.0 Expansion of Treatment Capacity

The City's water production currently operates at the plant's available capacity and peak system demand is met by purchasing wholesale water from Fulton County. If the EPD approves the increase of the surface water withdrawal permit, the City could expand its treatment capacity and reduce its reliance and expenditures on wholesale purchases. Three alternatives for increasing plant capacity examined were the construction of a new 3 MGD WTP, high rating the existing WTP to 1.5 MGD, and the construction of a new 2 MGD WTP.

The first alternative considered was the construction of a new 3 MGD plant at the existing WTP site. The existing WTP could be decommissioned when the new plant construction is complete. A 3 MGD plant would provide the capacity for the City to meet the annual average demand of its entire system and handle peak day demand through 2025. With additional storage capacity, a 3 MGD plant could likely handle most peak day demands of the entire system through 2060.

Another alternative considered was increasing the existing WTP capacity by high rating its filters. This alternative has the lowest cost of the treatment capacity

expansion alternatives. By increasing the filtration rate the WTP could be increased to 1.5 MGD. This would allow the City to reduce the amount of water it purchases. However, the City would still have to rely on purchased water to meet its existing demand. It is not clear whether Georgia EPD would permit a higher filter rating to this facility due to its age. It is possible that additional costs (such as raw water storage or other improvements) may be necessary to facilitate the high rating of the filters.

Another alternative to increase treatment capacity is to construct a new 2 MGD WTP and continuing the use of the existing WTP at 1.2 MGD. The existing WTP's useful life is anticipated to be around 10 years. When the existing WTP has to be decommissioned, the new WTP could be expanded as needed.

8.0 Economic Analysis

8.1 Key Assumptions

Future water supply options were evaluated based on their capital, operating, and life-cycle costs expressed as net present value. Net present value calculations assume an annual inflation rate of 2.5% and a discount rate of 5%.

Capital costs were determined in 2010 dollars, based on the cost of completing similar projects. It should be noted that construction market conditions have been highly volatile during the past 10 years, including several years of dramatic cost escalation in 2000 to 2005, followed by the recent economic recession in 2007 to 2010.

8.2 Descriptions of Future Scenarios

A complete cost analysis of each of the following four scenarios has been developed and is presented in this section:

Scenario 1 – Increase Ground Water Supply

This scenario depends on securing approximately 2 MGD on an annual basis from ground water sources. The most likely sources of high yielding wells are high yielding wells outside the City, or shallow aquifers that have not yet been explored. Treatment required may vary from chemical addition to full conventional water treatment, depending on ground water quality. Each well field would require a well pump as well as chemical addition and potentially further treatment depending on water quality, and conveyance to the City's water distribution system.

Scenario 2 – Increase Surface Water Production with New 3 MGD Water Treatment Plant

This scenario depends on securing an increase in the withdrawal permit from Big Creek up to 3 MGD and a new water treatment facility. The existing Cecil B. Wood Water Treatment Plant is old and does not meet the City's current water capacity needs. A new treatment facility would require less refurbishment, repair, and operator attention to product high quality drinking water. A key component of this alternative is a new raw water storage tank to provide storage during low flow periods and reduce raw water quality variation. This alternative requires capital investment to fund construction of a new plant. The new plant will substantially reduce the marginal cost of water production due to economies of scale, reduced water quality variation, and lower repair and refurbishment requirements.

Scenario 3 – High Rate Existing Water Treatment Plant to 1.5 MGD

This scenario would increase capacity by an estimated 20% from the current 1.2 MGD to 1.5 MGD. Due to the age and construction of the existing WTP, this scenario does not meet the goal of providing self sufficiency, without additional ground water or surface water supply and treatment capacity. If successful and approved by EPD, high rating will provide an interim step towards self sufficiency with a very low marginal cost for added capacity.

Scenario 4 - Increase Surface Water Production with New 2 MGD Water Treatment Plant

Similar to Scenario 2, building a 2 MGD new water treatment plant provides many of the same benefits at a lower capital cost with a lower production capacity capable of providing the average system for the next 30 years. Capacity would not be sufficient to meet current peak demands and additional supplies (ground water and/or purchase of drinking water from neighboring systems) would be required.

8.3 Capital Cost Estimates

The capital costs were estimated for the most viable improvement options described in Sections 4 through 7. Project definition statements and breakdowns of capital cost estimates are provided in Appendix A. These estimates were based on bid tabulations from previous projects, published industry guidance, and our professional experience. Each of these capital improvements is a component in one or more of the four scenarios for which a life cycle cost analysis has been performed. A summary of the capital costs associated with each improvement option is provided in Table 6.

Table 6 Summary of Capital Cost Estimates

Description	Estimated Capital Cost (2010 Dollars)
1 MG Finished Water Storage Tank	$ 2,582,120
10 MG Raw Water Storage Tank / Intake PS and Raw Transmission Line Replacement	$ 5,283,736
Deep Well Development / ACOE Partnership	$ 140,000
Shallow Aquifer Well Development	$ 1,548,204
New 3 MGD WTP	$ 8,400,000
High Rate Existing WTP Filters	$ 351,800
New 2 MGD WTP	$ 5,600,000

8.4 Operating Cost Estimates

To complete a life-cycle cost comparison among potential scenarios, operating costs were projected for each of the scenarios evaluated. The average operating and maintenance cost was estimated for each scenario. The major differences among the scenarios are the portion of the annual water demand provided from 3 different sources: 1) the City's WTP; 2) ground water wells; and 3) wholesale purchase from Fulton County. Each of these three potential supply sources has a different marginal cost of production.

Table 7 summarizes the forecasted annual operating cost for each scenario with additional supporting information on the projected quantities and cost of each water source provided in Appendix B. The remainder of this section summarizes the estimated the operating and maintenance costs associated with the three sources.

Table 7 Forecasted Operating Costs for Improvement Scenarios[1]

Year	Scenario 1 - Increase Ground Water Production		Scenario 2 - Increase Surface Water Production with New 3 MGD WTP		Scenario 3 - High Rate Existing WTP to 1.5 MGD		Scenario 4 - Increase Surface Water Production with New 2 MGD WTP	
	Annual O&M Cost, $	Average O&M Cost, $/1000 gal	Annual O&M Cost, $	Average O&M Cost, $/1000 gal	Annual O&M Cost, $	Average O&M Cost, $/1000 gal	Annual O&M Cost, $	Average O&M Cost, $/1000 gal
2008	$ 1,256,890	$ 2.22	$ 1,256,890	$ 2.22	$ 1,256,890	$ 2.22	$ 1,256,890	$ 2.22
2010	$ 1,190,457	$ 2.05	$ 1,190,457	$ 2.05	$ 1,190,457	$ 2.05	$ 1,190,457	$ 2.05
2015	$ 1,213,023	$ 2.02	$ 917,384	$ 1.52	$ 917,384	$ 1.52	$ 917,384	$ 1.52
2020	$ 959,934	$ 1.55	$ 877,487	$ 1.41	$ 960,535	$ 1.55	$ 877,487	$ 1.41
2030	$ 977,221	$ 1.50	$ 887,445	$ 1.37	$ 1,025,940	$ 1.58	$ 887,445	$ 1.37
2040	$ 996,751	$ 1.46	$ 898,694	$ 1.32	$ 1,099,825	$ 1.61	$ 898,694	$ 1.32
2050	$ 1,025,287	$ 1.40	$ 915,132	$ 1.25	$ 1,207,788	$ 1.65	$ 915,132	$ 1.25
2060	$ 1,049,811	$ 1.36	$ 929,258	$ 1.21	$ 1,300,572	$ 1.69	$ 929,258	$ 1.21

[1] The average operating and maintenance cost was estimated for each scenario. The primary differences among the scenarios are the portion of the annual demand that is provided from each of 3 sources: 1) the City's WTP; 2) ground water wells; and 3) wholesale purchase from Fulton County. Details of the future projected quantities and cost from each source are provided in Appendix B.

8.4.1 Roswell WTP Production Costs

Future WTP operating costs were estimated based on review of current WTP costs and factors that will affect annual expenses in the future. The current plant operating budget was reviewed to determine the current cost of water production. During this review, it was determined that several one time capital repair and refurbishment expenses were included in the water plant operating budget which are not related to water production. For example, funding for the ground water well exploration program, security system installation, flocculator baffles, sludge removal equipment, and chemical feeders are costs that were removed as non-routine (e.g., capital) costs or costs that are not annual surface water treatment operating costs (e.g., ground water exploration and well development). The current cost of production per 1000 gallons was estimated at approximately $2.27.

For this analysis, the fixed costs of the existing WTP are assumed to be constant in the future, with variable costs increasing in proportion to water production. Due to the small size of the water treatment plant, there are substantial fixed costs that will not increase with increasing water production, including labor costs. The current operating staff of 7 full time positions is not anticipated to increase in the future. Of current annual costs, approximately $0.38 per 1000 gallons or 16.7% are associated with power and chemicals and judged to vary with increasing or decreasing water production.

If a new plant were constructed, operating costs should decrease due to lower operations and maintenance associated with a new facility. Capital repair and replacement costs would also be projected to be lower for a new plant, particularly during the first decade following construction. Operating costs with scenarios that include a new WTP (Scenarios 3 and 5) were estimated by further reducing variable costs by 8% per unit of water produced and reducing repair and replacement line item operating costs by 30% from the 2010 budget.

8.4.2 Wholesale Water Purchases

The current wholesale rate paid by the City (including meter charges) is $2.27 per 1000 gallons. This rate was increased by 15% in 2008. Future rate increases were assumed to match the inflation rate.

8.4.3 Ground Water Production Costs

Based on our experience and discussions with other water utilities using ground water, a current operating cost of $0.50 per 1000 gallons has been assumed for annual operating and maintenance costs. This estimate would include ground water well pumping, treatment chemicals, and power to pump into the distribution system. In the future, it is assumed that ground water operating costs will increase 20% as additional pumping energy and/or treatment are necessary for future wells.

8.5 Net Present Value Analysis

A summary of the net present values determined for each scenario are presented in Table 8. Additional details showing the specific capital projects, major rehabilitation expenses, the timing assumed for these investments, and operating cost forecast for each scenario are included in Appendix C. All scenarios include capital investment to increase water production capacity and also reduce wholesale water purchases to reduce the unit cost of water production. In addition, investment addresses the City's water planning goals to:

a. Provide reliable supply during peaks and droughts;
b. Provide cost effective service;
c. Diversify and expand water sources to meet projected service area demand;
d. Work towards targets of 3 million gallons per day (MGD) surface water and 2 MGD groundwater; and,
e. Stakeholder acceptance.

Table 8 Summary of Net Present Value Analysis

	Scenario	Results	
		Capital Cost	25-yr NPV
1	Increase Ground Water - Deep Well and/or Shallow Aquifer Wells	$6,730,960	$27,698,300
2	Increase Surface Water - New 3 MGD WTP in 2015	$13,823,736	$31,437,416
3	High Rate Existing WTP; Initial Wells; Increase Wholesale	$3,073,920	$27,731,893
4	Increase Surface Water - New 2 MGD WTP in 2015	$17,525,856	$33,896,794

All costs in year	2010
Annual inflation rate	2.50%
Annual discount rate	5.00%

8.6 Preliminary Revenue, Expense, and Rate Analysis

The City implemented a new conservation rate structure in 2008 and the 2009 Comprehensive Annual Financial Report reflects the new rate structure. These data together with water demand forecasts and the annual inflation rate from 1999 through 2009 were used to forecast water revenues and expenses. The annual inflation rate as indicated by the US Department of Labor Statistics Consumer Price Index averaged 2.56 percent during this 10-year period. Forecast expenses also include the cost of additional water production at the wholesale purchase price of $2.27 per 1000 gallons.

Figure 4 shows the forecast revenue and expenses, as well as the projected net income under several assumed annual rate adjustment options. The projections demonstrate that rate adjustments to keep pace with inflation are necessary for long-term sustainability as evident in the growing gap between forecast expenses (solid red line) and forecast revenues with no adjustments (dashed red line).

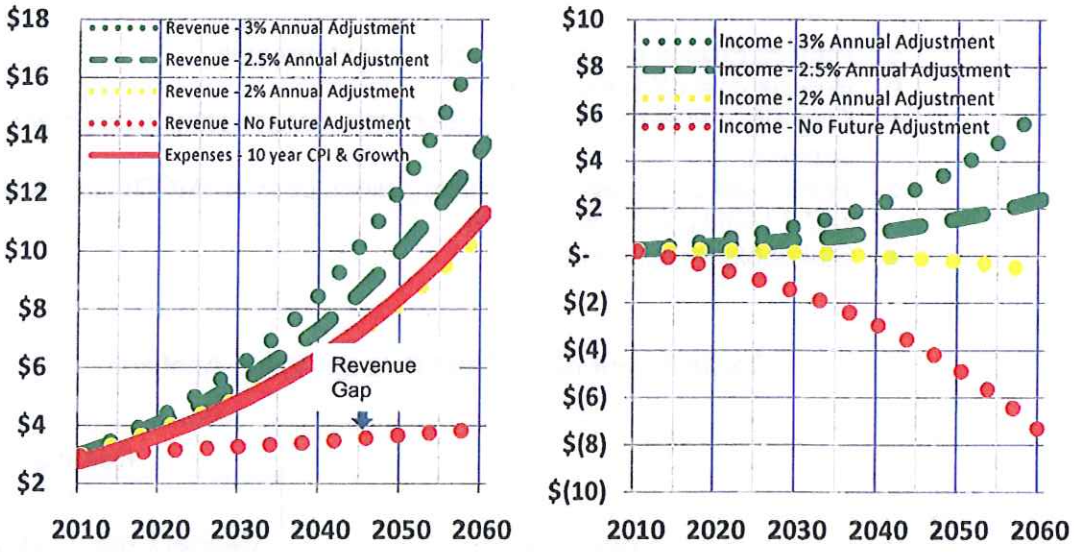


Figure 4 – Forecast Revenue, Expenses, and Income

The second graph in Figure 4 shows the forecast net income (revenue minus expenses). Again, Figure 4 shows that adjustments in the future are essential to maintain sustainable financial condition, as the system cannot operate long with negative net income.

A policy of annual 2.5 to 3.0 percent annual adjustments provides a positive net income necessary to fund needed capital and improvements to sustain the system, improve reliability, and provide for growth. Over the next 50 years, a 2.5 percent annual adjustment could fund up to $11 million dollars of capital improvements, while a 3 percent annual adjustment could fund up to $22 million at a discount rate of 5%.

9.0 Recommendations

1. The following Immediate Improvements are the most critical and are recommended to be implemented during the next 3 years (2010-2013). These investments have a very high return in that they reduce the City's marginal water production cost by adding lower cost water supplies.

    a. High rate Cecil B. Wood Water Treatment Plant
    b. Develop initial deep well (Well 1C and Well 1J) system
    c. Construct a 1 million gallon finished water tank
    d. Construct a 10 million gallon raw water storage tank

2. The following intermediate term (3 to 5 year) paths are available to the City to expand its water supply system capacity and reliability.

    a. Develop or acquire high yield wells with a capacity of 1 MGD
    b. Expand and substantially renovate the existing WTP to a capacity of 2 MGD
    c. Increase service area and expand WTP to 3 MGD

3. Obtain daily (or hourly) readings from the City's primary wholesale meters where water is purchased from Fulton County to monitor daily water demand and quantify peak water demand.

4. Adopt a policy of planned annual rate adjustments of 2.5 to 3 percent per year. Annual planned adjustments are necessary to keep pace with inflation, fund necessary rehabilitation, build capital reserves for improvements, and improve the credit rating and financial health of the water enterprise fund.

5. Assess capital funding options (e.g., selling bonds, the Georgia Environmental Facilities Authority, etc...).

6. City staff should review and update this Plan annually and upon resolution or clarification of key factors upon which actions and decisions depend. A list of key decision-making factors include the following:

    a. City receives approval from Georgia EPD for the requested increase to its surface water withdrawal permit from Big Creek.
    b. City receives approval from Georgia EPD for ground water withdrawal permit for Wells 1C and 1J.
    c. The Court passes judgment on Georgia's appeal of Judge Magnusson's July 2009 ruling.
    d. The 3-year time period outlined in Judge Magnusson's ruling expires July 2012, when water use from Lake Sidney Lanier would revert to mid-1970s levels.
    e. Yield and pricing at the most feasible ground water sites are determined.
    f. Shallow ground water exploration results refine yield and production cost.
    g. The cost to acquire property and existing well(s) are confirmed.