2030 Water and Wastewater Master Plan

gwinnettcounty

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Buford Dam and Lake Sidney Lanier: Sole water supply for more than 800,000 people in Gwinnett County

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TO: Gwinnett County Board of Commissioners

SUBJECT: 2030 Water and Wastewater Master Plan

We, along with the County staff that worked diligently to develop this Plan, are pleased to present the following Gwinnett County 2030 Water and Wastewater Master Plan. For the first time this plan is a joint effort of the Departments of Water Resources and Planning and Development. Our goal and direction in this venture was to create a plan that provides a path for the future of water and wastewater infrastructure upgrades that was in unison with our current vision of growth. We are proud to say that our expectations have been exceeded; this Master Plan provides a path for the Department of Water Resources that supports the Gwinnett County 2030 Unified Plan's vision to keep Gwinnett a preferred place to live, work, and play into the future.

Key components of the new Master Plan:

- This Plan builds on the vision and goals outlined in the Unified Plan, and supports its implementation through the County's water and wastewater services
- This Plan addresses new state and regional water policies, unresolved water rights disputes, and future system demands
- This Plan identifies the infrastructure that will need to be in place to support growth far past the 2030 planning period

Perhaps most importantly, the eight priorities set by The Master Plan Citizens Advisory Panel were used as the guiding framework in preparation of this document:

1. Protect public health, quality of life, and the environment and comply with existing regulations
2. Be regional leaders in good stewardship of water resources (conservation, reuse, consumptive use, etc.)
3. Plan for water and sewer capacity proactively to support economic development activities
4. Develop strong maintenance and rehabilitation programs to improve reliability and lower costs (including leak abatement)
5. Coordinate with stakeholders to support the County's objectives and the Unified Plan
6. Provide a high level of service at a responsible cost to customers (with effective and efficient management)
7. Employ responsible long-term planning and financing for major projects
8. Consider regional opportunities for leadership and coordination with the Metro Water District and the State

We want to express our appreciation to the staff of Planning and Development and Water Resources, without whose tireless cooperation this project would not have been possible. Working together they have met the needs of our customers and the citizens of Gwinnett.

Additionally, we would like to thank the Board of Commissioners and the County Administrator for their support of this effort in developing this Water and Wastewater Master Plan.

Sincerely,

Bryan Lackey
Director of Planning and Development

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Acknowledgements

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Quick Facts

Raw Water Intake and Pump Stations

Capacity	Lanier Intake and Raw Water Pump Station	Shoal Creek Intake and Raw Water Pump Station	
Combined Capacity	180 MGD	120 MGD *	200 MGD **
Firm Capacity	150 MGD	90 MGD *	150 MGD **
Number of Pumps	Six at 30 MGD each	Four at 30 MGD each	Four at 50 MGD each

* Serving Shoal Creek Filter Plant
** Serving Lanier Filter Plant (full redundancy)

Water Treatment Facilities

Supply	Capacity
Supply Source: Lake Lanier	Combined Rated Capacity: 225 MGD
# of Filter Plants: 2	Combined Firm Capacity: 200 MGD

Water Distribution System

Customers	Stats
Number of Customers: 230,000	Miles of Pipe: 3,600
Number of Wholesale Customers: 11	Number of Booster Stations: 13
Number of Treated Water Storage Tanks: 10	Total System Storage: 61.15 MG

Wastewater System

Customers	Stats
Number of Customers: 146,000	Number of Pump Stations: 200+
Number of Wholesale Customers: 2	Number of Plants: 3
Miles of Sanitary Sewer Pipe: 2,600	Miles of Pressurized Force Main: 250

Wastewater Treatment Facilities

Water Reclamation Facility	Receiving Water Body	Permitted Discharge (MMF)
F. Wayne Hill Water Resources Center	Lake Lanier Chattahoochee River	40 MGD 20 MGD
Crooked Creek Water Reclamation Facility	Chattahoochee River	16 MGD
Yellow River Water Reclamation Facility	Yellow River	22 MGD

MG = million gallons
MGD = million gallons per day
MMF = maximum monthly flow

Note: Quick Facts data was compiled in 2012.

Executive Summary

The 2030 Water and Wastewater Master Plan details the water and wastewater investments and policies for the next 20 years. The Master Plan supports the Gwinnett County 2030 Unified Plan's vision to keep Gwinnett a preferred place to live, work, and play.

After more than 20 years of aggressive growth and expansion, Gwinnett County is experiencing a slower rate of growth and a shift in development priorities. During the previous period of rapid growth, the County worked feverishly to build the necessary infrastructure ahead of the demand. Since the pace of growth began to slow in 2007, the County started to adjust its plans and policies to adapt to the slower pace and a new set of challenges.

The County began the process of adjusting plans and policies by adopting a new "Unified Plan" in 2009. The Unified Plan addresses many of the challenges the County will face as it positions itself for the future. Through the testing of various growth scenarios, the Unified Plan envisioned a future that maintains economic development and fiscal health as an "International Gateway." In this scenario the County continues to promote its advantages as a major growth center within the Atlanta region.

The Unified Plan presented priorities and policies to support the International Gateway growth scenario. Several of the policies affect the planning for water and wastewater infrastructure. The Master Plan is consistent with the Unified Plan, and supports its implementation through the County's water and wastewater services.

In addition to supporting the Unified Plan, the Master Plan addresses other issues that affect the County's water and wastewater infrastructure. These issues include new state and regional water policies, unresolved water rights disputes, and future system demands. As with the Unified Plan, the Master Plan anticipates the need for flexibility, as several of these issues are mired in uncertainty regarding timing and impacts.

Chattahoochee River at Jones Bridge Park

PLANNING ISSUES

Several planning issues were identified in the Master Plan that may present challenges for the County's water and wastewater infrastructure. Such challenges include:

- **Long-term viability of the County's water supply from Lake Lanier** – during the preparation of the Master Plan, a U.S. District Court judge erroneously ruled that Lake Lanier was not authorized for water supply use. The ruling was later overturned by the U.S. 11th Circuit Court. Gwinnett County relies exclusively on Lake Lanier for its water supply and has and will continue to defend its right to the use of this supply; however, this matter is not yet fully resolved. Studies are underway by the Corps of Engineers to determine water supply authority and future allocations and costs. Gwinnett will continue to depend upon Lake Lanier for its long-term water supply
- **Return of reclaimed wastewater for reuse** – as responsible stewards of the environment and to extend the use of the water supply available from Lake Lanier, Gwinnett County returns highly treated wastewater back to the Lake. One unresolved issue is how to account for the water that is returned to its original source, in terms of a credit, so that the County can accurately report the net withdrawal from the Lake
- **Water conservation and reduced revenues** – recent droughts, water conflicts and economic conditions have inspired a culture of water conservation in metropolitan Atlanta. New ways to reduce the amount of water used by residents, business and industry have effectively extended the useful "life" of our water supplies. The flip side of successful water conservation is that water sales have declined with the drop in water usage. The drop in water sales creates a challenge for the County to cover the expenses for operating and maintaining the water and sewer systems, and to make investments in the future. However, conservation practices must continue, and adjustments are necessary to address this change in consumption behavior
- **Uncertain timing for building infrastructure** – the current economic recession caused a dramatic and sudden stop to growth in the Metro Atlanta area, including Gwinnett County. This leaves under-used capacity in parts of the water and wastewater system. The capacity built on the premise of continuing rapid growth, which is now delayed, may now be regarded as excess capacity. The uncertainty of when the economy will recover, when growth will return to Gwinnett, and how it will occur, presents a new planning issue for this Master Plan. It is clear that the old model of preparing a capital improvement plan based upon assumed continued rapid expansion is no longer a valid approach

COMMUNITY PRIORITIES

A Citizen Advisory Panel provided community input and guidance for the Master Plan. The Citizen Panel provided a cross-section of perspectives, with representatives from business, city governments, County departments, environmental advocacy, and residents. The panel of 24 participants were engaged early in the planning process to establish priorities for the Master Plan. Their overall goal for the Master Plan was to keep Gwinnett a preferred place. Many of the participants were also citizen advisors for development of the Unified Plan, and were fully informed of its policies and implementation actions.

COMMUNITY PRIORITIES

The priorities that the Citizen Advisory Panel listed for the Water and Wastewater Master Plan are:

1. Protect public health, quality of life, and the environment and comply with existing regulations
2. Be regional leaders in good stewardship of water resources (conservation, reuse, consumptive use, etc.)
3. Plan for water and sewer capacity proactively to support economic development activities
4. Develop strong maintenance and rehabilitation programs to improve reliability and lower costs (including leak abatement)
5. Coordinate with stakeholders to support the County's objectives and the Unified Plan
6. Provide a high level of service at a responsible cost to customers (with effective and efficient management)
7. Employ responsible long-term planning and financing for major projects
8. Consider regional opportunities for leadership and coordination with the Metro Water District and the State

FORECASTING FUTURE WATER AND WASTEWATER NEEDS

The future water and wastewater needs (forecasts) formed the basis for the planning effort. The forecasts reflect the population and employment growth through the year 2030, according to the International Gateway growth scenario. The forecasts consider:

- Beneficial reductions in water demands associated with the County's water conservation program
- Areas planned for higher density development in the future
- Areas that are intended for lower density developments that will primarily be served by septic systems versus centralized sewer
- Areas that are currently served by septic systems that will transition to centralized sewer as they redevelop
- Impact of non-revenue water on the demand for treated drinking water and the impact of infiltration into the collection system on the future wastewater flows

The countywide population and employment forecasts and the water and wastewater forecasts are summarized in Figure ES-1. The forecasts were also developed on a smaller geographic scale that provided the detail needed for infrastructure planning.

Given the uncertainty following the 2007 recession, Gwinnett recognizes that the projected 2030 demands may extend beyond the planning horizon used in the Unified Plan. Therefore, the planning recommendations recognize the potential variability in economic development trends, and the need for flexibility in the timing for implementation.

EVALUATING FUTURE SYSTEM NEEDS

Much of the work on the Master Plan involved assessing the ability of the existing water and wastewater infrastructure to handle the anticipated water and wastewater demands. The water and wastewater forecasts formed the basis for the evaluation, which also considered future regulations and aging infrastructure that may require additional financial investment in the future.

The evaluation for each of the major system components (water supply, water treatment, water distribution, wastewater collection, and water reclamation) is summarized below.

- Water Supply: Evaluated the ability of the existing water supply to meet future water demands. Considered the role of water conservation and credits for reclaimed water returned to Lake Lanier
- Water Treatment: Considered the need for additional water treatment in the future to meet demands as well as to increase system reliability in concert with the *Georgia Water System Interconnection Redundancy and Reliability Act*
- Water Distribution: Used computer models to identify areas where additional system capacity is needed to meet future demands while maintaining the current level of service
- Wastewater Collection: Used computer models to identify areas where additional system capacity is needed to meet future demands while meeting regulatory requirements
- Wastewater Treatment: Evaluated wastewater treatment expansion options in terms of short-term facility rehabilitation needs, minimizing interbasin transfers, and the desire to return reclaimed water to Lake Lanier to support future withdrawals. Performed a life cycle cost analysis of five different waste solids handling alternatives

RECOMMENDED PROJECTS AND PRIORITIES

The future needs identified during the system evaluation, along with the community priorities, resulted in a series of recommended actions. A summary of the recommended actions for each of the major system components (raw water supply, water treatment, water distribution, wastewater collection, and water reclamation) is provided below.

- **Raw Water Supply:** Additional permitted water withdrawal from Lake Lanier will be needed along with continued implementation of the adopted water conservation program to meet anticipated demands. Additional water supply sources, evaluated as part of the Master Plan, may be needed beyond the 2030 timeframe. Given the time and expense associated with future water supply development, continued exploration of new sources is recommended. This project is estimated at $42 million and is shown in Figure ES-2
- **Water Treatment:** Additional water treatment at the Shoal Creek Filter Plant is needed to meet future demands as well as to increase system reliability in concert with the Georgia Water System Interconnection Redundancy and Reliability Act. This project is estimated at $56 million and is shown in Figure ES-3
- **Water Distribution:** Additional water transmission capacity is needed to deliver water to meet increasing demands in some portions of the County. This capacity is primarily needed to serve the I-85 and GA316 corridors that are proposed for higher density development. As the existing infrastructure ages, continued implementation of the asset management program will be critical. The sixteen projects, estimated at more than $280 million, are shown in Figure ES-4
- **Wastewater Collection:** Additional collection system capacity is needed to meet future flows and meet regulatory requirements in some portions of the County. The capacity projects primarily involve short reaches of collector sewers which may need capacity upgrades to address future flows. Projects also include upgrades and expansions to pump stations to convey flows to the wastewater treatment facilities. Continued implementation of the asset management program to replace aging infrastructure and to minimize the amount of water infiltrating into the collection system are also important elements of the Master Plan. The fourteen projects, estimated at more than $16 million, are shown in Figure ES-5
- **Wastewater Treatment:** Additional wastewater treatment capacity and permitted discharges will be needed to address anticipated flows. The expansions are recommended at both the Crooked Creek Water Reclamation Facility and F. Wayne Hill Water Resources Center. The plant expansions are based on consideration for rehabilitation needs, minimizing interbasin transfers, and the desire to return reclaimed water to Lake Lanier to support future withdrawals. Upgrades to the solids handling facilities at the Crooked Creek Water Reclamation Facility and F. Wayne Hill Water Resources Center are also recommended to handle the solids generated from future flows. The seven projects, estimated at $600 million, are summarized in Figure ES-6

Figure ES-1: Forecasts

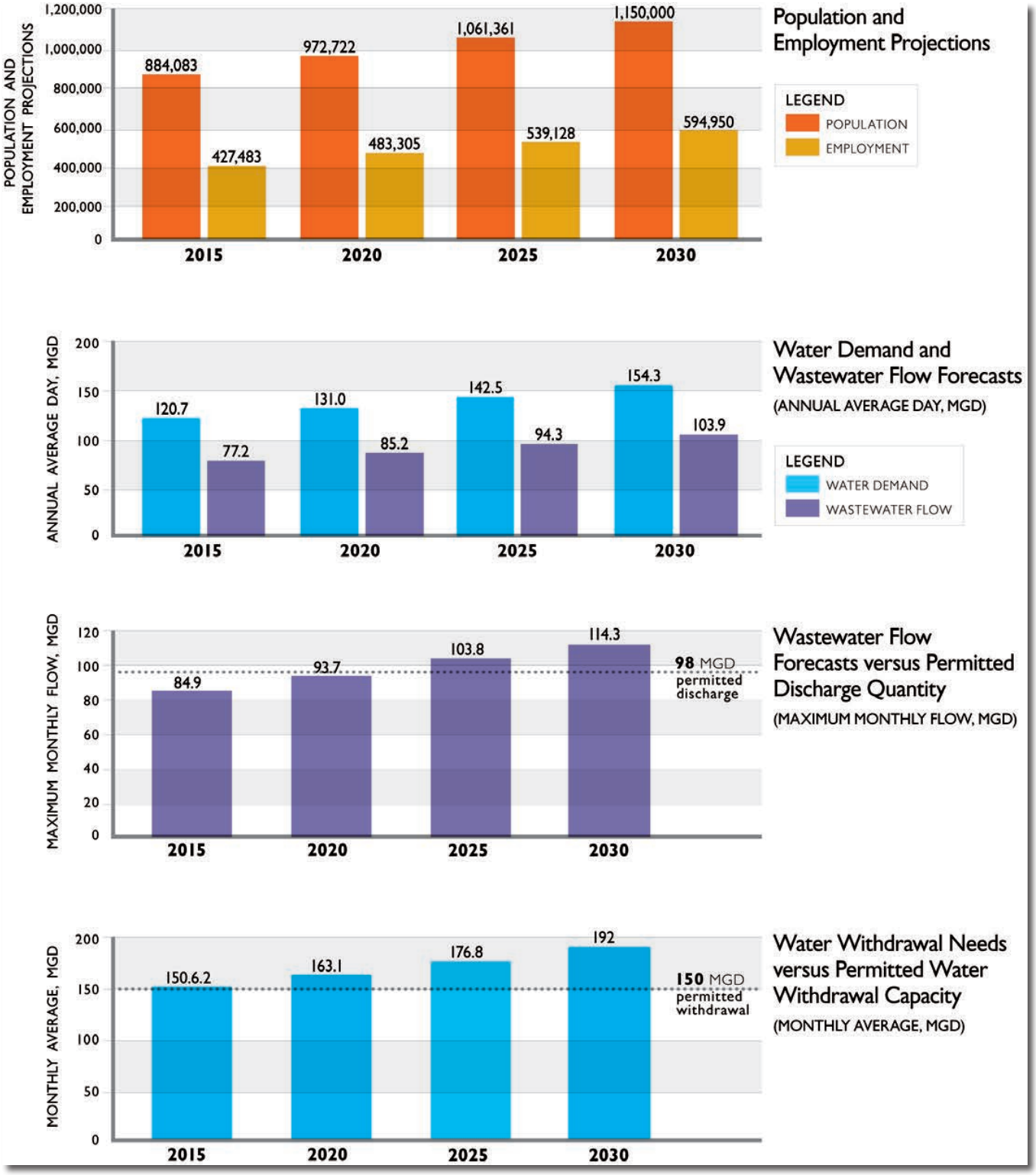


Figure ES-2: Water Supply Recommendations

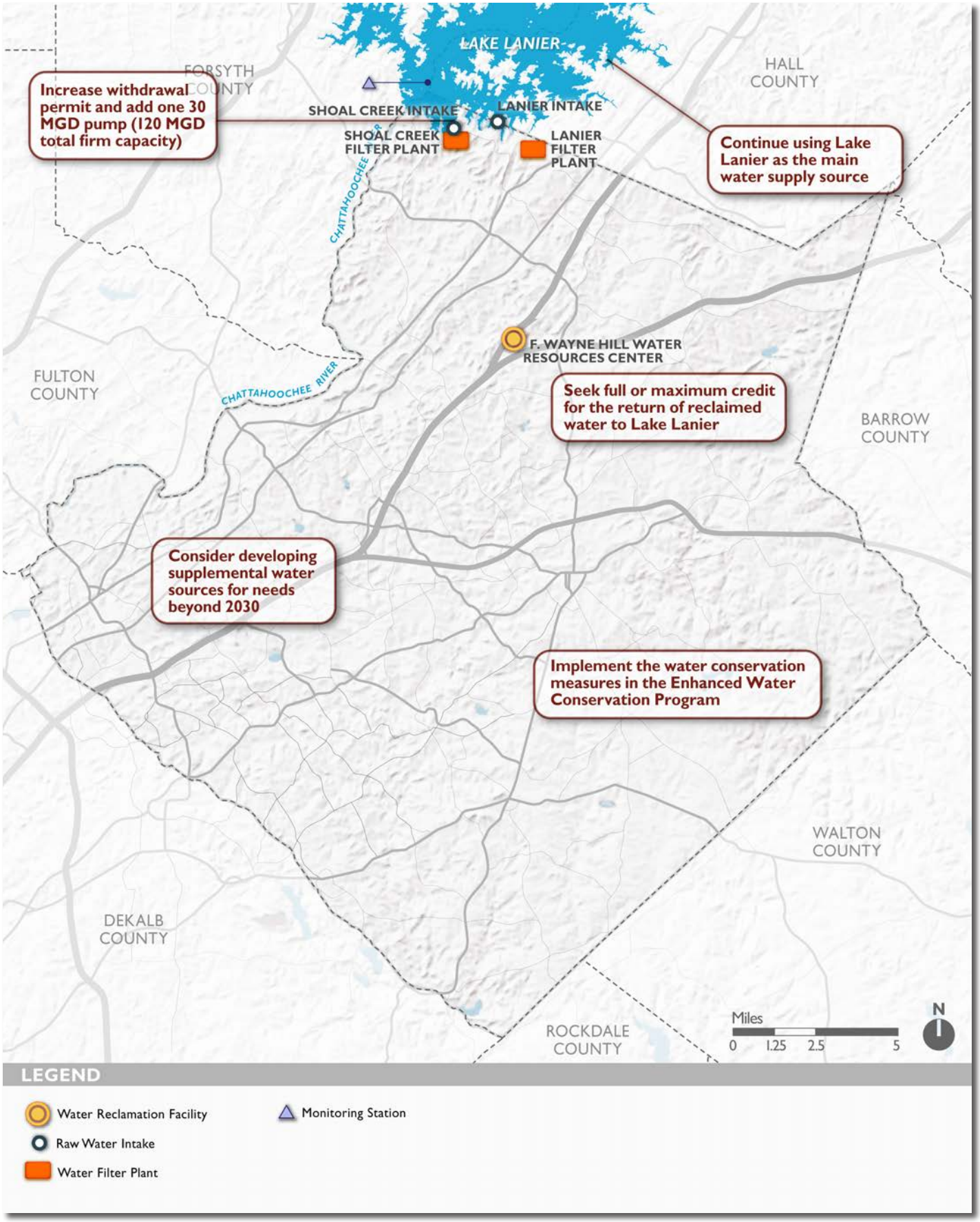
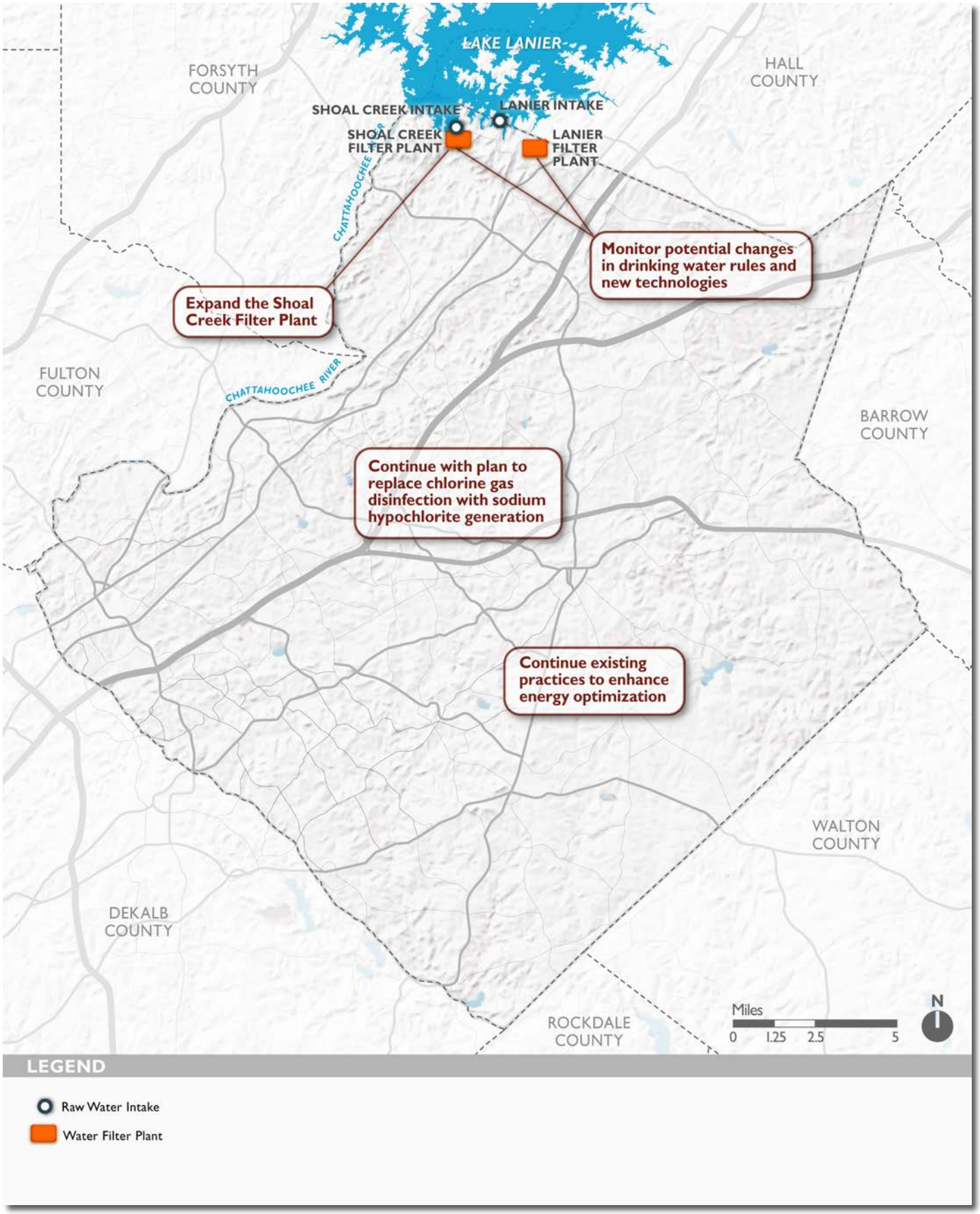


Figure ES-3: Water Treatment Recommendations



IMPLEMENTING THE MASTER PLAN

The Master Plan recommends policies and projects needed to support the International Gateway scenario of the Unified Plan. With the uncertainty regarding the timing of the economic recovery and the need for additional infrastructure, the Master Plan does not assign a schedule to the recommended projects and priorities. Instead, the Master Plan identifies a process for timing future projects that considers actual system measurements and other influences (regulatory, development, financial) to determine the initiation point for the recommended projects and priorities.

System monitoring is an important component of the Master Plan as it ties to the timing for project implementation. The Master Plan recommends twenty-nine long-term monitoring locations (shown in Figures ES-2 through ES-6). Of the recommended monitoring loctions, twelve are new locations and the remainder are locations already monitored by the Department of Water Resources.

The project timing will be adjusted in part based on the measured changes in demand, flow, and pressure in the water and wastewater system. The approach is intended to work within the Department of Water Resources' existing capital improvement project planning framework and provide infrastructure "just-in-time" to meet future needs and keep Gwinnett a preferred place.

Additionally, the importance of continually monitoring pending legislation and regulations in all areas of responsibility (water, wastewater and reuse) cannot be overemphasized. Being aware of and anticipating new requirements will facilitate more efficient and effective planning of needed infrastructure.

Implementation of this Master Plan, while largely shouldered by the Department of Water Resources, is intended, similar to this planning process, to be a shared effort by both the Department of Water Resources and the Department of Planning and Development. This communication and feedback loop will continually serve to improve planning efforts in the future.

The Yellow River Membrane Bio-Reactor filters physical solids in the wastewater treatment process

Figure ES-4: Water Distribution System Recommendations

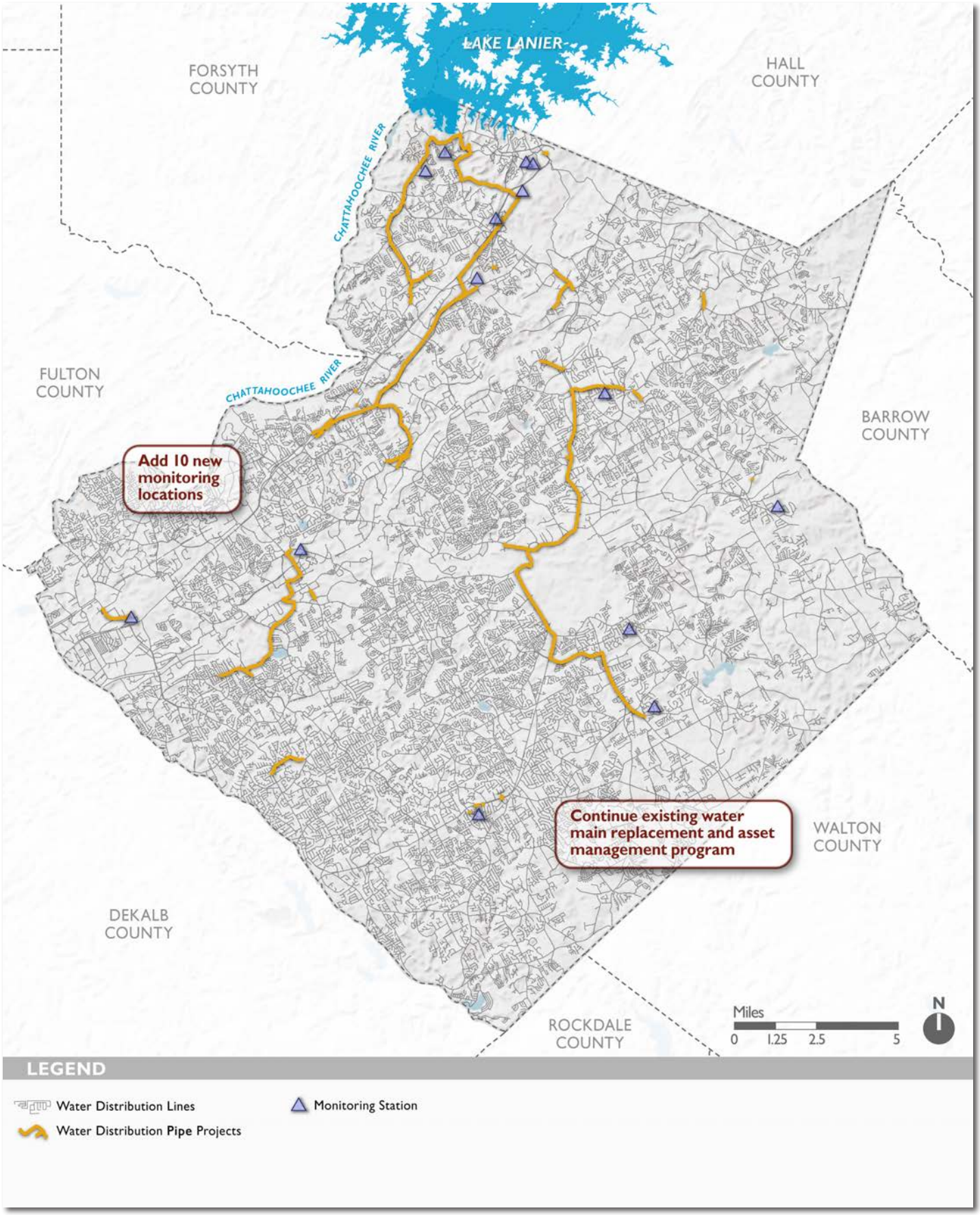


Figure ES-5: Wastewater Collection System Recommendations

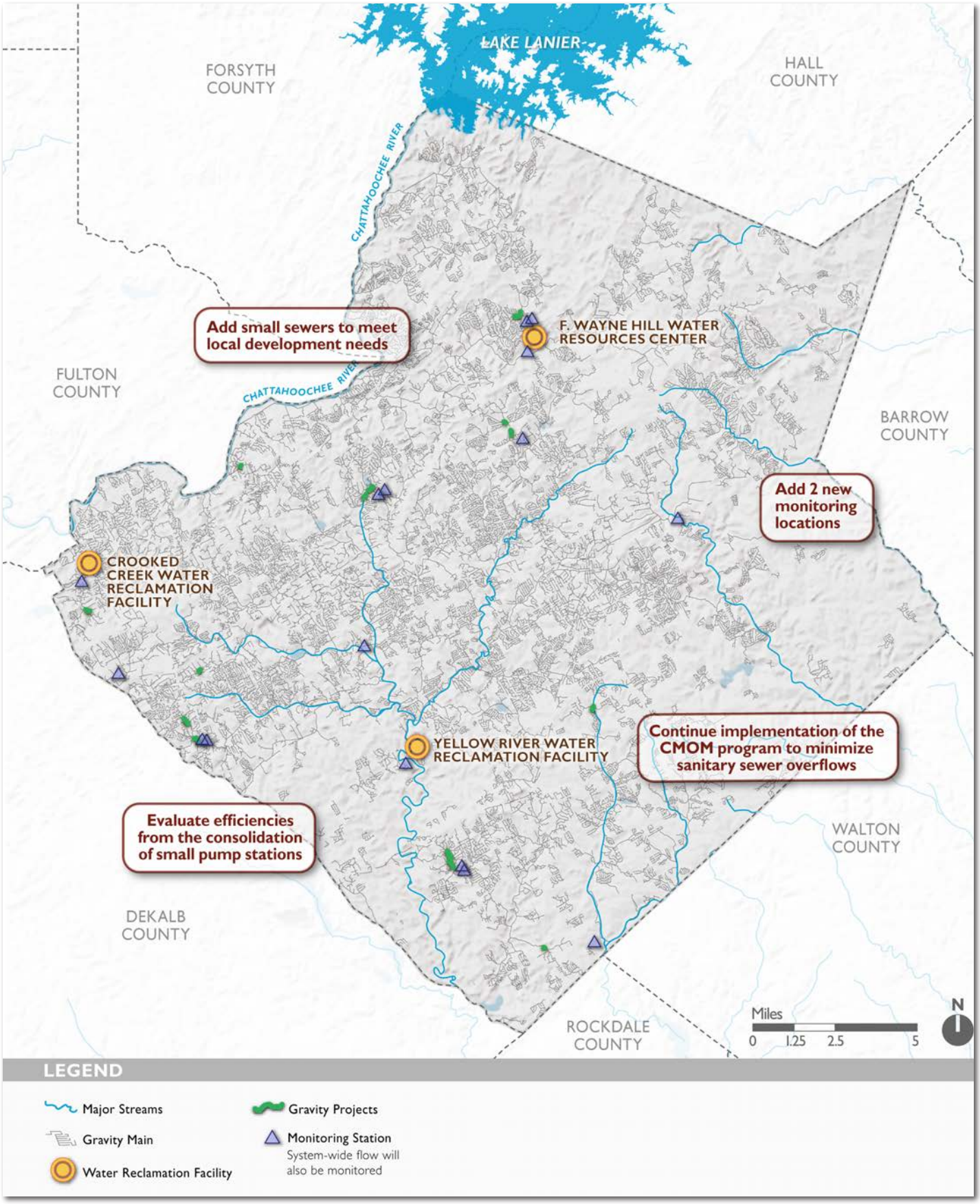
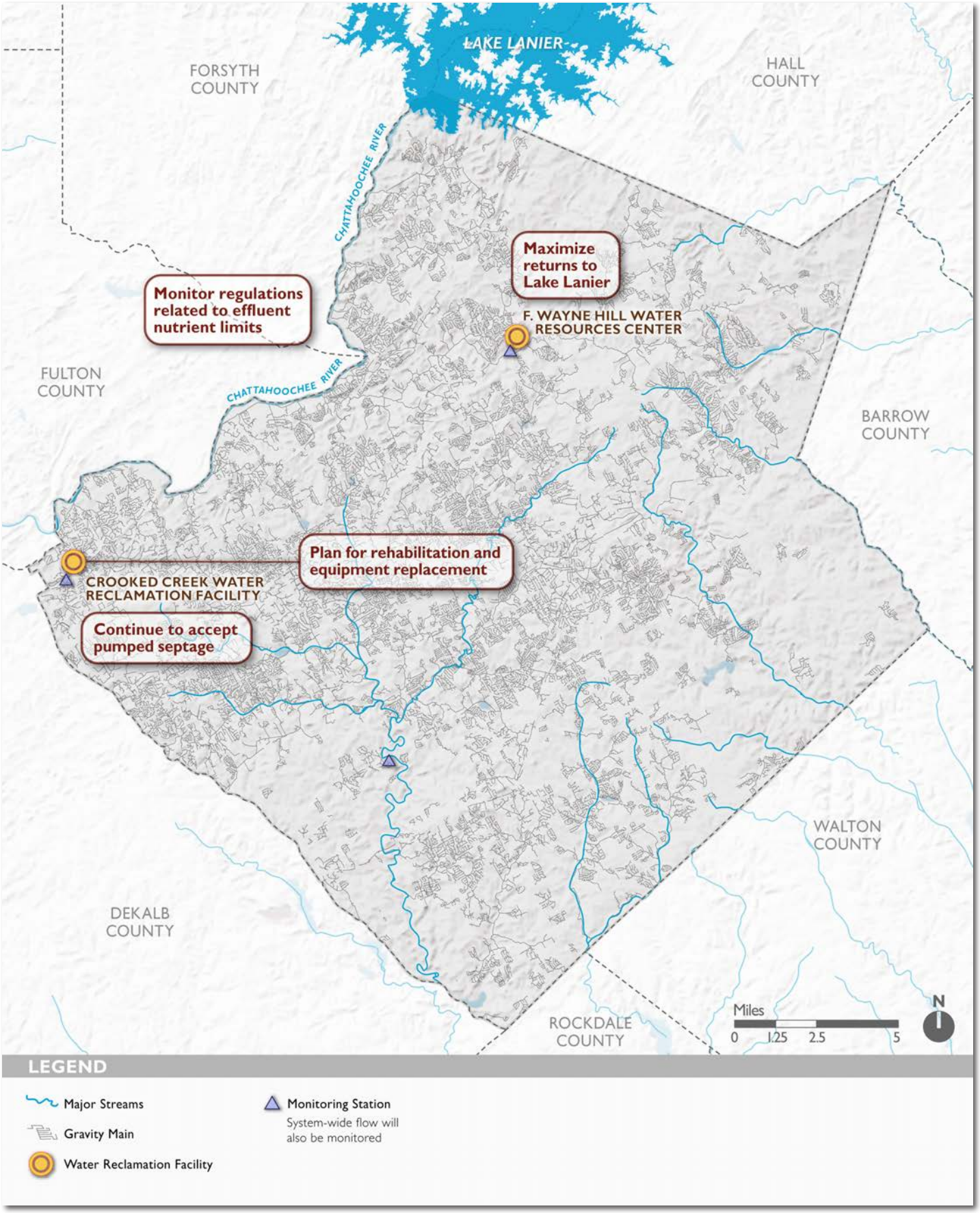


Figure ES-6: Wastewater Treatment Recommendations



Part 1: Trends and Challenges

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Part 1: Trends and Challenges

Gwinnett County's 2030 Unified Plan creates a vision to keep Gwinnett a preferred place to live, work, and play into the future. The 2030 Water and Wastewater Master Plan supports this vision and details the water and wastewater investments and policies for the next 20 years.

ABOUT THIS PLAN

The 2030 Water and Wastewater Master Plan (Master Plan) is one of the first implementation plans to evolve from the Unified Plan. This plan reflects the Unified Plan's "International Gateway" scenario, which guides development into urban corridors, fosters redevelopment, and reserves two large areas along the eastern border of the County for low density development. The Master Plan identifies water and wastewater projects and policies to link the current infrastructure to the preferred future.

A. PLANNING FRAMEWORK

After more than 20 years of aggressive growth and expansion, Gwinnett County is experiencing a slower rate of growth and a shift in development priorities. During the previous period of rapid growth, the County worked feverishly to build the necessary infrastructure ahead of the demand. Since the pace of growth began to slow in 2007, the County started to adjust its plans and policies to adapt to the slower pace and a new set of challenges.

The County began the process of adjusting plans and policies by adopting a new "Unified Plan" in 2009. The Unified Plan addresses many of the challenges the County will face as it positions itself for the future. Through the testing of various growth scenarios, the Unified Plan envisioned a future that maintains economic development and fiscal health as an "International Gateway." In this scenario the County continues to promote its advantages as a major growth center within the Atlanta region.

The Unified Plan presented priorities and policies to support the International Gateway growth scenario. Several of the policies affect the planning for water and wastewater infrastructure. The Master Plan is consistent with the Unified Plan, and supports its implementation through the County's water and wastewater services.

In addition to supporting the Unified Plan, the Master Plan addresses other issues that affect the County's water and wastewater infrastructure. These issues include new state and regional water policies, unresolved water rights disputes, and future system demands. As with the Unified Plan, the Master Plan anticipates the need for flexibility, as several of these issues are mired in uncertainty regarding timing and impacts.

A.1. Link to the 2030 Unified Plan

The International Gateway planning scenario was applied as the basis for defining future water and wastewater needs in the County. This scenario is the preferred outcome of the Unified Plan, as it balances future investments with affordability. The population and employment projections, and Land Use Plan from the International Gateway scenario were used to forecast future water supply demands, and wastewater flows across the County. Planning for the demands expected from this growth scenario, geographically and quantitatively, guided the strategies and policies developed in this Master Plan.

HOW TO USE THIS PLAN

The Master Plan is presented in four parts:

Part 1: Trends and Challenges - provides background information and planning issues.

- What are the driving forces that affect the water and wastewater systems?

Part 2: Plan Development - describes the expected future demands on the existing water and wastewater infrastructure, and where additional improvements will be needed based on forecasted demands.

- Do we have enough system capacity? Where will we need improvements?

Part 3: Implementation - lays out the specific projects and policies needed to implement the plan.

- What will we need to do? When?

Part 4: Appendix - is comprised of a series of technical memorandums that present details about the studies that underlie the recommendations in the plan.

- How did we reach our conclusions and recommendations?

Gwinnett Place CID

The Gwinnett County 2030 Unified Plan will be utilized to guide the County toward build out, envisioning a future that maintains economic development and fiscal health.

Gwinnett Village CID

Evermore CID

THE UNIFIED PLAN

The Gwinnett County 2030 Unified Plan (Unified Plan) reflects the coordinated updates of the Comprehensive Plan, the Consolidated Plan, and the Comprehensive Transportation Plan. The Unified Plan will guide future land use and community development decisions in the County through 2030. The Master Plan is a complementary document that outlines the water and wastewater actions and policies needed to support the growth envisioned in the Unified Plan.

Two foundational elements in the Unified Plan that were used for the Master Plan include population and employment forecasts and the future development map, described below.

Population and Employment: The Unified Plan considered four future population and employment growth scenarios.

- The International Gateway scenario reflects accelerated regional growth that is facilitated by proactive policies and changes to future funding
- The Middle of the Pack scenario reflects the continuation of existing policies and funding approaches
- The Regional Slowdown considers the outcome if new businesses are slower to move into Gwinnett and existing businesses elect to move out
- The Radical Restructuring includes additional incorporations of land into the cities

The Unified Plan evaluated the most likely scenarios: International Gateway and Middle of the Pack. The evaluation showed that the Middle of the Pack scenario did not generate sufficient funds to address infrastructure needs, such as transportation and sewer capacity. Therefore, the preferred outcome of the Unified Plan is the International Gateway scenario.

While the International Gateway scenario is the preferred outcome, the Unified Plan recognizes that more than one future outcome is possible. "The County will need to be prepared for a different outcome if it cannot (or chooses not) to take the actions required to secure this desired future"[1].

As a supporting document, the Master Plan must also remain flexible to future population and employment changes.

Future Development Map: The Unified Plan includes a future development map that outlines the location and type of development (see Figure 1-1). The features unique to the International Gateway scenario are described in the International Gateway Scenario text box.

1 The Gwinnett County 2030 Unified Plan. Page 86.

THE INTERNATIONAL GATEWAY SCENARIO

The International Gateway scenario (Figure 1-1) is the preferred outcome of the Unified Plan and is the basis for the evaluation of water and wastewater needs in the Master Plan.

Features of the International Gateway scenario include:

- focuses future employment along the major transportation corridors (e.g., I-85, GA-316) with incentives for re-development and infill development (see Figure 1-2)
- identifies a shift from light industrial and warehousing use to high-tech research and development opportunities, which increases the number of jobs per acre
- encourages an increase in international and multicultural workforce and investments
- focuses higher density population in areas where adequate infrastructure already exists (see Figure 1-3)
- reserves the area designated for low density development in the eastern portion of the County for large lot development that will not be served by sanitary sewer
- encourages re-development activities in areas with available infrastructure to focus limited funds on rehabilitation of existing infrastructure

The recommended actions and policies for water and wastewater will support the implementation of the International Gateway vision.

Figure 1-1: Gwinnett's Planned Development Approach for the International Gateway Scenario of the 2030 Unified Plan

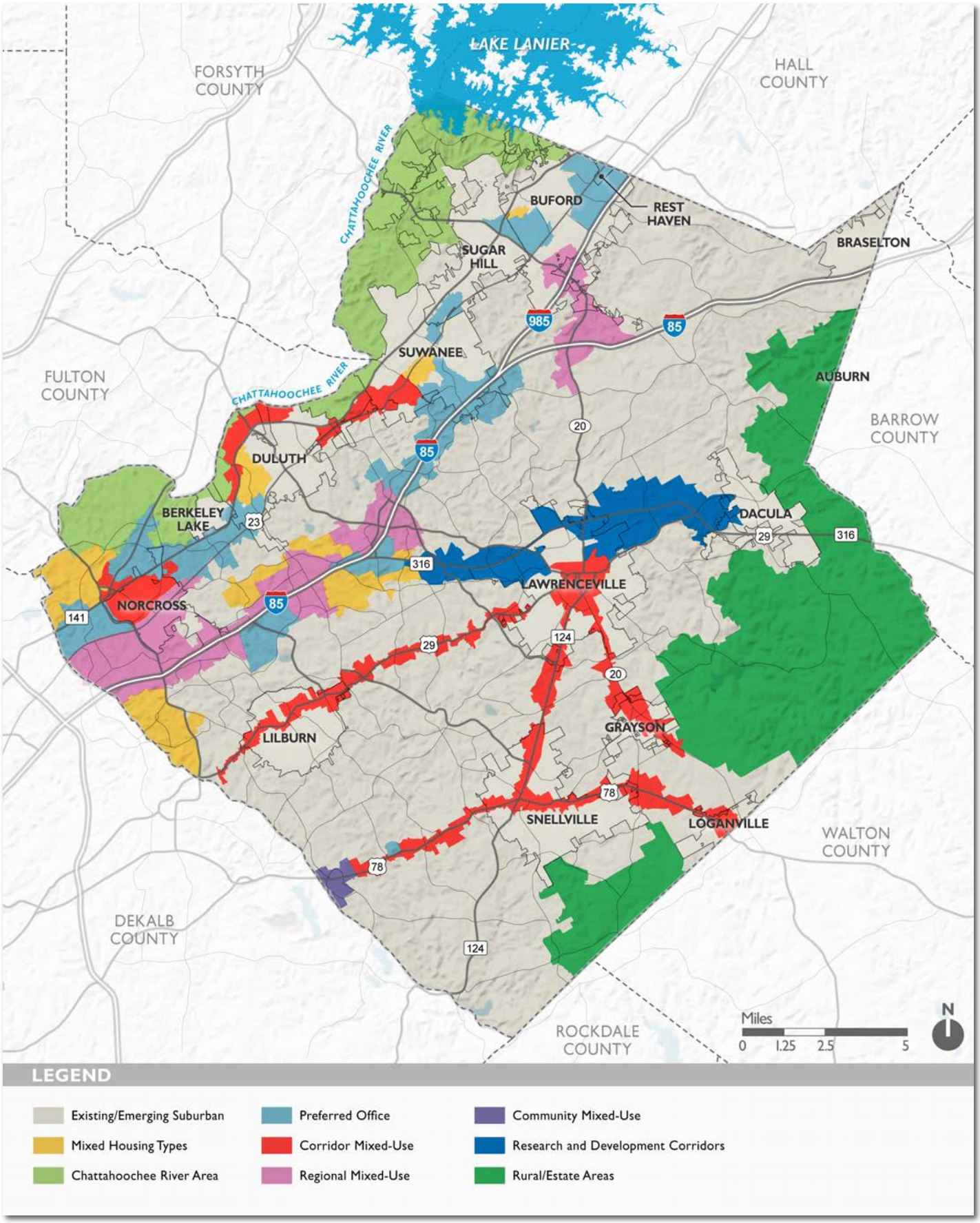


Figure 1-2: Change in Employment Density from 2010 to 2030 shows Strategic Growth along Transportation Corridors

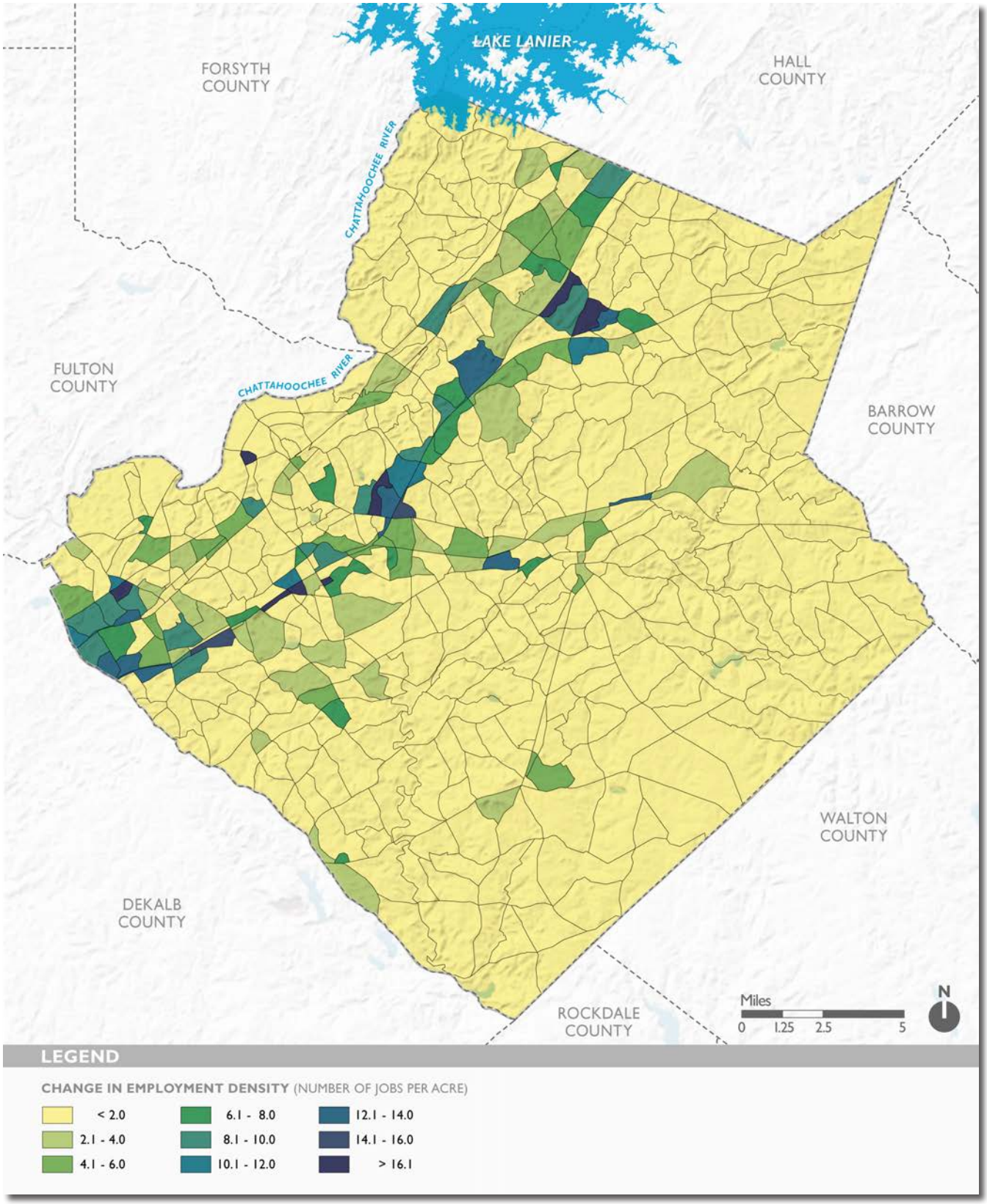
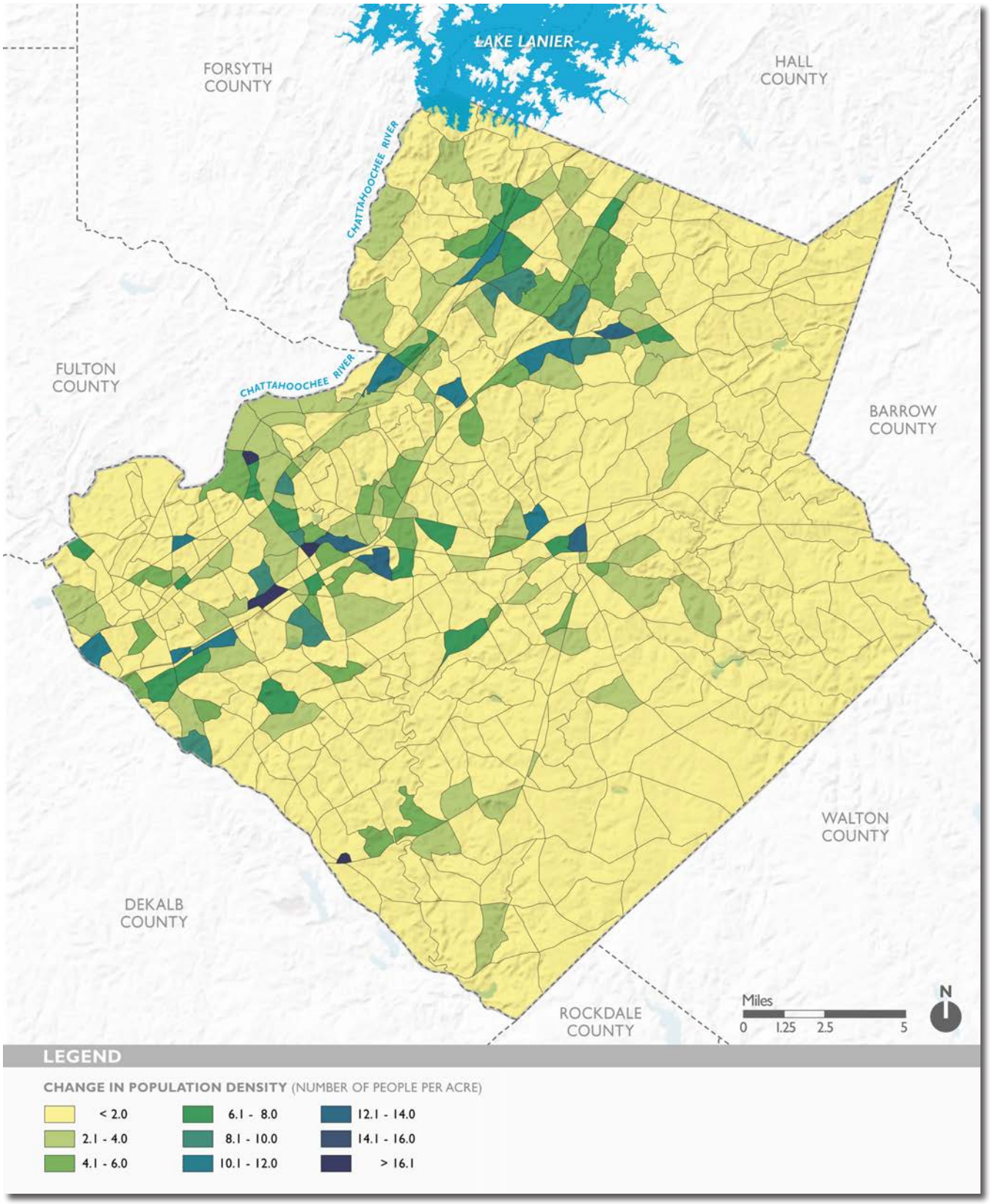


Figure 1-3: Change in Population Density from 2010 to 2030 shows Planned Mixed Use and Redevelopment Areas



A.2. Planning Issues

The Unified Plan helped to guide decisions about placement of sewer infrastructure for the Master Plan. Beyond that, other issues present challenges for the County's water and wastewater infrastructure that are not addressed by the Unified Plan. Such challenges include:

- **Long-term viability of the County's water supply from Lake Lanier** – during the preparation of the Master Plan, a U.S. District Court judge erroneously ruled that Lake Lanier was not authorized for water supply use. The ruling was later overturned by the U.S. 11th Circuit Court. Gwinnett County relies exclusively on Lake Lanier for its water supply and has and will continue to defend its right to the use of this supply; however, the matter is not yet fully resolved. Studies are underway by the Corps of Engineers to determine water supply authority and future allocations and costs. Gwinnett will continue to depend upon Lake Lanier for its long-term water supply
- **Return of reclaimed wastewater for reuse** – as responsible stewards of the environment and to extend the use of the water supply available from Lake Lanier, Gwinnett County returns highly treated wastewater back to the Lake. Currently only water from the F.W. Hill WRC can be returned to Lake Lanier. In the future it may be desirable or even necessary to return water from one or both of Gwinnett's other treatment facilities
- **Water conservation and reduced revenues** – recent droughts, water conflicts and economic conditions have inspired a culture of water conservation in metropolitan Atlanta. New ways to reduce the amount of water used by residents, business and industry have effectively extended the useful "life" of our water supplies. The flip side of successful water conservation is that water sales have declined with the drop in water usage. The drop in water sales creates a challenge for the County to cover the expenses for operating and maintaining the water and sewer systems, and to make investments in the future. However, conservation practices must continue, and adjustments are necessary to address this change in consumption behavior
- **Uncertain timing for building infrastructure** - the current economic recession caused a dramatic and sudden stop to growth in the Metro Atlanta area, including Gwinnett County. This leaves under-used capacity in parts of the water and wastewater system. The capacity built on the premise of continuing rapid growth, which is now delayed, may now be regarded as excess capacity. The uncertainty of when the economy will recover, when growth will return to Gwinnett, and how it will occur, presents a new planning issue for this Master Plan. It is clear that the old model of preparing a capital improvement plan based upon assumed continued rapid expansion is no longer a valid approach

Digesters at the F. Wayne Hill Water Resources Center

WATER SUPPLY CHALLENGES

On July 2, 1973, Gwinnett County entered into the "Contract between the United States of America and Gwinnett County, Georgia, for Withdrawal of Water from Lake Sidney Lanier," administered by the Mobile District, Corps of Engineers (Corps) and has since entered into several extensions and modifications to that agreement (collectively known as the "Contract"). The Contract granted the County the right to withdraw raw water from Lake Lanier for municipal and industrial uses at a rate of 53 MGD. The Contract permitted the County to construct and operate facilities to withdraw water and requires the County to maintain certain records.

The Contract originally provided that either party could terminate it upon providing three years advanced notice. Unless otherwise terminated, the Contract would continue for 30 years or until the Federal government completed its study of area water storage, discharge, and withdrawal needs. In June 1985, the Corps gave the County notice that the Contract would be terminated on July 1, 1989. In June 1989, the Contract was extended for six months, until January 1, 1990. That historical contract is no longer in effect; however, the County has continued to withdraw and pay the Corps for water from Lake Lanier, which provides all of the County's raw water.

From 1990 to 2000, the County paid $9.74 per million-gallon (MG) for water withdrawn. In April 2000, the Corps increased this fee to $18.80 per MG.

The use of storage in Lake Lanier for water supply has been under litigation since 1990. The multiple lawsuits in this litigation have been directed at the Corps. The litigation affects water supply for the entire region. Despite a favorable appeals ruling in July 2011, there is still uncertainty regarding the quantity of future supply that will be available. As of March 2012, the amount of Lake Lanier storage available for municipal and industrial use, and its corresponding yield, has not been determined.

As a party to the litigation, Gwinnett seeks to secure its water rights by obtaining storage contracts, as necessary, pursuant to past acts of Congress. Further Congressional action, which would remove any residual doubt regarding the use of Lake Lanier storage for water supply, is an alternative means of resolving the conflict.

The Corps is preparing an updated Water Control Manual for its dams in the Apalachicola-Chattahoochee-Flint (ACF) Basin. The outcome of the litigation will bear upon the Water Control Manual. Gwinnett County will be engaged in this update through public participation channels.

Gwinnett County plans to continue withdrawing water from Lake Lanier and to maximize its return flows. Due to Gwinnett's geographic location at the upper end of two water basins and the absence of any sizable or dependable groundwater aquifer source, Lake Lanier is the only viable source for Gwinnett through this plan's horizon. However, the County will explore additional water supply alternatives outside of this Master Plan which could augment and diversify its water rights portfolio for the long-range future.

A.3. Community Priorities

A Citizen Advisory Panel provided community input and guidance for the Master Plan. The Citizen Panel provided a cross-section of perspectives, with representatives from business, city government, County departments, environmental advocacy, and residents. The panel of 24 participants engaged early in the planning process to establish priorities for the Master Plan. Their overall goal for the Master Plan was to keep Gwinnett a preferred place. Many of the participants were also citizen advisors for development of the Unified Plan, and were fully informed of its policies and implementation actions.

The priorities set by the Citizens Advisory Panel were instrumental in guiding the technical work that resulted in a series of Technical Memorandums documenting this technical analysis and making recommendations for the Master Plan. As the technical teams were performing their analysis and preparing recommendations, the guiding theme for their work was the priorities that had been set by the Citizens Advisory Panel. As each Technical Memorandum was reviewed and adopted for incorporation into this Master Plan it was mapped to the specific Citizens Advisory Panel goals that it helped to address.

COMMUNITY PRIORITIES

The priorities that the Citizen Advisory Panel listed for the Water and Wastewater Master Plan are:

1. Protect public health, quality of life, and the environment and comply with existing regulations
2. Be regional leaders in good stewardship of water resources (conservation, reuse, consumptive use, etc.)
3. Plan for water and sewer capacity proactively to support economic development activities
4. Develop strong maintenance and rehabilitation programs to improve reliability and lower costs (including leak abatement)
5. Coordinate with stakeholders to support the County's objectives and the Unified Plan
6. Provide a high level of service at a responsible cost to customers (with effective and efficient management)
7. Employ responsible long-term planning and financing for major projects
8. Consider regional opportunities for leadership and coordination with the Metro Water District and the State

Gwinnett Mountain Park Aquatic Center

A.4. Comparison with Previous Master Plans

This Master Plan represents a significant departure from previous water and wastewater plans. Previous plans prepared the County for continued high paced growth and large infrastructure investments. This plan starts with a premise of slower growth, and with much of the major infrastructure already in place.

The Unified Plan established the planning platform and set the expectation for this Master Plan to be a coordinated effort between the Department of Water Resources and the Department of Planning and Development. The planning process began with individual interviews of key stakeholders from both departments and County administration, as well as from the Chamber of Commerce. This process resulted in a plan that is different from previous master plans in the following ways:

- This document reflects the guidance, look and feel of the Unified Plan. Use of this familiar style was intended to show that the Master Plan was developed as a companion to the Unified Plan
- A more flexible approach to implementation of capital improvement projects is recommended, to preclude the overbuilding of infrastructure. Future projects will be implemented based upon indicators of need and monitored system data. Previous plans tied projects to specific years or a range of years using growth projections based largely on historic growth trends
- The preferred growth scenario of the Unified Plan directs water and sewer projects toward major traffic corridors to allow for higher density mixed uses and expanded employment, and to support fiscal health. Residents in the eastern part of the County will largely be served with septic systems to preserve funding for rehabilitation and redevelopment in the growth corridors and aging areas. Previous plans anticipated eventual county wide sewer services, led by development interests
- Most future projects recommended in this Master Plan enhance the performance and capacity of the existing infrastructure; new large infrastructure projects are not expected. Major water treatment and wastewater treatment facilities are in place, with some upgrades expected in the next 20 years. Previous plans have focused on massive capital projects to expand system capacity and build state-of-the-art treatment facilities. The Department of Water Resources proactively put much of the large capital infrastructure in place during the past decade allowing funding and planning efforts to focus more on system enhancements and rehabilitation efforts during coming years

Inside of street manhole

B. WATER AND WASTEWATER SYSTEM OVERVIEW

The water and wastewater infrastructure to serve the citizens of Gwinnett County is owned by the Gwinnett County Water and Sewerage Authority. The Authority was created by law in 1970 to acquire, own and construct water and sewerage facilities. Creation of the Authority enabled the County to establish major water and sewer lines beginning in the 1970s. Today, ownership of the system continues to be managed through the Authority, with the Department of Water Resources providing day-to-day maintenance and operation of the facilities as a publicly-owned utility.

From the 1970s to the present, the County's water and wastewater system evolved from many small facilities and developer-built sewers, to a sophisticated, technologically-advanced system that is considered best-in-class (see Figure 1-5). County residents came to Gwinnett to experience a high quality of life, and inspired the development of award-winning water and wastewater facilities and services.

The following is a brief overview of the current system (also shown in Figure 1-6).

B.1. Water Supply, Treatment and Distribution

Gwinnett's source of drinking water is Lake Lanier, a 38,000-acre Federal impoundment created by Buford Dam on the Chattahoochee River. Most of Buford Dam and part of Lake Lanier is located in the northwest portion of the County. Raw water from Lake Lanier is of very high quality due to the mountainous watershed draining into the Lake, and the large volume of storage in the reservoir.

The County operates under a storage contract with the U.S. Army Corps of Engineers (Corps), who operates Buford Dam for water supply, hydro-power generation, flood control and navigation. Gwinnett also has a permit from the Georgia Environmental Protection Division (EPD) to withdraw 150 million gallons per day (MGD) on an average monthly basis from Lake Lanier. The storage contract with the Corps has lapsed. Any changes to the storage contract with the Corps could impact the withdrawal permit issued by EPD.

The County built two separate intakes and treatment plants at Lake Lanier. The Lanier Filter Plant was built in 1977 and the Shoal Creek Filter Plant was built in 2004. The two separate intakes and plants provide necessary back-up and system redundancy in case of a temporary operational issue at one of the intakes. The plants are permitted by EPD to treat a maximum combined total of 225 MGD (150 MGD at the Lanier Filter Plant and 75 MGD at the Shoal Creek Filter Plant).

The County has been at the forefront of treatment technology and has consistently provided drinking water that complies with all existing Safe Drinking Water Act water quality parameters. Both the Lanier Filter Plant and Shoal Creek Filter Plant use advanced treatment processes.

WATER RESOURCES AND RIVER BASINS

Gwinnett County sits at the top of a continental divide and includes waters from 3 major river basins: Chattahoochee, Ocmulgee, and Oconee River Basins. The major water resources and watersheds in the County (shown in Figure 1-4) include:

- Chattahoochee River (Chattahoochee River Basin): The Chattahoochee River forms most of the northwestern boundary of Gwinnett County. The Chattahoochee River starts in the Blue Ridge Mountains and flows southwest into Lake Lanier. From Buford Dam, the Chattahoochee River flows southwest through the Metro Atlanta region and joins the Flint River to form the Apalachicola River in southern Georgia before flowing to the Gulf of Mexico. The Chattahoochee River is the receiving water body for the Crooked Creek Water Reclamation Facility and receives a portion of the effluent from the F. Wayne Hill Water Resources Center

- Lake Lanier (Chattahoochee River Basin) was built in the 1950s by the Army Corps of Engineers through the construction of Buford Dam on the Chattahoochee River in Buford. Lake Lanier currently provides 100 percent of Gwinnett County's drinking water and receives reclaimed water from the F. Wayne Hill Water Resources Center. Lake Lanier is also a major recreational destination and enhances the quality of life in Gwinnett County

- Yellow River (Ocmulgee River Basin): The headwater for the Yellow River is located just slightly west of I-85 within the County. The Yellow River, along with Big Haynes Creek and the Alcovy River, form the headwaters of the Ocmulgee River Basin, which flows into Lake Jackson about 30 miles south of Gwinnett County. The river basin boundary is a major sub-continental divide as the Chattahoochee River flows to the Gulf of Mexico and the Ocmulgee River flows to the Atlantic Ocean. The Yellow River is the receiving waterbody for the Yellow River Water Reclamation Facility.

- Apalachee River (Oconee River Basin): The Apalachee River headwaters are in Gwinnett County and the river forms a portion of the eastern border. The Apalachee River flows into the Oconee River which joins the Ocmulgee River and flows to the Atlantic Ocean. The Oconee River Basin is the smallest basin in Gwinnett County and drains a relatively low growth area

Figure 1-4: Water Resources and River Basins in Gwinnett County

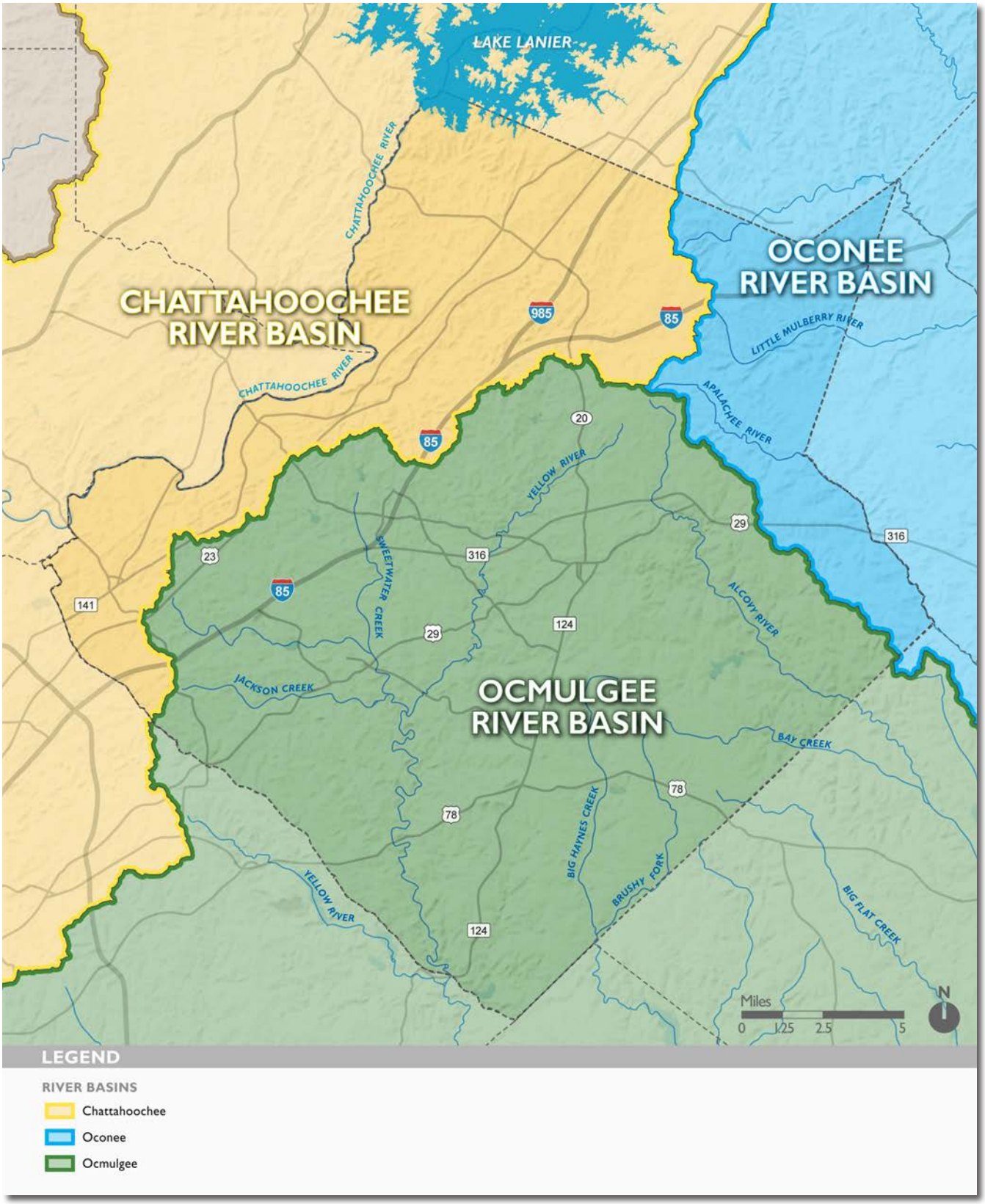


Figure 1-5: Water and Wastewater System History

before 1970

The County was primarily rural, with limited water and wastewater infrastructure.

- The Corps of Engineers constructed Buford Dam in the 1950's and formed Lake Lanier
- Gwinnett constructed a water supply intake on the Chattahoochee River near Duluth to initiate the County's utility services
- No public sewer services were available; septic tanks served individual homes and businesses

1970s

The County began to develop a public sewer system and expand the drinking water service area.

- Four small wastewater plants and sewer systems were built to serve new developments: Crooked Creek (1972), Jackson Creek (1973), Beaver Ruin (1975), and No Business Creek (1979)
- The number of septic tanks continued to expand
- The Lanier Filter Plant was built at Lake Lanier and became the County's primary drinking water supply

1980s

Water services expanded countywide. Sewer system improvements were made to accommodate rapid growth and address development moratoriums.

- Two wastewater treatment facilities were opened in southern Gwinnett: Yellow River/Sweetwater Creek (1982), and Jack's Creek (re-opened 1986)
- The Big Haynes Creek treatment plant was deeded from private ownership to the County
- Water system extensions provided drinking water throughout the County

1990s

Water and sewer lines were extended and wastewater treatment plant expansions and upgrades were accomplished. Additional water supply capacity was developed.

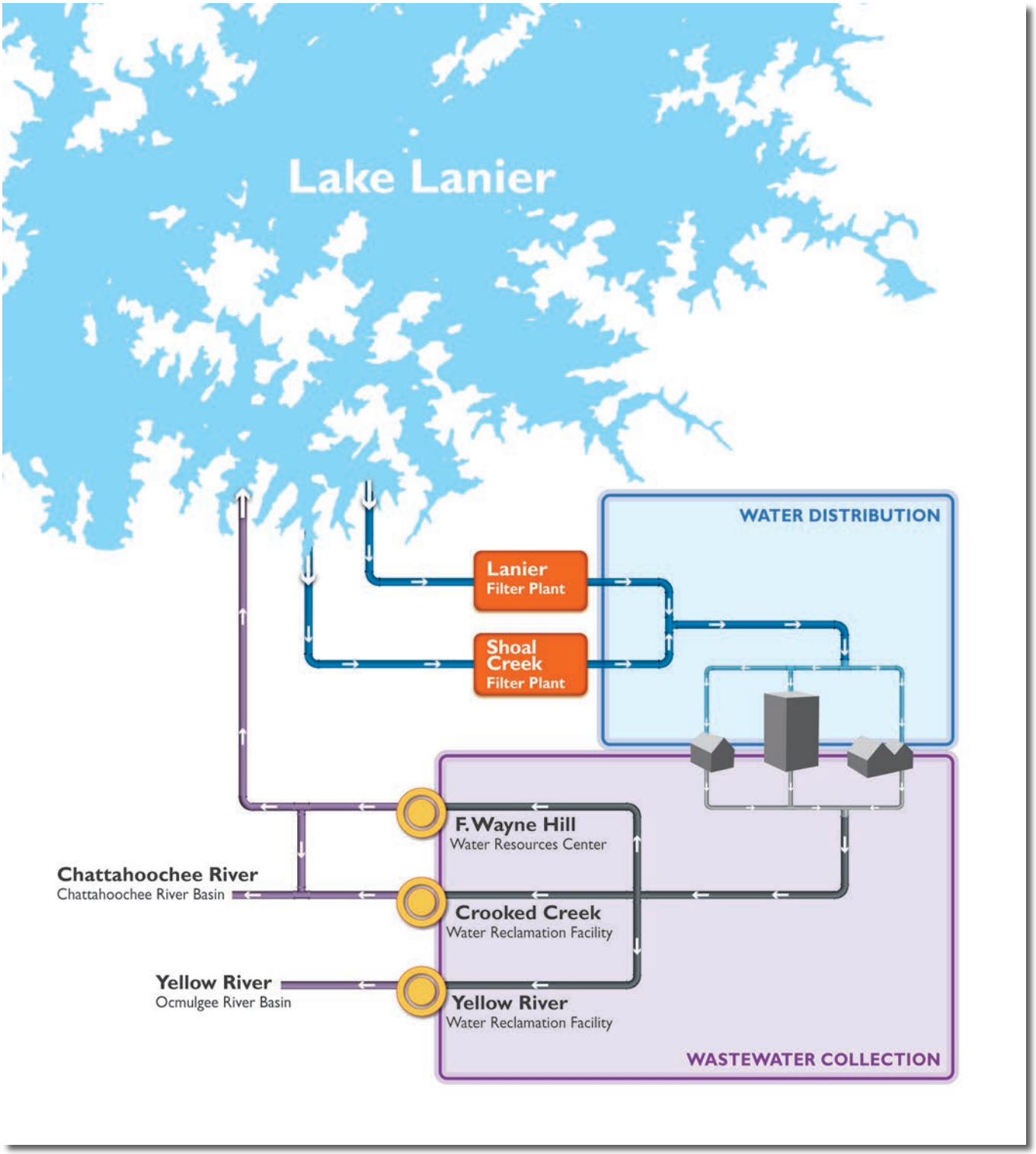
- More water distribution lines were installed than any other prior decade
- Lanier Filter Plant was expanded
- Private developers installed local sewers and pump stations to access the County collection system
- Private septic tanks continued to be installed where public sewer was not available

2000s

Gwinnett's water and wastewater infrastructure continued to expand and improve to serve development throughout the County and address new regulations. The County developed state-of-the-art facilities to prepare the County for continued fast-paced growth.

- A second water plant was built at Lake Lanier: the Shoal Creek Filter Plant came on line in 2004
- The County's largest wastewater facility, the F. Wayne Hill Water Resources Center, was constructed to treat and return water to Lake Lanier
- Enhanced and expanded treatment capabilities were added to Yellow River and Crooked Creek Water Reclamation Facilities
- Six small, older wastewater treatment facilities were consolidated, decommissioned, and the flows diverted to newer facilities
- Large regional pumping stations were built to convey wastewater to the F. Wayne Hill Water Resources Center
- New and expanded programs for asset management, water conservation, and drought management were implemented

Figure 1-6: Water and Wastewater System Overview



Water treated at the two plants is delivered through a network of approximately 3,600 miles of pipe, ranging in diameter from 2 inches to 78 inches. These pipes are classified as either transmission mains (pipes that distribute treated water from the water filter plants to the network of storage tanks and pumping facilities) or distribution pipes (pipes that extend to individual customer meters and fire hydrants). Approximately 150 miles, or four percent, of the 3,600 miles of water distribution pipes are classified as transmission mains.

Potable water is distributed throughout the County through two primary pressure zones with three additional sub-pressure zones. These five zones provide appropriate water pressure to overcome elevation differences across the County. Distribution pipes within each zone are properly looped to enhance customer access to treated water, and to provide for water movement and circulation. Connections exist between the two zones to ensure uninterrupted service during periods of system maintenance.

B.2. Wastewater Collection, Conveyance and Treatment

The Department of Water Resources operates three wastewater treatment facilities. The largest facility is the F. Wayne Hill Water Resources Center (60 MGD), located in northern Gwinnett near Buford. The Yellow River Water Reclamation Facility (22 MGD) is located in central Gwinnett near Lilburn. The Crooked Creek Water Reclamation Facility (16 MGD) is located in southwestern Gwinnett near Norcross. The three treatment facilities are currently permitted by EPD to return a total of 98 MGD of highly-treated effluent to waters in the County on a maximum monthly basis. Reclaimed water can be discharged to Lake Lanier, the Chattahoochee River, and the Yellow River.

All three of the water reclamation facilities provide advanced treatment. Highly advanced technologies such as membrane filtration are used at the F. Wayne Hill Water Resources Center and the Yellow River Water Reclamation Facility. These advanced processes produce a very high quality effluent which is returned to Lake Lanier to augment drinking water supplies or discharged to the Yellow or Chattahoochee Rivers.

The wastewater collection system conveys wastewater from homes and businesses through 2,850 miles of pipe to one of the three treatment plants. The collection system includes two categories of pipe: gravity sewers (over 2,600 miles) and pressurized force mains (250 miles). Pipes range in size from 2 to 72 inches in diameter. Approximately 73% of the County has access to sewer, with the exception of the low density development areas in eastern Gwinnett and several older residential areas in southwestern Gwinnett.

Pump stations and force mains are used in areas of the County where collected wastewater cannot flow by gravity to a wastewater treatment facility and therefore must be pumped. There are more than 200 pump stations in the County because many were constructed by private developers to serve individual developments or neighborhoods. These developer-built pump stations are now owned and maintained by the Department of Water Resources.

Regional pump stations serve large areas and may receive flow from large gravity sewers and from other, smaller pump stations. Several of the regional pump stations have the flexibility to divert flow to more than one location, by pumping or bypassing flow to other pump stations or by pumping flow directly to a water reclamation facility. The F. Wayne Hill Water Resources Center receives all of its flow from regional pump stations while Yellow River and Crooked Creek Water Reclamation Facilities receive at least a portion of their flow directly from gravity sewers.

The ability to divert flow from any part of the system to another provides flexibility and redundancy. Flows from most areas of the County can be conveyed to more than one wastewater treatment facility. This level of redundancy and flexibility is important, as it enables the County to optimize system operations under a variety of weather and flow conditions.

Approximately 27 percent of the population in Gwinnett is not connected to public sewer. These homes rely on private septic tanks. The materials that collect in septic tanks (septage) should be periodically pumped to maintain proper functionality and to protect the environment. Guidance can be obtained from the Gwinnett County Department of Public Health. Private haulers can dispose of the septage from Gwinnett County homes and businesses for a fee at the Crooked Creek Water Reclamation Facility.

The County has been at the forefront of treatment technology and has consistently provided drinking water meeting all existing water quality parameters.

F. Wayne Hill Water Resources Center

Crooked Creek Septage Facility

SEPTIC TANKS AND SEPTAGE DISPOSAL

The International Gateway scenario reserves the eastern and northeastern portions of the County for low density developments that are served primarily by private septic tanks. Although the septic systems are private, the Department of Water Resources will need to maintain sufficient capacity to accept and treat waste (called septage) from current and future septic systems.

According to the Gwinnett County Department of Health Guidelines, septic tanks should be pumped to maintain proper function. The pumping frequency is based on the type, size, and usage of the septic system; however, pumping every three to ten years is common for residential homes[1]. The pumped septage is typically hauled to a water reclamation facility for treatment. The Department of Water Resources accepts septage pumped by private haulers from County residents and businesses for a fee at the Crooked Creek Water Reclamation Facility.

Septage is often more concentrated than municipal sanitary sewage, which is diluted by water (showers, sinks, etc.). Typically in a septic tank, the solids remain in the tank while water flows into a drainfield and infiltrates into the ground. The solids in the tank should be pumped and removed.

The County's water reclamation facilities will continue to need adequate capacity to accept and treat pumped septage from the existing and new septic systems.

1 http://health.state.ga.us/pdfs/environmental/LandUse/misc/OnsiteHomeownersGuide.pdf and http://www.gwinnettcounty.com/static/departments/publicutilities/pdf/septic_management_brochure.pdf

B.3. Conservation and Reuse

Gwinnett has a comprehensive water conservation program to encourage efficient water use in the County. The program is implemented by the Department of Water Resources and includes a wide range of conservation measures from incentives (e.g. public outreach, education, pricing, toilet rebates) to enforceable measures included in County ordinances (e.g. prohibiting observable water wasting). As a member of the Metropolitan North Georgia Water Planning District (Metro Water District), the County is required to comply with the 2009 Water Supply and Water Conservation Management Plan, and report progress. The Metro Water District Plan includes 12 conservation measures, and 10 additional measures recently adopted (December 2010) for utilities that use Lake Lanier or the Chattahoochee River for water supply to further enhance the program.

From a recent County progress report (August 2011), more than 8,500 toilets have been replaced with high-efficiency models through the County's rebate program. As toilets are the largest end use of water inside the home, toilet replacement is an effective way to improve water use efficiency. Outdoor water use is managed by ordinances and conservation pricing. The County's conservation rate structure sets the price for excessive water use at a higher rate to curb discretionary water use.

REUSE IN GWINNETT

Reclaimed water is virtually colorless and odorless, and is allowable for human contact but not for direct human consumption. Gwinnett County's reclaimed water is treated at the state-of-the-art F. Wayne Hill Water Resources Center located in Buford, Georgia. At the F. Wayne Hill Water Resources Center, the water undergoes a stringent treatment process that returns it to an almost pristine state before sending it to Lake Lanier or through a 20-mile pipeline to a discharge point at the Chattahoochee River. Gwinnett County's highly treated reclaimed water meets the state's water quality requirements. Gwinnett's return of this valuable water resource to Lake Lanier recharges the supply for water withdrawal needs.

Reuse line being constructed in Lake Lanier

B.4. Regulations and Constraints

The County's water and wastewater system operates in a highly regulated environment. These regulations are intended to protect human health and the environment, and enable reasonable uses of water by the County and others downstream.

Federal and state regulations control the quantity and quality of water withdrawn, treated and returned. The primary Federal regulations that address water systems are the Clean Water Act and the Safe Drinking Water Act.

The configuration of the County's wastewater system enables water to be reclaimed and returned to Lake Lanier and the Chattahoochee River for reuse. These waters are major sources of water supply for the region. Reclaimed water is also released to the Yellow River, which supplements the water supplies for downstream users in the Ocmulgee Basin.

In Georgia, enforcement of the Federal regulations is delegated to the State. The Georgia Environmental Protection Division (EPD) manages the regulatory requirements through permits that establish withdrawal limits, treatment standards and discharge limits. EPD establishes water quality standards for Georgia lakes and streams, and sets permit limits to meet these standards.

Federal regulations are heading in the direction of regulating additional constituents in drinking water supplies and reducing nutrients (nitrogen and phosphorus) released through wastewater. As more is learned about the effects of these constituents on human health and the environment, and appropriate control measures are identified, the regulations will follow. Generally, new regulations provide a reasonable implementation schedule to allow the regulated community time to prepare. New permit limits would be set by EPD, with a transition allowed to meet the new limits.

Gwinnett County currently operates under the most stringent phosphorus controls in the state, through the discharge to Lake Lanier from the F. Wayne Hill Water Resources Center. If in the future the water quality of the lake declines, further constraints on nutrients may be required to protect the Lake.

Beyond the primary federal regulatory programs that affect the County's water and wastewater system, four recent state acts present planning constraints. These are:

- **The Metropolitan North Georgia Water Planning District Act (2001)** – requires the 15 counties in Metro Atlanta, including Gwinnett County, to implement coordinated long-term plans for water supply and water conservation, wastewater management, and watershed management. These plans define the way water is allocated and managed in the Metro region. Plans are implemented by local governments and water utilities, and compliance is audited by EPD. The next update of the District's plans is scheduled to be completed no later than 2014
- **Comprehensive Statewide Water Management Planning Act (2004)** – extends the concept of coordinated water planning beyond Metro Atlanta, to include all areas of the state. Planning councils were appointed to work on plans for 10 new water planning regions. EPD facilitated the planning process and provided technical consultants to work with the councils to prepare basin-specific plans. The plans were completed in winter 2011. The planning cycle for the Metro District and the state's regional plans may align in the future
- **Water Stewardship Act (2010)** – creates a statewide culture of water conservation. The act directs the Department of Natural Resources (DNR) to work with other state agencies to drive programs that will conserve water and enhance supplies. The act includes revisions to the state plumbing code to restrict the sale of inefficient toilets, and requires water meter installations in multi-tenant properties
- **Water System Interconnection, Redundancy and Reliability Act (2010)** – directs the Georgia Environmental Facilities Authority (GEFA) to conduct a thorough engineering study of the water systems in the Metro Water District to determine the capability to accept or share water with adjacent systems during emergencies. Findings from the study included a recommendation for Gwinnett County to add redundancy at the Shoal Creek Filter Plant, in case of failure at the Lanier Filter Plant
- **Water Wars** – On June 28, 2011 the Federal 11th Circuit Court of Appeals overruled Judge Magnuson's ruling in the Tri-State Water Rights Litigation. The Circuit Court reversed the District Court's decision and remanded all four cases to the District Court with instructions to remand to the Corps of Engineers for further proceedings not inconsistent with this opinion.

  The Court of Appeals gave the Corps of Engineers one year to complete its analysis of its water supply authority and release its conclusions. The Court stated "At the end of this one-year period, we expect the Corps to have arrived at a well-reasoned, definitive and final judgment as to its authority under the RHA and the WSA." This means to Gwinnett County that one year from June 28, 2011 the COE will have to issue its determination as to its authority under the RHA and the WSA. This is expected to be a legal determination and the actual amount of water that can be used for water supply to be determined later when the new Water Control Manual is published after public input and all relevant regulatory requirements, such as NEPA have been addressed.

  After the COE issues its Water Control Manual, the state of Georgia will have to allocate the amount of water from Lake Lanier that can be used for drinking water to the water providers in the Metro Atlanta Area. Then Gwinnett County will know how much water it will have permanently from Lake Lanier to use for its raw water supply for the future. The issue of how reclaimed water that is returned to Lake Lanier by Gwinnett and others will be accounted for in this arena is still unknown and will be determined in the future

C. DRIVING FORCES

This section presents some of the driving forces that provided direction for the Master Plan. Typical drivers for water and wastewater master plans are often related to growth trends and need for service area expansion and facility improvements. Regulatory compliance or consent orders also are common drivers. However, the 2030 Water and Wastewater Master Plan is not driven by these factors.

Rather than responding to growth, this plan is intended to help drive economic development according to the Unified Plan. Rather than expanding the County's sewer service area, this plan intends to leave portions of the County unsewered. Rather than planning for new large facilities, this plan makes use of existing facilities which are relatively new and technologically advanced. Finally, no pressing regulatory compliance matters are driving the recommended actions in the Master Plan.

Following are the key driving forces identified for the 2030 Water and Wastewater Master Plan. The forces reflect the 2030 Unified Plan, as well as concerns uncovered through discussions with County staff, and the goals set by the Citizen Advisory Panel.

C.1. Alignment with the Unified Plan's International Gateway Growth Scenario

Once the Unified Plan was adopted, it became necessary to adjust other County plans and programs to complement and support each other. The Water and Wastewater Master Plan is one of the first plans to evolve from the Unified Plan. Many of the recommendations in the Unified Plan are feasible only if policies and actions are coordinated within the County's water and sewer program.

In particular, the Master Plan is driven by the population and employment projected under the International Gateway Scenario. Water and wastewater services need to support the land use plan and development policies. The growth and development projections drive the location and capacity of the water and wastewater system.

SUMMARY OF FEDERAL AND STATE WATER REGULATIONS

The first regulation that addressed water quality was the Federal Water Pollution Control Act, passed in 1948. The basis for the majority of the current water and wastewater requirements, however, weren't passed until the 1970s. These regulations include the Clean Water Act (1977, this renamed and revised the Federal Water Pollution Control Act) and Safe Drinking Water Act (1974). Since their passage, the U.S. Environmental Protection Agency (EPA) has continued to shape and refine these laws, adding new requirements to address emerging health and environmental concerns.

EPD has primacy for implementation of these Federal requirements in Georgia. The Georgia Safe Drinking Water Act (passed in 1977, amended in 1983, 1989, 1990, 1992, 1993, 1994, 1997, 1999, 2000, 2001, 2002, 2004, 2005, 2009) and the Georgia Water Quality Control Act (passed in 1972, amended in 1974, 1980, 1985, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 2000, 2001, 2002, 2003, 2005, 2007, 2009, 2011) outline how these Federal laws are implemented in Georgia. Some of the key provisions include:

Georgia Water Quality Control Act:

- Outlines the water use classifications (e.g., recreation, fishing) and the water quality standards that could impact future wastewater discharge alternatives
- Water quality standards for Lake Lanier were adopted in 2000 based on amendments to the Water Quality Control Act passed in 1990. Nutrient limits (particularly phosphorus limits) influenced the treatment levels at the F. Wayne Hill Water Resources Center for returns to Lake Lanier
- The Total Maximum Daily Load (TMDL) program is a requirement of the Clean Water Act for waterbodies that do not meet water quality standards. While addressing TMDL's is the responsibility of the County's stormwater program, water quality challenges could impact future treatment requirements

Georgia Safe Drinking Water Act:

- Establishes permitting requirements for raw water withdrawals and source water quality monitoring
- Sets requirements related to drinking water treatment to ensure facilities provide safe drinking water in accordance with Federal standards
- Provides distribution system monitoring requirements to provide for public health and safety to ensure that water quality is not compromised in the pipe distribution system. The distribution requirements have expanded to include monitoring for disinfection by-products (1996 Amendment) as well as traditional parameters (fecal coliform, parasites, etc.)

C.2. Strategic Placement of Sewer

Through the Unified Plan, the County decided to strategically place infrastructure to build a more sustainable community and to reduce the County's capital investments and service costs. This decision led to a recommended policy to preserve the characteristics of the low density residential development in eastern Gwinnett County. To implement this Unified Plan policy, a new policy is recommended in the Master Plan to limit and restrict new sewers in this portion of the County.

Strategic placement of sewer also requires study of the economic development corridors along I-85 and GA-316, as well as the areas slated for redevelopment and revitalization in southern Gwinnett. Sewer and wastewater treatment capacity needs to be in place to support these Unified Plan initiatives.

C.3. Water Resources Limitations

The County's water supply from Lake Lanier is vulnerable due to Federal ownership and control of Buford Dam. There is uncertainty regarding possible outcomes of Corps studies underway and continuing inter-state negotiations between Georgia, Florida and Alabama. The amount of raw water that will be available in the future for Gwinnett, and the contract terms will not be known until late 2013 when the Corps' studies are completed.

The water supply issue drives the County's continued prosperity and quality of life. Competition for limited water supply and wastewater discharge allocations will create more challenges for the County. The competition is managed through the Metro Water District plans as input to state permitting decisions. Gwinnett's Master Plan will provide important input to the next update of the Metro District plans.

Other water resources management drivers addressed in the Master Plan include inter-basin transfers, consumptive use discussions, impacts of water conservation, maximizing and accounting for wastewater returns, and continued demonstration of water stewardship.

STRATEGIC PLACEMENT OF SEWER

The Unified Plan concluded that sufficient funds were not available to both extend sewer into the eastern portion of the County and to rehabilitate the older sewers in the western and southern portions of the County. Therefore, extending sewer infrastructure into the eastern portion of the County could effectively limit the recommended re-development efforts along the major transportation corridors and in turn limit overall economic development of the County.

Limiting sewer extensions in the low density development area will support the growth identified in the International Gateway scenario of the Unified Plan. The low density development also provides a desirable housing option and helps keep Gwinnett a preferred place.

Actions by the Gwinnett County Board of Commissioners outlined in Policy A.1.3: Strategic Placement of Sewer in the Unified Plan are needed to identify specific boundaries and limit the extension of sewer.

Lake Lanier

C.4. Fiscal Challenges

The utility has $1-billion of debt from investment in infrastructure built during many years of high-growth. Debt financing is the traditional method of paying for public infrastructure during a growth phase. This allows a utility to continue to provide service to its current ratepayers at a reasonable rate while at the same time building the infrastructure that will be needed by future users. Much of the major infrastructure needed is now in place and the Department of Water Resources is transitioning away from debt financing to a pay-as-you-go method of paying for projects. While a utility of this size will always have several large projects to construct, it is believed that DWR has reached a balance in projects that it will likely be able to build future infrastructure without resorting to additional debt.

The downshift in the economy has significantly reduced new construction in all of Gwinnett County and as a result income from System Development Charges has been equally impacted. Additionally, the number of non-paying accounts resulting in termination of service has increased. Water conservation has also reduced the quantity of water billed due to reduced use, especially in the summer months as more people choose not to water their lawns.

The utility continues to experience rising operating costs for daily operation as the cost for electricity and chemicals (the primary operating expense) has continued to rise. Much of the existing infrastructure was installed in the 1980s and 1990s, and is nearing a point that it will require repairs and rehabilitation or in some cases replacement. The Department has been pro-active in developing programs for rehab and replacement, nonetheless large expenses loom during this planning period.
Existing debt, rising costs, declining consumption and the desire to move to a pay-as-you-go approach are driving the utility toward new approaches to planning infrastructure and addressing cash-flow. All of these factors influence the budgeting, planning, timing and implementation of projects and how the Department will set levels of service in the future.

C.5. Just-in-Time Implementation

Continued growth and development in Gwinnett County are certain. The probable location of development is made more certain by the Unified Plan. What is less certain is the timing of that development. A new approach for initiating projects is needed to time capital investments just ahead of the customer demands. This approach estimates the trigger point (initiation point for project planning and development) based on the system limit (point where new capacity is needed) and the project duration (time frame to plan, design, and execute the project).

Along with this driving force is the need for budgeting adequate reserves for the uncertainties that are sure to arise. Directly related to the fiscal challenges above, is the drive toward capital reserves to fund imminent but unscheduled projects. Unstable revenues caused by the economic downturn are also driving the County toward cautious project planning and budgeting.

Timing and effectively staging projects to occur closer to the actual need, is an emphasis for this Master Plan. The cooperative alliance between the Department of Planning and Development and the Department of Water Resources will foster the just-in-time implementation of projects. Monitoring of system performance indicators and economic trends will drive a stronger connection to triggering projects and financing them with the pay-as-you-go approach.

Part 1 provided the context for the Water and Wastewater Master Plan. Part 2 provides a detailed look at the future system demands under the International Gateway growth scenario. It examines where system improvements will be necessary to support the Unified Plan.

A NEW APPROACH TO CAPITAL IMPROVEMENT PLANNING

The Unified Plan recognizes that there is more than one plausible future for development in the County (International Gateway and Middle of the Pack). The water and wastewater infrastructure outlined in the Master Plan is intended to support the anticipated growth for the International Gateway scenario. However, the higher growth in the International Gateway scenario may not be realized if the recommended interventions outlined in the Unified Plan are not adopted, or if the economy remains stalled. Given this uncertainty, the Master Plan presents a new approach to timing for the recommended actions.

Although infrastructure is needed in advance of development, if water and wastewater infrastructure is built too far ahead of the demand, there can be some negative operational consequences. For example if the water infrastructure is too large, drinking water quality may be more difficult to manage because water moves more slowly through the pipe system. In the wastewater collection system, oversized pipes may result in odor challenges or pipe corrosion.

Previous Master Plans associated capital improvement projects with specific time frames. Instead, this Master Plan ties the recommended projects to measurements of the conditions in the water and wastewater systems, such as flow and water pressure. If growth is faster or slower than anticipated, the implementation of recommended actions will be adapted to the actual system conditions. This flexible strategy minimizes the risk of building needed capacity either too early or not in time.

Part 2: Plan Development

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Part 2: Plan Development

Part 2 of the Master Plan presents an overview of the water and wastewater demand projections and the infrastructure analysis prepared during plan development. The primary questions addressed during the analysis are: Does the County have enough water and wastewater system capacity to meet its long-term needs? Where and when will the system need improvements?

A. WATER AND WASTEWATER DEMAND FORECASTS

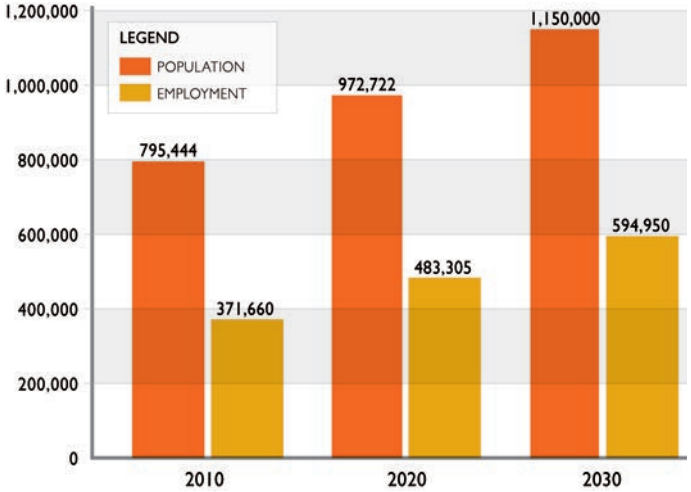
The water and wastewater demand forecasts are the foundation for this Master Plan. These forecasts are estimated from the population and employment forecasts developed for the International Gateway scenario in the Unified Plan. Under this scenario, the highest concentration of future population and employment will be distributed along the I-85, I-985 and Georgia Highway 316 corridors. From a river basin perspective, the highest concentration of population and employment, and water and wastewater demand, will be distributed in the Upper Yellow River Basin and the Chattahoochee Basin.

A.1. Population and Employment Projections

Population and employment forecasts were developed in the Unified Plan based on historical population data and an evaluation of future land development potential. The International Gateway scenario was determined to be the preferred outcome because it would enable the County to develop the economic base needed to fund and operate community infrastructure.

Figure 2-1 shows the forecasted population and employment for the International Gateway scenario. Under this scenario, the County's population is forecasted to grow from 795,444 in 2010 to 1,150,000 by 2030 (a 45 percent increase) with employment growing from 371,660 in 2010 to almost 595,000 jobs in 2030 (a 60 percent increase).

Figure 2-1: Population and Employment Forecasts 2010 to 2030



SR 316 corridor in Gwinnett County

Figure 2-2: Population Projection Overview, 2010

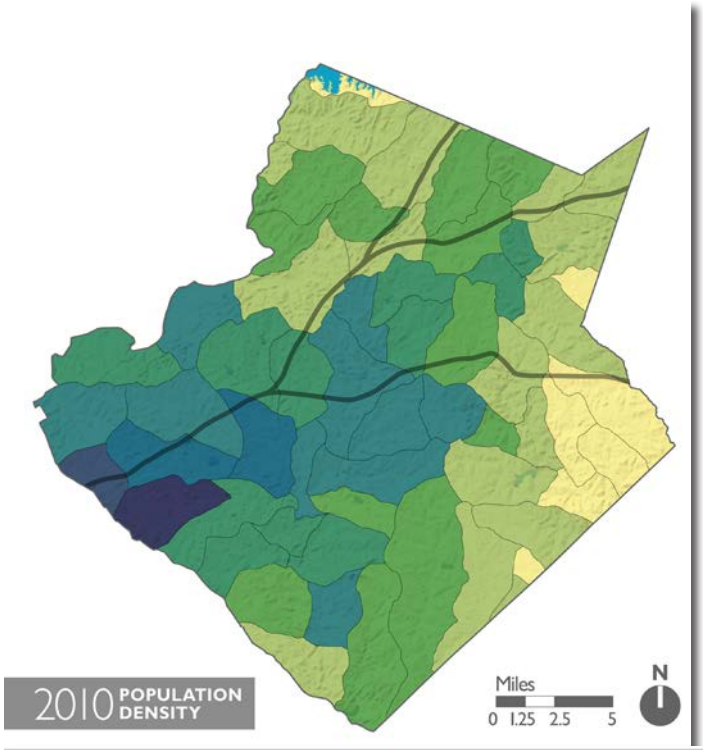
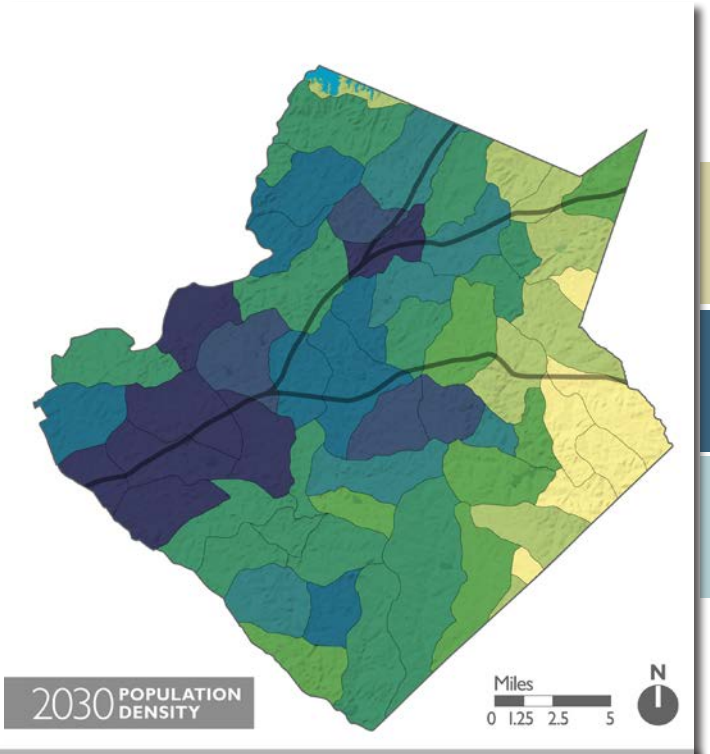


Figure 2-3: Population Projection Overview, 2030



LEGEND

PEOPLE PER ACRE

< 1	3 - 4	6 - 7
1 - 2	4 - 5	> 7
2 - 3	5 - 6	

The Unified Plan's International Gateway scenario anticipates higher future population density along the major transportation corridors (as shown in Figures 2-2 and 2-3, the darker colors signify higher densities). The low density area in the eastern portion of the County is projected to have minimal changes from the current density.

Residential property in Gwinnett County

Figure 2-4: Employment Projection Overview, 2010

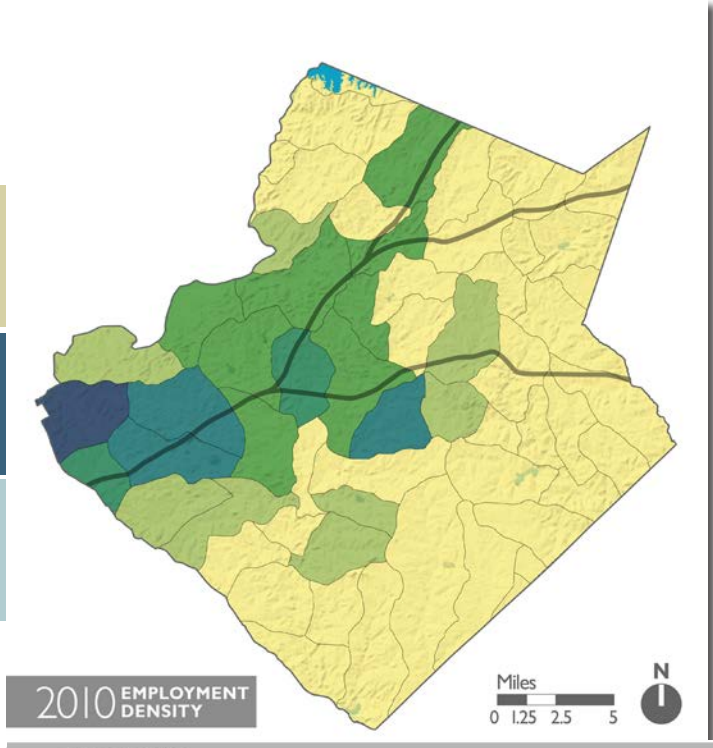
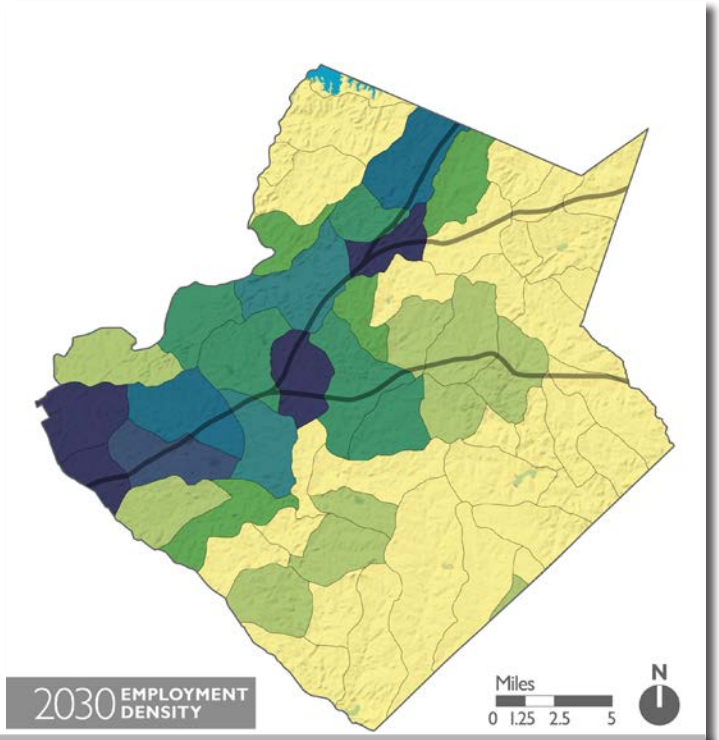


Figure 2-5: Employment Projection Overview, 2030



LEGEND

JOBS PER ACRE

< 2.0	6.1 - 8.0	12.1 - 14.0
2.1 - 4.0	8.1 - 10.0	14.1 - 16.0
4.1 - 6.0	10.1 - 12.0	< 16.1

Substantial job growth is also forecasted along the I-85 and I-985 corridors (Figures 2-4 and 2-5) for the planning horizon. The Georgia Highway 316 corridor (also known as University Parkway) is envisioned as a center for research and development. These employment centers are surrounded by areas with greater population density (as shown in Figure 2-3). The northeast and eastern portions of the County are predicted to have minimal changes in employment density.

These population and employment projections (quantity and geographic distribution) were used to develop the future water demand and wastewater flow projections that were then applied to evaluate the system improvements required to support the International Gateway scenario.

Commercial property in Gwinnett County

COMPARISON OF RECENT POPULATION AND EMPLOYMENT PROJECTIONS

Since the adoption of the Unified Plan in 2009, the 2010 Census data became available. Also, in March, 2010, the Georgia Office of Planning and Budget (OPB) published a set of population projections developed for the purposes of regional water planning as part of Georgia's State Water Plan. The Census estimates show that the 2010 population in Gwinnett County was 805,321, or about 1 percent higher than the 795,444 forecast in the Unified Plan International Gateway scenario. The long-term population projected by the State OPB is about 5 percent higher for the year 2030 than the International Gateway scenario projection.

The following figure compares the available population data and projections. The 2009 projections used in the Metro Water District Water Supply and Water Conservation Management Plan were considered low, as they were developed based on population estimates (developed by the Atlanta Regional Commission) that were lower than the Census estimates for the period of 2005 to 2010.

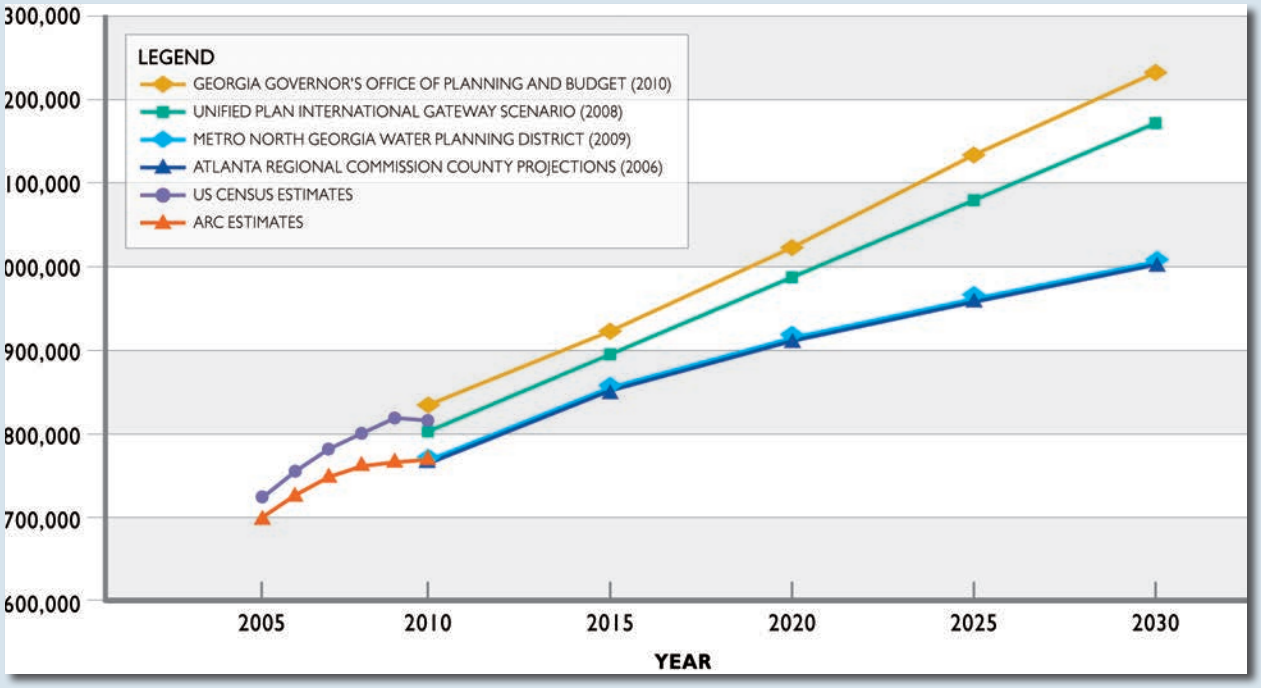
The International Gateway scenario of the Unified Plan outlines actions to keep Gwinnett a "preferred place", which will result in higher population and employment. After discussions with the Gwinnett County staff, the International Gateway scenario was selected as the most appropriate basis for long-term planning of water and wastewater infrastructure for the Master Plan.

It is worth noting that the OPB population projections were developed for use by the State Water Plan in 2011. The future update of the Metro Water District plans will be required to consider these updated populations, with Census estimates available at the time of plan updates.

The estimated employment based on the Quarterly Census of Employment and Wages in June 2010 was 295,569, or approximately 20 percent lower than the employment projections (371,660) developed in the Unified Plan for the International Gateway scenario. Periods of higher than anticipated employment growth are anticipated in the future as the Unified Plan recommendations are implemented to reach these employment projections.

The fluctuations in growth rates and differences between projections and Census estimates highlight the importance of monitoring and comparing current data to the projected estimates. As mentioned in Part 1, over-sized infrastructure can lead to operational and maintenance challenges. A strategy to minimize this situation by monitoring development trends and system performance for timing infrastructure improvements is discussed in Part 3, Implementation.

Comparison of Recent Population Projections for Gwinnett County



A.2. Water Demand Forecasts

With a continued emphasis on water conservation, the County's long-term water demands are projected to reach 154 MGD on an annual average basis. The following sections outline the basis and methodology used for estimating the future water demands. The projected water demands were used to assess the system's readiness to support the International Gateway scenario and to identify any necessary improvements (described in Part 2B).

Existing Water Demands

For the period of 2005 to 2010, the two filter plants treated approximately 71 to 87 MGD from Lake Lanier on an annual average basis. The peak day production from the same period ranged from 88 to 130 MGD. See Table 2-1. In general, the amount of water withdrawn has decreased since 2003 due in part to water conservation efforts, voluntary and mandatory watering restrictions, and the economic recession. By comparison, the peak day withdrawal in 2000 reached 143 MGD.

Lake levels were at a historical low during the drought of 2007 to 2008. In 2008, the total water withdrawn from Lake Lanier decreased approximately 17 percent from the pre-drought levels on an annual average basis as a result of the water conservation program and water restrictions imposed during this period. Peak day water usage in 2008 also declined significantly (approximately 30 percent), due to a complete outdoor watering ban.

Additionally the economic downturn that coincided with the beginning of the drought period may have been an influence in the reduction in consumption. Moving forward it will be important to monitor consumption patterns to identify new trends.

HOW THE FORECASTS ARE USED

The water and wastewater demand forecasts are prepared to reflect the population and employment estimates for the year 2030, according to the Unified Plan, International Gateway growth scenario. The demand forecasts were used to evaluate the County's long-term water and wastewater infrastructure needs in order to achieve the community development patterns preferred by the County. Given the uncertainty following the 2008 recession, Gwinnett recognizes that the projected 2030 demands may extend beyond the planning horizon used in the Unified Plan. Therefore, planning recommendations recognize the potential variability in economic development trends, and the need for flexibility in the timing for implementation. Forecasts are used to identify long-term system needs, while other strategies (outlined in Part 3) are used to initiate specific infrastructure projects. The methodology used to determine when a specific project should be initiated is outlined in detail in Appendix C "Project Timing Guidance".

Table 2-1: Water Production Data Summary

Category	2005	2006	2007	2008	2009	2010
Annual Average Demand (MGD)	80.7	87.4	86.8	71.9	71.3	74.7
Peak Day Demand (MGD)	113.3	129.8	126.3	87.9	103.1	99.8
Peak Day Factor	1.4	1.5	1.5	1.2	1.4	1.3

Note: Peak Day Factor = Peak Day Demand divided by Annual Average Day Demand

Future expansion for the Shoal Creek Filter Plant

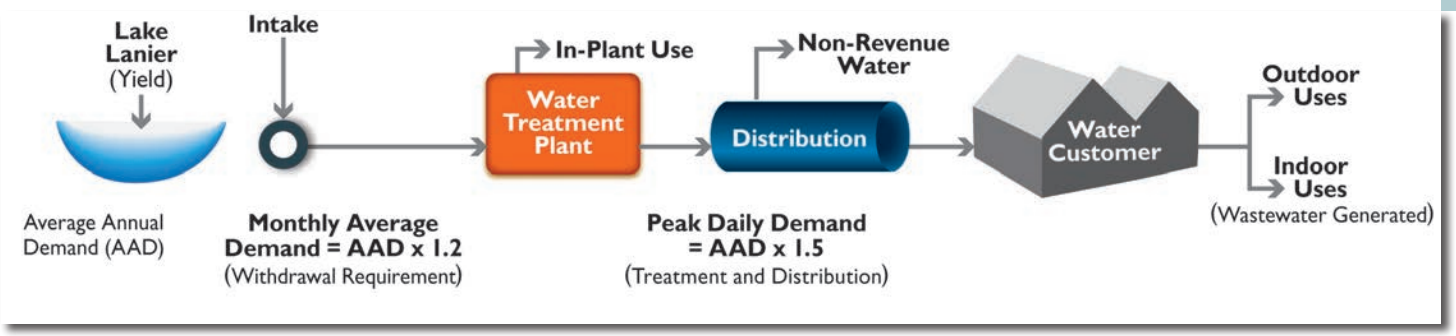
Peaking Factors

Gwinnett's recent water demands were used to develop a relationship between the annual average demand (used for water demand forecasts), monthly average demands (used for water supply and treatment), and peak day demands (used for water distribution systems).

EPD issues water withdrawal permits on a monthly average (MGD) basis. The monthly average demand reflects the volume of water withdrawn throughout a specified month divided by the number of days in that month. Gwinnett's monthly average demand is typically 1.2 times the average annual demand, based on an analysis of recent plant production data (2005 to 2010). This factor (1.2) is consistent with the factor used for the Metro Water District planning process.

The peak day factor is the ratio between peak day water demand and an average day demand for a given year. The peak day factor is important because pumping stations, treatment facilities and distribution mains are typically sized to handle the system's peak day demand. Gwinnett's peak day factor for the period of 2005 to 2010 ranged from 1.2 to 1.5 (Table 2-1). A peak day factor of 1.5 was selected for conservative facility planning for this Master Plan. The lower peak day ratio in 2008 (1.2) reflects the effect of outdoor watering bans implemented during the drought period.

Figure 2-6: Water System Schematic



Gwinnett Braves Stadium

Basis for Forecasts

Figure 2-6 illustrates how water is conveyed from the source to end users. Water production and billing data provided input data for the analysis.

Water Use Categories

Figure 2-7 illustrates how water is used in Gwinnett after being pumped from Lake Lanier. The total water withdrawn from the Lake (raw water) is treated at the County's two filter plants. A small percentage of the water withdrawn is used by the plants (in-plant water use) for basin washing, sampling, chemical mixing, and plant personnel uses. The remaining withdrawn water enters the distribution system after treatment at a filter plant. The in-plant water use averaged 3.6 percent of total water pumped during the period of 2005 and 2009. This percentage is within the industry average of 3 to 5 percent.

The treated water is distributed through a network of water mains, pump stations and storage tanks to serve Gwinnett's residential, commercial, and wholesale customers. Treated water also includes non-revenue water. Non-revenue water is water that is pumped into the distribution system but is not reflected in customer billings. Non-revenue water includes unbilled authorized water uses (such as water for fire fighting), unauthorized consumption, and water losses (see the expanded definition on page 45). For the period of 2005 to 2009, the total non-revenue water averaged 12 percent of total treated water entering the distribution system while the actual lost water averaged 6 percent. These non-revenue and lost water quantities are considered low by industry standards.

Based on the County's billing data (2009), Figure 2-7 also shows how the treated water is distributed among Gwinnett's residential, commercial, and wholesale customers. Types of residential water uses are shown based on estimates in the 2009 Metro Water District Water Supply and Water Conservation Management Plan.

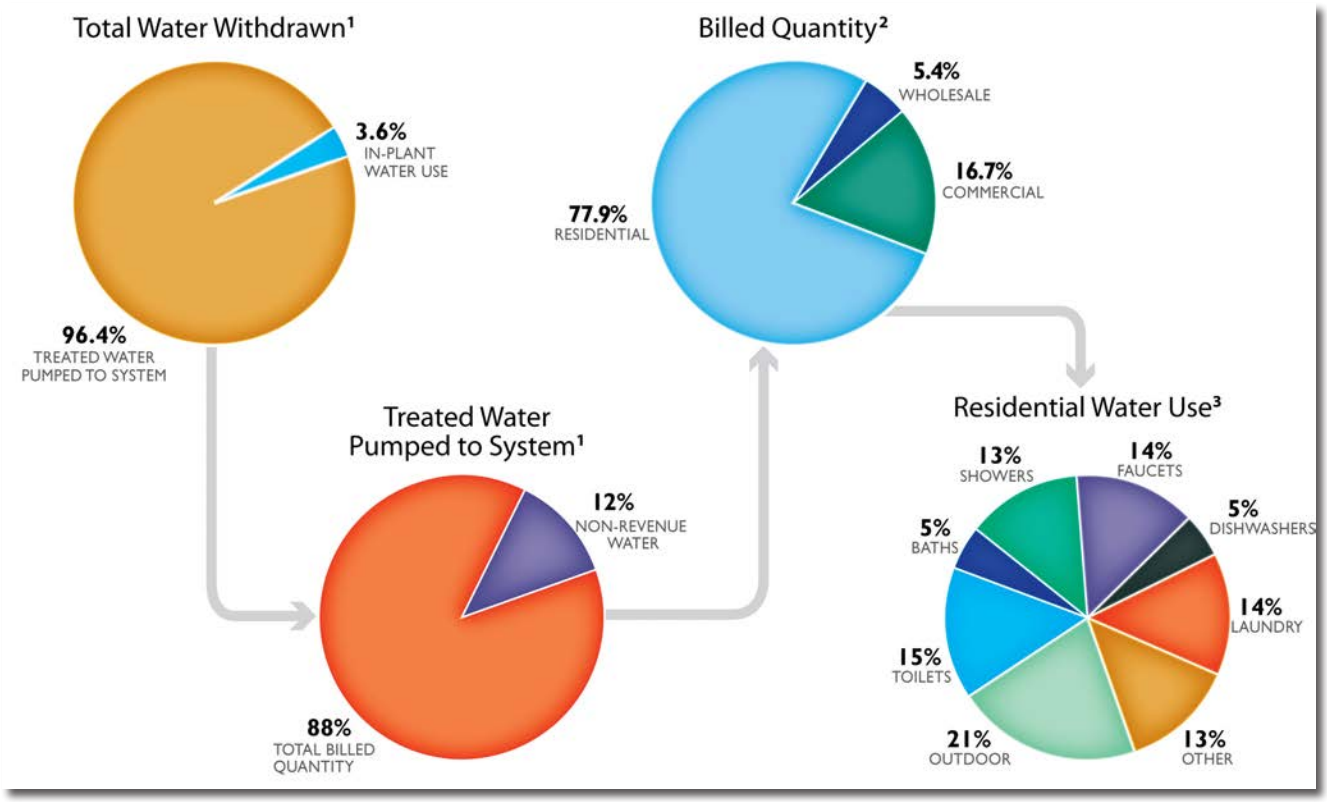
Baseline per Capita Water Demand

An overall per capita water demand represents the total volume of water entering the distribution system divided by the total population served. For the Master Plan projections, an overall per capita water demand of 145 gallons per day (gpcd) was used as the baseline. This value was calculated for the 2009 Metro Water District Water Supply and Water Conservation Management Plan (based on Gwinnett's plant production data in 2006).

The per capita water demand of 145 gpcd is considered "baseline." This represents the demands for residential, commercial/industrial, and wholesale customers as well as non-revenue water. Additional water conservation should reduce the future per capita demand.

To assess localized infrastructure needs, the water demands were estimated for smaller geographical units (i.e. the traffic analysis zones used in the Unified Plan). This was particularly important for evaluating the future needs of the targeted developments along major transportation corridors that will be served by existing infrastructure. The projected population or employment for each sub-basin was multiplied by the residential and commercial per capita demand to estimate the respective water demands.

Figure 2-7: Gwinnett's Water Uses



Notes:

1. Plant production data (2005 - 2009)
2. Plant production data (2005 - 2009) and billing data (2009)
3. 2009 Metro Water District Water Supply and Water Conservation Management Plan (2009)

Forecast Assumptions

The forecasted water demands for the County were calculated by multiplying the overall per capita water demand by the projected population. The residential and commercial water demands were also estimated for traffic analysis zones to assess localized infrastructure needs.

It was assumed that any of Gwinnett's current wholesale customers located outside of the county will continue to be supplied at current levels throughout the planning horizon. As the current level of non-revenue water (12 percent of total pumped to the system) is low based on industry average, it is assumed that the percentages will remain constant throughout the planning horizon as Gwinnett intends to continue its non-revenue water management program.

Water Conservation Scenarios

Future water demands were projected for three scenarios with various levels of conservation efforts based on the International Gateway population and employment forecasts:

- The **Baseline** Water Conservation scenario assumes that the existing water use patterns and conservation efforts (based on the 2003 Metro Water District plan requirements) will continue into the future without any change. The Baseline scenario provides a point of comparison to calculate the conservation savings associated with the other scenarios
- The **Regional** Water Conservation scenario incorporated water conservation requirements adopted by the Metro Water District in 2009 and key aspects of the Georgia Water Stewardship Act of 2010
- The **Enhanced** Water Conservation scenario incorporated additional conservation programs adopted by the Metro Water District in 2011 for water providers who withdraw water from Lake Lanier or the Chattahoochee River within the Metro Water District

Details of the Regional and Enhanced Water Conservation programs are summarized on the page 46.

NON-REVENUE WATER

Non-revenue water is water that is pumped and treated, but is not billed to customers. Non-revenue water can be divided into two general categories: Unbilled authorized consumption and water losses, which can be further divided into two categories, defined as follows:

1. Real Losses – Water lost from the distribution system through leaking pipes, joints, and fittings; leakage from reservoirs and tanks; reservoir overflows; and,
2. Apparent Losses – Water that is not physically lost but does not generate revenue because of inaccuracies related to customer metering, consumption data handling errors, or any form of theft or illegal use.

Based on production and billing data from the period 2005 through 2010, non-revenue water in the County averaged 12 to 13 percent of the total volume of water entering the distribution system.

Gwinnett County has a proactive program aimed at reducing its non-revenue water managed by a cross-divisional task force. The program elements include an ongoing leak detection and repair program including in-house dedicated crews; a large meter calibration and replacement program; a small meter replacement program; a water main replacement program to replace leak-prone material; a pressure management team to manage pressure zones; continuous monitoring of tank filling via computerized software; and, an annual water audit to monitor the non-revenue water and assess the effectiveness of the program based on standards recommended by the International Water Association and the American Water Works Association. The County intends to continue its efforts to maintain a low level of non-revenue water.

Shoal Creek Filter Plant

WATER CONSERVATION SCENARIOS

The Baseline Water Conservation scenario includes the following measures:

- Conservation Pricing
- Replace Older, Inefficient Plumbing Fixtures
- Pre-Rinse Spray Valve Retrofit Education
- Rain Sensor Shut-Off Switches on New Irrigation Systems
- Require Sub-Meters in New Multi-Family Buildings
- Assess and Reduce Water System Leakage
- Conduct Residential Water Audits
- Distribute Low Flow Retrofit Kits for Residential Customers
- Conduct Commercial Water Audits
- Implement an Education and Public Awareness Plan

Note: These measures are based on the 2003 Metro Water District Water Supply and Water Conservation Management Plan.

The Regional Water Conservation scenario includes the measures in the baseline scenario as well as enhancements to three existing measures and two new measures, as follows:

- Conservation Pricing - enhanced to include irrigation meter pricing
- Replace Older, Inefficient Plumbing Fixtures - enhanced to only provide rebates for high-efficiency toilets after 2014
- Implement an Education and Public Awareness Plan - enhanced with minimal annual requirements
- Install High Efficiency Toilets and Urinals in Government Buildings
- Require New Car Washes to Recycle Water

Note: These measures are based on the 2009 Metro Water District Water Supply and Water Conservation Management Plan.

The Enhanced Water Conservation scenario includes the following measures in addition to the measures in the Regional Water Conservation Scenario:

- Expedited water loss reduction - achieving planned reductions in water loss at a faster pace
- Multi-family high efficiency toilet rebates - extending the rebate program to multi-family properties
- Fixture retrofit on reconnect (on-hold pending further evaluation)
- Install meters with point of use leak detection - meters that proactively inform customers of potential leaks
- Require private fire lines to be metered - required for all new fire lines
- Maintain a water conservation program - includes funding and staffing support
- WaterSense new home mandatory program (on-hold pending further evaluation)
- Water waste policy - provisions for fining customers who waste water
- Require high efficiency plumbing fixtures consistent with state legislation - implement the Water Stewardship Bill
- State legislation requiring irrigation designer/installer certification (pending state legislation)

Note: These measures are based on the program adopted by the Metro Water District Board (December 2010) in response to legal challenges to the continued use of Lake Lanier and the Chattahoochee River.

The Citizen Advisory Panel developed community priorities that supported "Keeping Gwinnett a Preferred Place". One of the community priorities included "Be regional leaders in good stewardship of water resources (conservation, reuse, consumptive use, etc.)". The implementation of the Enhanced Water Conservation scenario supports this priority.

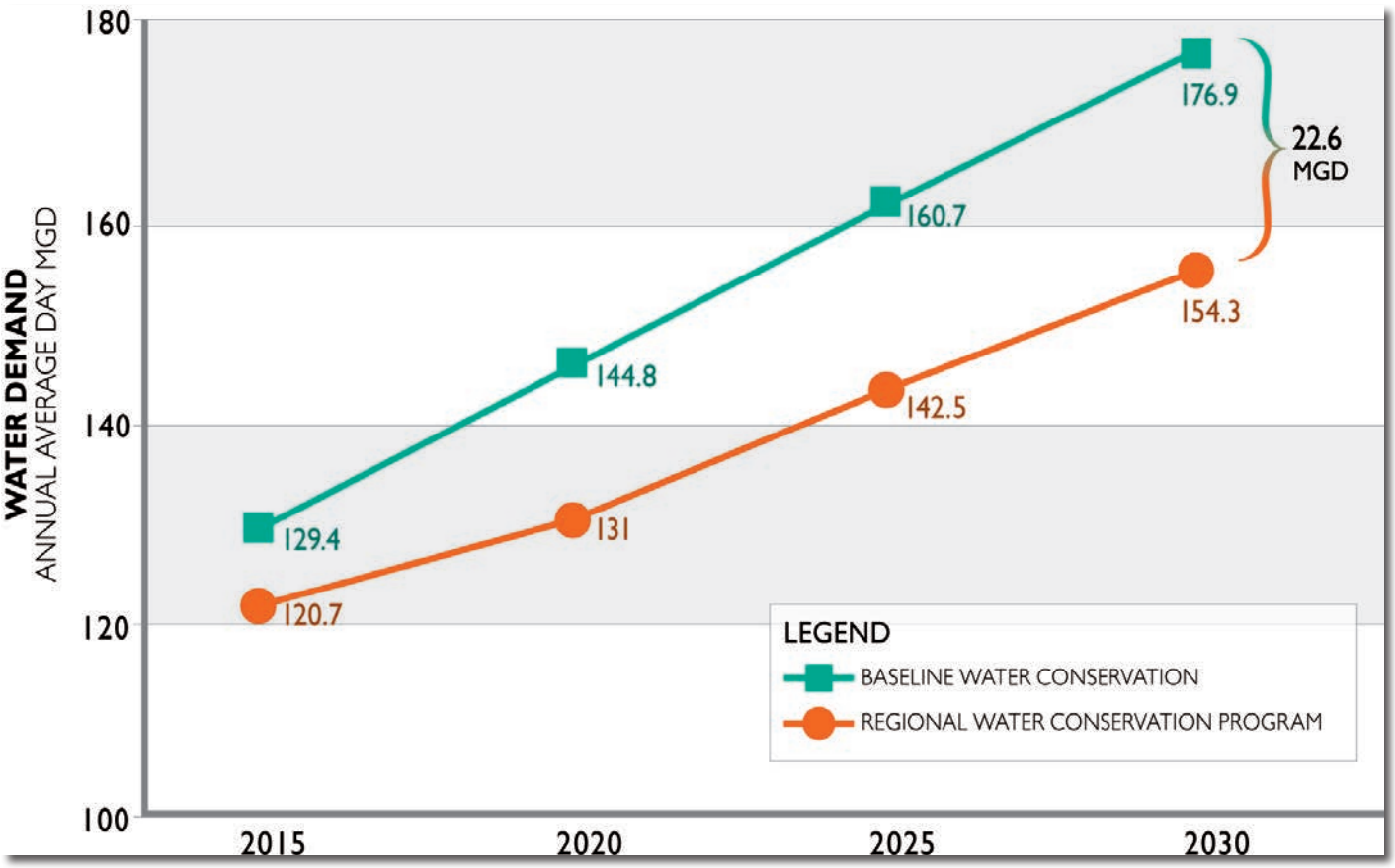
Rain barrel made from a water conservation education class provided by Gwinnett County

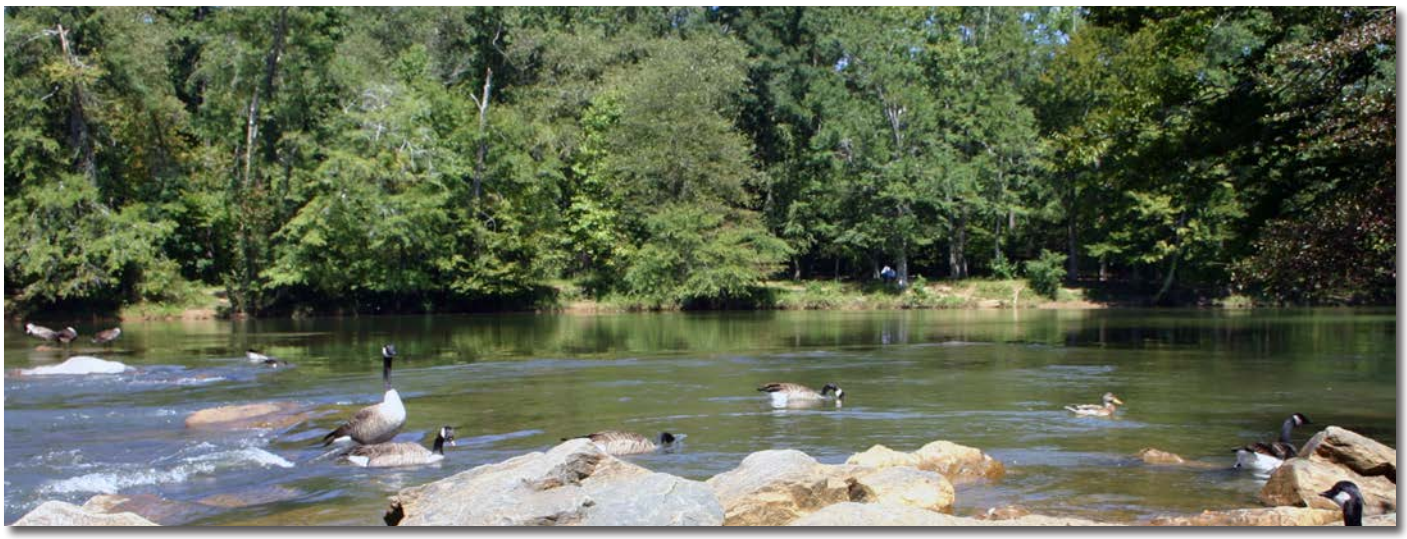
Water Demand Projections

Figure 2-8 compares projected annual average water demands for the baseline and regional conservation scenarios. As shown by the figure, the projected long-term water demand with Baseline Water Conservation is approximately 177 MGD. In the Regional Water Conservation scenario, future demands may be reduced to 154 MGD, if the measures achieve an additional reduction of 23 MGD. Although the demand for water will be 154 MGD under the Regional Water Conservation Scenario, 160 MGD of raw water from Lake Lanier will be used for planning purposes.

The Enhanced Water Conservation scenario is quite aggressive; some of the requirements will require support from the state legislature and some will require additional staff and funding. Although Gwinnett County plans to implement these requirements, it may take several years before the conservation practices are fully effective. After discussions with Gwinnett's staff, it was determined that the projections based on the Regional Water Conservation Program (154 MGD on an annual average basis) should be used for this Master Plan for long-term planning of infrastructure ; a value of 160 MGD will be used for water supply and water treatment needs.

Figure 2-8: Water Demand Projections





Chattahooche River in Gwinnett County

A.3. Wastewater Flow Forecasts

This section discusses the wastewater flow forecast methodology and summarizes the projected wastewater collection and treatment demands for the International Gateway scenario.

Existing Flow Data Summary

Over the last decade, Gwinnett has consolidated its wastewater facilities from a total of 9 facilities to 3 facilities in operation in 2011. These facilities are: the F. Wayne Hill Water Resources Center, the Crooked Creek Water Reclamation Facility and the Yellow River Water Reclamation Facility. (The Jackson Creek Water Reclamation Facility was decommissioned in August of 2011, with flows now managed at the Yellow River Water Reclamation Facility.)

Because of the recent facility consolidations, wastewater flow and treatment records from 2007 to 2009 were used to analyze system operation characteristics.

In 2007 and 2008, the drought resulted in reduced water consumption and therefore reduced wastewater flows; conversely, the flood in 2009 increased the wastewater flows entering the collection and treatment systems. An average approach was applied for flow analysis, because of the weather patterns experienced during the three-year period.

For the period of 2007 to 2009, the water reclamation facilities treated a combined flow of approximately 51 MGD on an annual average basis. The maximum monthly average flow during this period was approximately 54 MGD. The peak day flow for this period averaged approximately 74 MGD.

Peaking Factors

Two peaking factors are important in evaluating wastewater system needs: the maximum month factor and the peak day factor. The wastewater flow data from 2007 to 2009 was used to calculate these factors for the forecasts.

The maximum monthly flow represents the highest average flow during any given month in the year. The ratio of maximum monthly flow to annual average flow was calculated to be 1.1, based on the 3-year period of data analyzed. Wastewater treatment facilities are typically sized to handle maximum monthly flows and the effluent discharge permits issued by EPD are based on a monthly average discharge.

The peak day flow represents the highest flow anticipated on one day during a given year and is typically associated with a significant storm event with high inflow and infiltration contributions. A peak day factor of 1.5 was calculated based on the 3-year period of data analyzed. Collection system infrastructure such as pumps and pipes are typically designed to handle peak day flow.

Damaged pipes due to roots can allow groundwater to infiltrate into the collection system

Water Resources employees repair broken pipeline

Basis for Forecasts

In addition to receiving wastewater flows from residents and businesses, the wastewater system must also convey and treat inflow and infiltration (I/I) (i.e., the storm water and groundwater that enter the wastewater collection system). The Crooked Creek Water Reclamation Facility also routinely receives pumped septage that has been hauled to the plant to be treated. These factors are described further below.

Figure 2-9 illustrates how wastewater is collected and treated and describes the terms used to describe flow. Plant operational data and billing data were used to forecast wastewater flows, as described below.

Indoor Water Use

Wastewater flows from households and businesses were estimated based on indoor water use. Water used indoors is assumed to return to the wastewater system through sewers, whereas outdoor water use (gardening, car washing) is assumed to evaporate, absorb into the soil and groundwater, or flow into a storm drainage system.

The percentage of indoor water use for residential, commercial, and wholesale customers in Gwinnett (shown in Figure 2-10) was based on calculations performed for the 2009 Metro Water District Wastewater Management Plan. These estimates were based on the difference between water use in the winter months (which reflect mainly indoor use) and the remainder of the year (which include outdoor uses such as irrigation, fountains, etc.). Figure 2-10 illustrates the different indoor water use percentages for each water use category.

Inflow and Infiltration

Inflow and infiltration (I/I) is stormwater and groundwater that enter the wastewater collection system through manhole covers (inflow), illegally connected downspouts (inflow), or leaks in aging pipes (infiltration). I/I is found in all wastewater collection systems. Previous I/I analyses conducted for the Gwinnett County system and recent flow records for dry and wet years suggest that 20 percent of the total wastewater flow is attributed to I/I. This percentage also was used for the 2009 Metro Water District Wastewater Management Plan.

Figure 2-9: Wastewater System Schematic

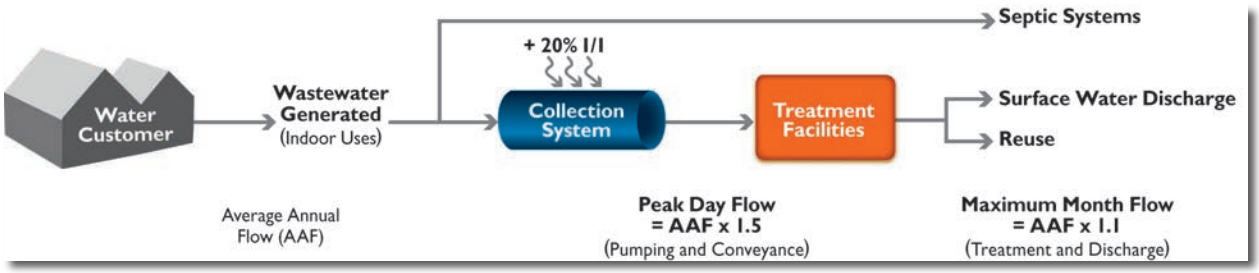
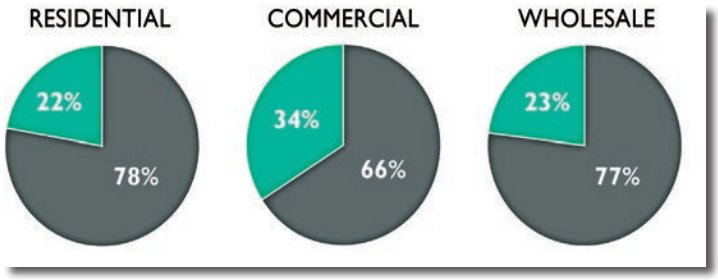


Figure 2-10: Gwinnett's Percent of Indoor and Outdoor Water Use (2006 data)



Future Wastewater Service Area and Forecast Assumptions

Wastewater generated at households or businesses can enter private onsite sewage management systems (such as septic tanks), or can enter the sewers and be treated at a public wastewater treatment facility. Approximately 27 percent of Gwinnett's residential population was served by privately-owned septic systems in 2010 based on estimates made by the Gwinnett Department of Health (2006) and updated by the Gwinnett Stormwater Management Division (2010). Conversely, 73 percent of Gwinnett's population is served by the County's wastewater system.

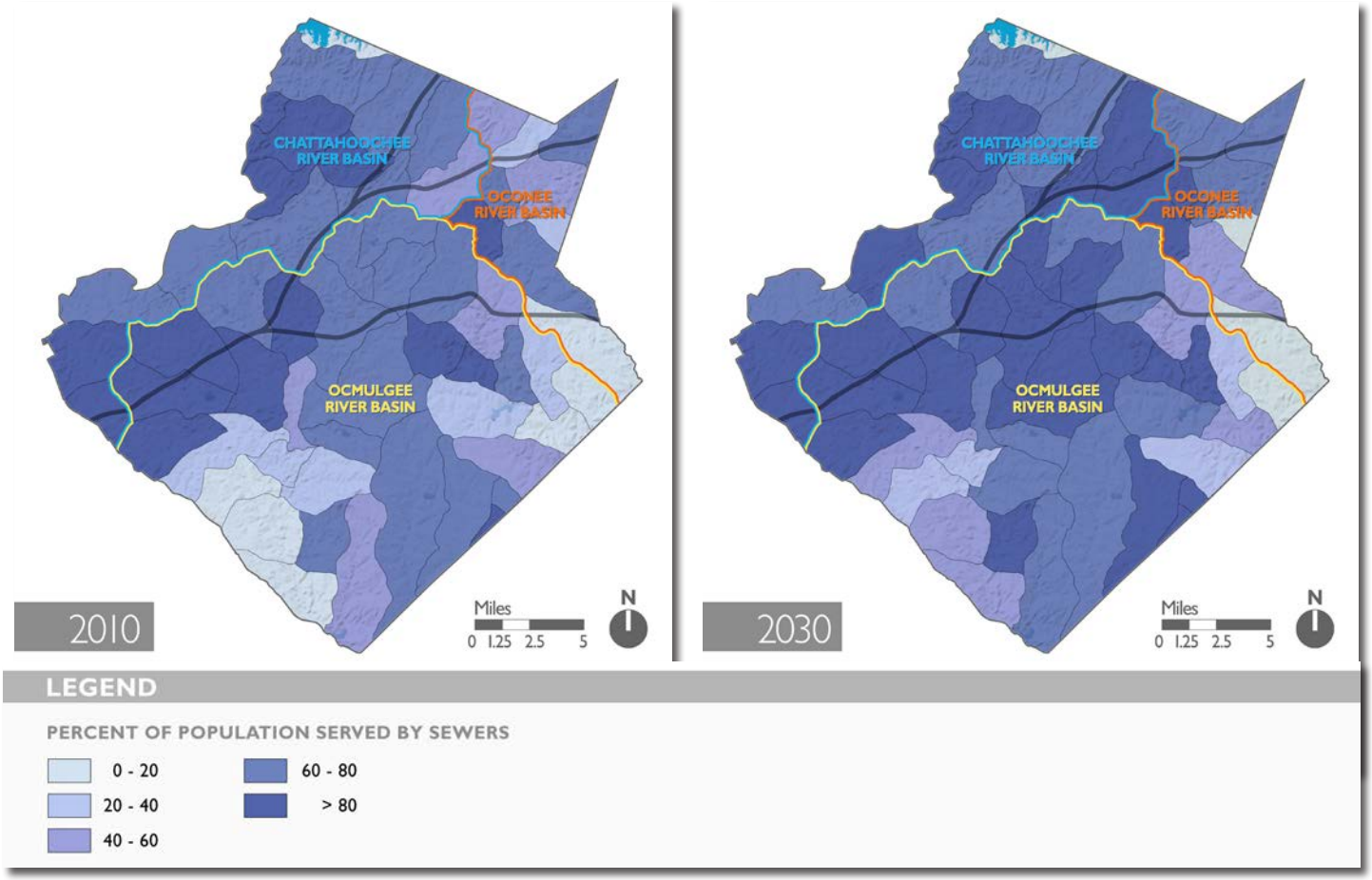
The future wastewater flows to a Department of Water Resources facility were estimated based on the following assumptions:

- All of the areas designated for higher density development in the Unified Plan would be 100 percent sewered in the next 20 years. This includes areas that are currently served by septic systems
- 100 percent of future commercial customers are assumed to have sewer service
- Most of the area designated for low density development in the Unified Plan is assumed to remain unsewered. For areas within the Rural Estate Character Area that already have existing collection system infrastructure, it is assumed that the collection system will only serve developments in areas immediately adjacent to the sewer

On the basis of these assumptions, the residential population served by the wastewater system is projected to increase from 73 percent in 2010 to 80 percent in 2030. Figure 2-11 shows the percent of population served by sewers in year 2010 and Figure 2-12 reflects the forecasted percentage in 2030.

Figure 2-11: Percent of population served by sewers by river sub-basins, 2010

Figure 2-12: Percent of population served by sewers by river sub-basins, 2030



Wastewater Flow Projections

Based on the factors and assumptions described above, the annual average wastewater flow for Gwinnett's wastewater system is estimated to reach approximately 104 MGD by the end of the planning horizon (i.e., 2030). The maximum monthly and peak day flows are projected to reach approximately 114 MGD and 156 MGD, respectively, by the end of the planning horizon. These flows are used for long-term planning purposes in this Master Plan. The highest concentration of future wastewater flows are distributed in the Upper Yellow River Basin and the Chattahoochee Basin within the County. Figures 2-13 and 2-14 illustrate the projected flows from 2010 to 2030 by the County's sewer basins. The sewer basins reflect the watersheds, or drainage areas, in the County as typically sewers are designed to flow by gravity from higher to lower elevations.

The sub-basins with the highest projected increase in wastewater flows reflect the areas planned for higher density development in the Unified Plan

Figure 2-13: Projected Wastewater Flows, 2010 (MGD)

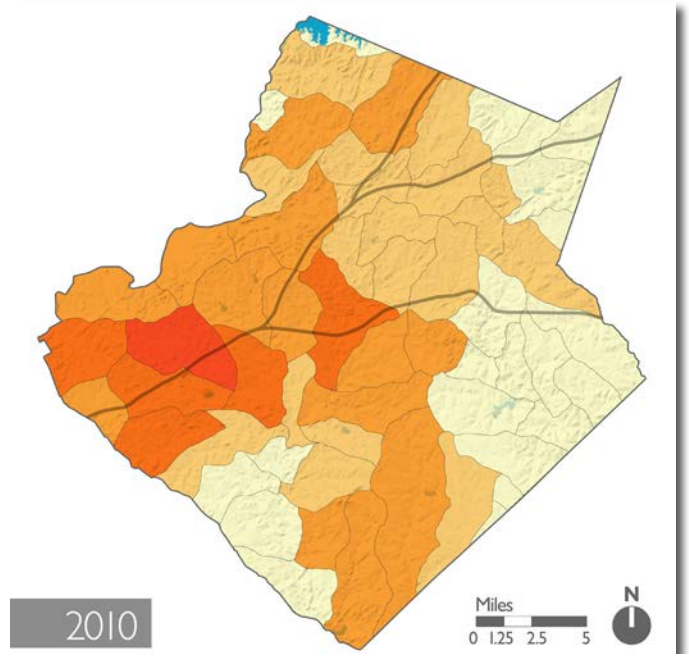


Figure 2-14: Projected Wastewater Flows, 2030 (MGD)

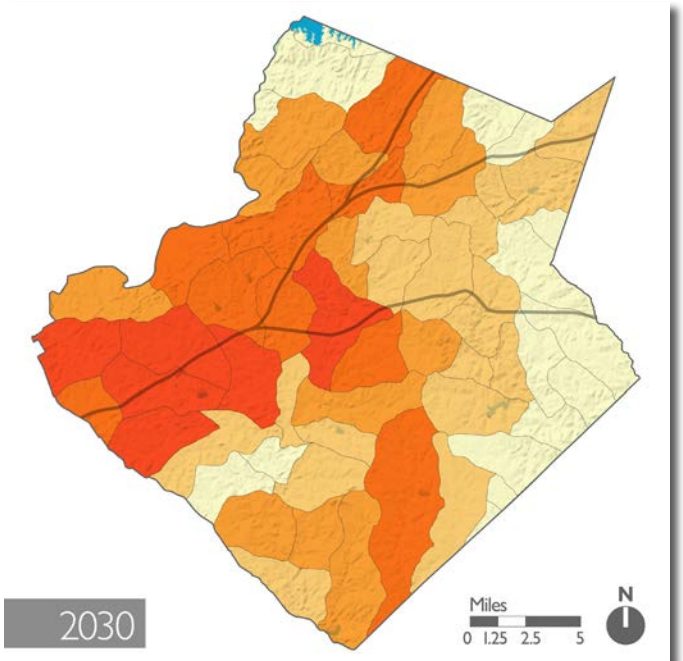
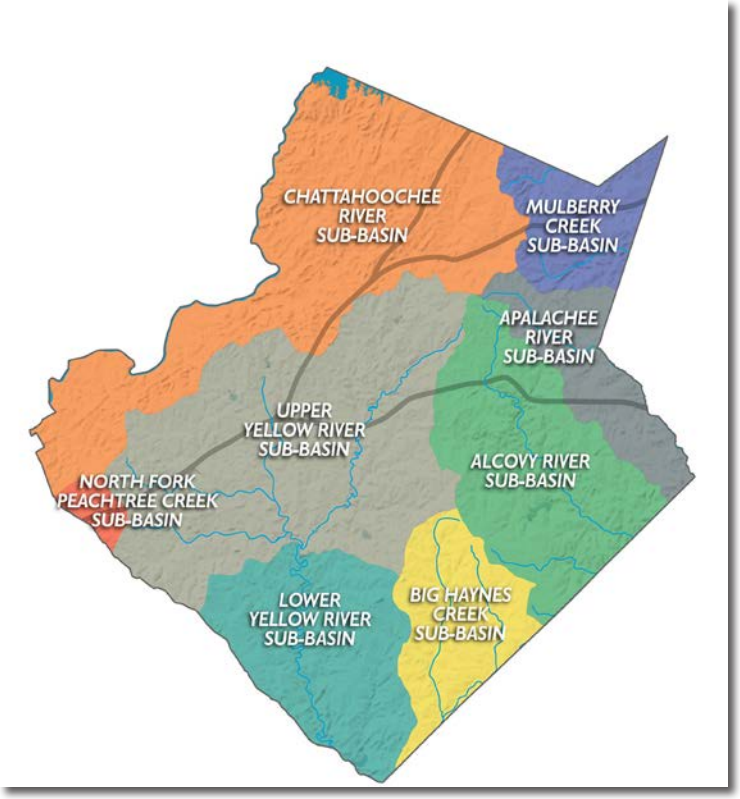


Table 2-2: Forecasted Population and Employment by Major Sub-Basins

Sub-Basins	2010		2015		2020		2025		2030	
	Pop.	Emp.	Pop.	Emp.	Pop.	Emp.	Pop.	Emp.	Pop.	Emp.
Alcovy River	71,046	18,959	76,995	21,442	82,945	23,925	88,894	26,409	94,844	28,892
Apalachee River	20,855	1,986	21,855	1,832	22,856	1,678	23,856	1,524	24,856	1,370
Big Haynes Creek	49,140	7,040	51,845	8,241	54,550	9,442	57,255	10,643	59,960	11,844
Chattahoochee River	168,378	122,911	207,532	150,139	246,686	177,366	285,840	204,594	324,994	231,821
Lower Yellow River	102,240	21,573	106,833	23,662	111,425	25,750	116,018	27,838	120,611	29,927
Mulberry Creek	28,894	3,622	29,067	3,896	29,240	4,170	29,412	4,445	29,585	4,719
North Fork Peachtree Creek	20,118	11,765	22,128	15,467	24,138	19,169	26,148	22,871	28,158	26,573
Upper Yellow River	334,773	183,803	367,827	202,803	400,882	221,804	433,937	240,804	466,992	259,805
Total	795,444	371,659	884,082	427,482	972,722	483,304	1,061,361	539,128	1,150,000	594,951

The highest concentration of future population and employment will be distributed along the I-85, I-985, and Georgia Highway 316 corridors in the Upper Yellow River and Chattahoochee River Basins



WATER AND WASTEWATER FORECAST SUMMARY*

This section provides a quick reference guide to commonly needed information that was used for this Master Plan. Specifically, this guide provides the water and wastewater forecast information for each five-year interval as well as the factors that were used during development of the forecasts. Figures 2-15 and 2-16 summarize the population, employment, water demand, and wastewater flow forecasts. Figure 2-17 compares the forecasted wastewater flow to the permitted discharge quantity. Figure 2-18 compares the forecasted water withdrawal needs with the existing permitted water withdrawal capacity.

Water Demand Forecast Peaking Factors

Factor	Value
Monthly Average Demand to Annual Average Day Demand	1.2
Peak Day Demand to Annual Average Day Demand	1.5
Note: Based on 2006 to 2009 production data	

Wastewater Flow Forecast Peaking Factors

Factor	Value
Maximum Monthly Flow to Annual Average Day Flow	1.1
Peak Day Flow to Annual Average Day Flow	1.5
Note: Based on 2007 to 2009 operations data	

Basis for Water Forecast Summary

Factor	Per Capita (Note 1)	% of Total Demand (Note 2)
Overall Per Capita	145	--
Residential Per Capita	96	77.9%
Commercial Per Capita	44	16.7%
Wholesale Per Capita	Note 3	5.4%

Notes
1. Per capita water demand in gallons per capita per day (gpcd)
2. Interpolated from the 2009 Metro Water District Water Supply and Water Conservation Management Plan (2006 data)
3. Average based on customer billing data from 2006 to 2009
4. Wholesale demands from outside the County held constant through the planning period

Basis for Wastewater Flow Forecast Summary

Factor	2010	2030
Inflow/Infiltration (%)	20%	20%
Indoor Water Use - Residential (%)	78%	78%
Indoor Water Use - Commercial (%)	66%	66%
Indoor Water Use - Wholesale (%)	77%	77%
Percent Sewered - Residential (%)	73%	80%
Percent Sewered - Commercial (%)	99%	100%
Note: Based on workshop with Gwinnett held on June 10, 2010		

Water Withdrawal Needs (MGD)*

Category	2015	2020	2025	2030
Annual Average Day	125.2	135.9	147.8	160.1
Monthly Average	150.2	163.1	177.4	192.1
Peak Day	187.8	203.8	221.7	240.1

Wastewater Flow Forecasts (MGD)*

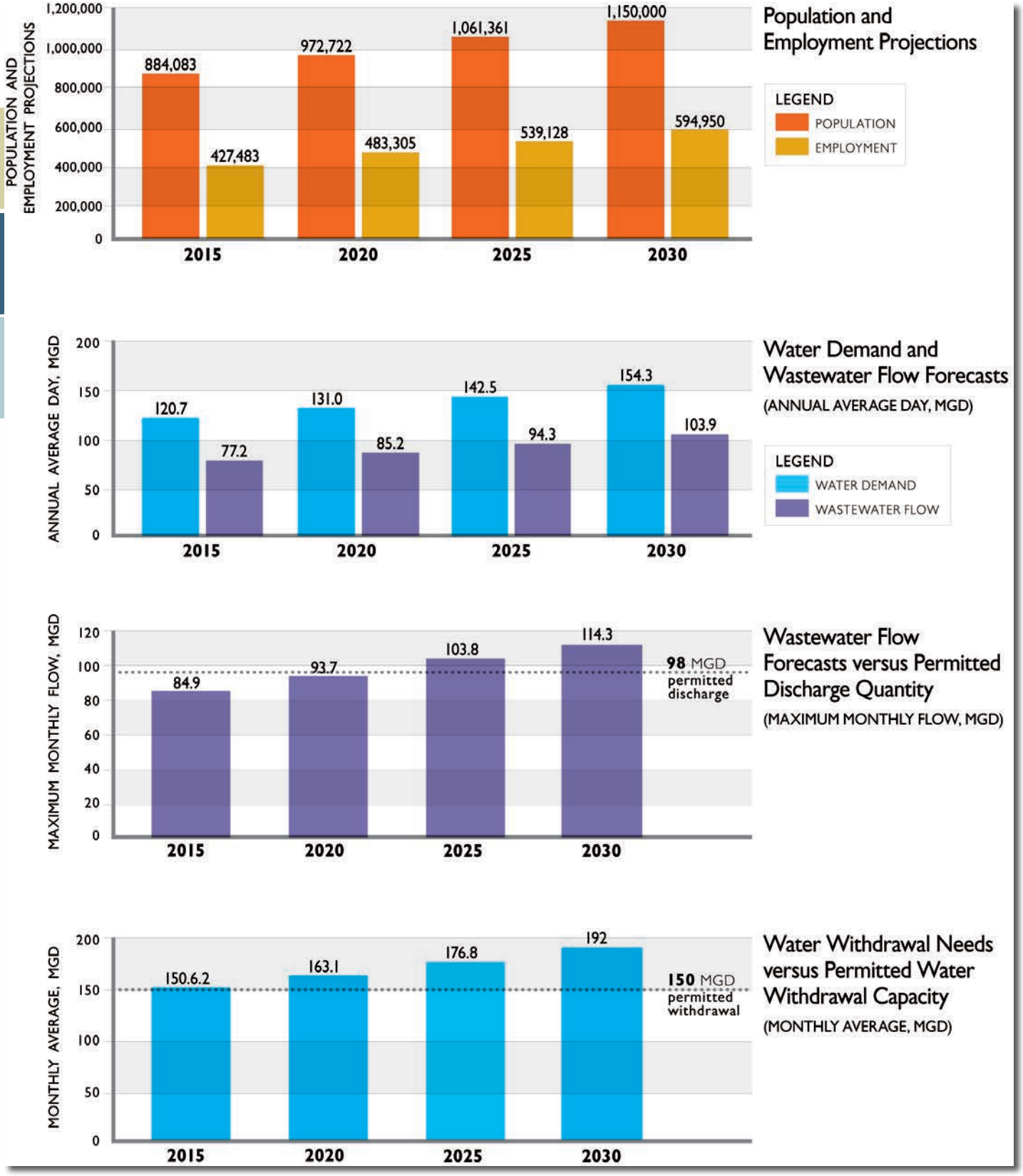
Category	2015	2020	2025	2030
Annual Average Day	77.2	85.2	94.3	103.9
Maximum Month	84.9	93.7	103.8	114.3
Peak Day	115.7	127.8	141.5	155.9

MGD = million gallons per day

*The values shown reflect the full realization of the International Gateway Scenario by the year 2030

Appendix C "Project Timing Guidance" provides more information on how flow forecasts are to be used

Figure 2-15 through 2-18: Summary of Projected Water Demands and Wastewater Flows, 2015 through 2030



*The values shown reflect the full realization of the International Gateway Scenario by the year 2030
Appendix C "Project Timing Guidance" provides more information on how flow forecasts are to be used

B. SYSTEM EVALUATION

The results of the water and wastewater infrastructure evaluation are presented in this section. Planning issues and priorities are addressed for each of the following system components:

- Raw Water Supply
- Water Treatment
- Water Distribution
- Wastewater Collection
- Water Reclamation and Reuse (including biosolids treatment and disposal)

The recommended projects, actions, and associated implementation issues are discussed in Part 3 of the Master Plan. Policies related to wastewater management, but not directly related to management of public infrastructure, also are discussed in Part 3.

B.1. Raw Water Supply

This section discusses current and future water supply issues, alternatives evaluated to meet the County's long-term water supply needs, and concludes with the County's best strategy to meet long-term water supply needs.

Existing Raw Water Supply Source

Lake Lanier is Gwinnett County's sole water supply source. The County is currently permitted to withdraw a maximum quantity of 150 MGD on a monthly average basis from Lake Lanier. The County has two raw water supply intakes and pump stations on the shore of Lake Lanier.

Future Water Supply Need

The County's long-term water withdrawal need for 2030 is projected to reach 192 MGD on a monthly average basis if the International Gateway vision is realized. To support this vision, an additional 42 MGD of permitted withdrawal will be needed.

The water conservation program and the complete outdoor watering ban imposed during the 2007 to 2008 drought decreased the overall water use (in the County in 2008 and 2009). Since 2010, the quantity withdrawn from the Lake has increased slightly, but has not returned to the pre-drought level. Sufficient data is not yet available to confirm if the lower per capita water use is the result of the ongoing water conservation efforts or the economic recession.

The need for an additional 42 MGD of permitted water withdrawal capacity is estimated based on two assumptions. The first assumption is that the County can continue to use Lake Lanier as its sole source of water supply. The second assumption is that the County will continue to implement the "Regional Water Conservation scenario" as required by the Metro Water District. Availability of Lake Lanier's water supply storage is currently being determined by the Corps of Engineers. (Note: The June 2011 decision by the U.S. 11th District Court gave the Corps of Engineers a year to determine the organization's authority under the Rivers and Harbors Act and the Water Supply Act, and charged the Corps of Engineers to make final decision on how much of the storage space in Lake Lanier is assigned to water supply.)

WATER SYSTEM EVALUATION PRIMER

The availability of water supply is typically evaluated on an annual average basis, such as the yield of a reservoir or other water supply sources.

EPD issues water withdrawal permits for withdrawals greater than 100,000 gallons per day. Gwinnett's withdrawal permit was issued based on a monthly average quantity (not to exceed 150 MGD on a monthly average basis).

Water supply intake, pump station, and water treatment facilities are designed to handle the maximum (or peak) daily quantity.

Long-Term Water Supply Alternatives

Three alternatives considered to meet the long-term water supply needs of the County are discussed below.

Additional Water Conservation

Gwinnett is committed to a strong water conservation program. Operationally, the County maintains a low level of water loss within the water system through actively managing the quantity of non-revenue water. The County regularly hosts homeowner water conservation workshops, promotes its toilet rebate program, offers retrofit and leak detection kits, and promotes the 12 conservation measures required by the Metro Water District Water Supply and Water Conservation Management Plan. The County also has adopted the District's 10 enhanced water conservation and educational measures and plans to implement and encourage these water conservation efforts. The County should continue to actively participate with the Metro Water District to monitor and further enhance water conservation opportunities as a way to extend existing water supplies.

The current estimate for additional water savings from implementing the Enhanced Water Conservation scenario is approximately 13 MGD on an annual average basis beyond the Regional Water Conservation scenario. Successful implementation of the additional conservation measures can potentially reduce the County's long-term annual average water withdrawal need from approximately 160 to 147 MGD. The maximum monthly water withdrawal can potentially be reduced from 192 to 176 MGD.

The practices included in the Enhanced Water Conservation scenario are aggressive in nature, and some of the actions are beyond the County's control. For example, state legislation will be required to implement the irrigation designer/installer certification program. Therefore, the immediate effects of the enhanced conservation efforts are difficult to quantify. For the purpose of long-term planning, the annual average water withdrawal need of 160 MGD based on implementation of the Regional Water Conservation scenario is used for the remaining evaluation of water and wastewater systems.

Obtaining Credits for Reclaimed Water Returned to Lake Lanier
Currently, Gwinnett is permitted to discharge 40 MGD of reclaimed water to Lake Lanier from the F. Wayne Hill Water Resources Center. The County does not receive water supply credit for returning the highly treated reclaimed water to the Lake. As the County pursues and negotiates a water storage contract with the Corps of Engineers, full credit for the return of reclaimed water should be pursued to optimize the value of the storage (i.e., a true storage contract).

Alternative Water Supply Sources
The County has evaluated several potential water supply sources to augment Lake Lanier and to diversify its water supply sources in case of an unfavorable outcome of the Corps findings. However, new water supply alternatives will require a high capital investment and take many years (seven to ten or more) to permit and implement. Due to Gwinnett's geographic location at the upper end of two water basins and the absence of any sizable or dependable groundwater aquifer source, Lake Lanier is the only viable source for Gwinnett through this plan's horizon. These additional sources should be considered to meet needs beyond 2030.

Evaluation of Water Supply Facilities
Gwinnett has two raw water supply intakes and pump stations on the shore of Lake Lanier and they are designed to pump to either filter plant in case of emergencies. Very few communities in the Metro Atlanta area are capable of providing this level of redundancy to their customers. A brief overview and the capacity evaluation are provided below.

The Lanier Raw Water Intake and Pump Station has been operational since 1977 and the most recent upgrade was completed in January 2008. The pump station is equipped with six 30-MGD pumps with a combined firm pumping capacity of 150 MGD (firm capacity is a measurement of pumping capacity with one pump out of service). To provide operational flexibility, raw water can be withdrawn from three different depths to take advantage of optimum water quality, which may vary by season.

The Shoal Creek Raw Water Intake and Pump Station was completed in 2004 and constructed to provide water to the Shoal Creek Filter Plant and to provide additional redundancy for the Lanier Intake. Although this is referred to as the Shoal Creek intake it is actually designed to provide water to either of the filter plants through two separate sets of pumps. The first set, serving the Shoal Creek Filter Plant, includes four 30-MGD pumps with a combined firm capacity of 90 MGD. This intake was built to allow the installation of three additional pumps to accommodate any future expansion of the Shoal Creek Filter Plant.

The second set of pumps, serving the Lanier Filter Plant, includes four 50-MGD pumps with a combined firm capacity of 150 MGD. Raw water pumping capacity is fully redundant and far exceeds any near-term capacity needs, therefore no near-term improvements are expected for any of the raw water pumping facilities.

Toward the end of the planning period when the maximum monthly water withdrawal approaches 150 MGD the additional withdrawal need can be achieved by adding one or more additional 30-MGD pumps at the current Shoal Creek Raw Water Pump Station. This will bring the total firm capacity of the set of raw water pumps serving Shoal Creek to a maximum of 180 MGD without the need for additional construction.

Summary of Water Supply Priorities
Gwinnett's best strategy for meeting its long-term water supply need is to:

- Pursue an additional 42 MGD of withdrawal beyond the current permitted withdrawal of 150 MGD (issued on monthly-average basis)
- Increase the total firm pumping capacity of the Shoal Creek Raw Water Intake Pump Station by the addition of one 30-MGD raw water pump
- Continue using Lake Lanier as the County's main water supply source and pursue negotiation of a storage contract with the Corps of Engineers
- Implement additional water conservation practices as required in the Enhanced Water Conservation Program
- Seek full or maximum credits for the return of reclaimed water from the F. Wayne Hill Water Resources Center to Lake Lanier
- Consider developing supplemental water supply sources for needs beyond 2030

Raw water intake valve

B.2. Water Treatment

This section discusses Gwinnett's long-term water treatment needs and priorities.

Existing Facilities

The County operates two water treatment facilities; the Lanier Filter Plant and the Shoal Creek Filter Plant. The Lanier Filter Plant was the County's primary treatment facility until the completion of the Shoal Creek Filter Plant in 2004. Table 2-3 summarizes current water treatment capacities.

A condition assessment is presently being conducted for the water production facilities to identify future needs for repair and replacement and to develop a long-term CIP. Since the life span of much equipment is often 20 years, it is quite feasible that there will be major rehabilitation/repairs needed during the planning horizon.

Table 2-3. Water Treatment Capacity Summary

Water Filter Plant	2011 Rated Capacity (MGD) (Note 1)	2011 Firm Capacity (MGD) (Note 2)
Lanier	150	137.5
Shoal Creek	75	62.5
Total	225	200

Notes:
1. Rated capacity is the total processing capacity of the plant with all filters operating at maximum filtration rates.
2. Firm capacity is calculated assuming one of the filters is out of service.

Backwash recovery at Lanier Water Filter Plant

Lanier Filter Plant

Rated Capacity (2011): 150 MGD

The Lanier Filter Plant (see Figure 2-19) was constructed in 1977 with major upgrades in 1986, 1988 and 2000. The plant is located on a 94-acre site north of the City of Buford.

The treatment processes at the Lanier Filter Plant include raw water storage, primary disinfection with ozone, rapid mixing, three-stage flocculation, direct filtration with deep bed dual media filters, secondary disinfection with chlorine, fluoridation, corrosion control, finished water storage, and high service pumping. The high service pump station has a firm capacity of 200 MGD with one of the largest pumps out of service.

Filter backwash water is 100 percent recycled at the plant. The residuals handling facility treats the filter backwash waste from both Lanier and Shoal Creek Filter Plants. The processes include waste backwash water clarification and dewatering of solids. The dewatered solids are hauled to a landfill for disposal. The clarified water is recycled to the raw water storage facility at the head of the plant.

Figure 2-19: Lanier Filter Plant

Shoal Creek Filter Plant

Rated Capacity (2011): 75 MGD

The Shoal Creek Filter Plant (see Figure 2-20) was completed in 2004 and is located on an 88-acre site in the City of Buford. The Shoal Creek Filter Plant was constructed to provide additional water system redundancy.

The treatment processes mirror those at the Lanier Filter Plant, with raw water equalization, primary disinfection with ozone, rapid mixing, flocculation, direct filtration with dual media filters, secondary disinfection with chlorine, fluoridation, corrosion control, finished water storage, and high service pumping. The plant has a rated capacity of 75 MGD and can be expanded to 150 MGD. The waste filter backwash water at the Shoal Creek Filter Plant is pumped to the Lanier Filter Plant for additional clarification and dewatering.

The high service pump station has a firm pumping capacity of 95 MGD with one of the largest pumps out of service.

A FEW WORDS ABOUT CAPACITY

Discussing the capacity of a water system can at times seem a bit confusing or even contradictory. In general there are three elements to consider when discussing capacity, and while they must be designed to work together they are rarely, if ever, exactly the same.

First is raw water pumping capacity; that is simply the ability to pump water from its source (Lake Lanier in this case) to the filter plant.

Next is the capacity of the filter plant itself; that is the actual amount of water that can safely be treated by the facility.

The last element is referred to as high service pumping; and that is simply the capacity of the pumps that send the treated water into the distribution system.

Figure 2-20: Shoal Creek Filter Plant

Emergency Supply Planning

In May 2010, the Water System Interconnection Redundancy and Reliability Act was signed into law by former Governor Purdue; the Georgia Environmental Finance Authority (GEFA) was charged to commission a study to evaluate and develop a Metro Water District-wide emergency water supply plan. The study evaluated interconnections, redundancy and reliability of 33 major water systems (i.e., those water systems serving more than 20,000 customers) in the Metro Water District. The study evaluated the ability of water systems to meet 65 percent of the future (2035) water demands through interconnections during various emergency scenarios.

The resulting report, Water System Interconnection, Redundancy and Reliability Act Emergency Supply Plan (September 2011) concluded that failure of the largest water treatment facility (Lanier Filter Plant) is the critical emergency water supply scenario for Gwinnett County. The Emergency Water Supply Plan recommended that the Department of Water Resources implement redundancy projects to eliminate the 14 MGD "critical scenario deficit" (at 2035 flows) created by a hypothetical failure at the Lanier Filter Plant. Expanding the Shoal Creek Filter Plant by at least 15 MGD to a capacity of at least 90 MGD (peak day basis) will meet this redundancy recommendation; this expansion should be in place when flows start approaching those projected for 2035 in the GEFA Plan. Water system redundancy, consistent with the study recommendations was studied as part of the water distribution evaluation (B.3.).

Long-Term Capacity Need

Filter plants are typically designed to treat peak day demands. The combined rated capacity of the two filter plants is 225 MGD (peak day basis). The rated capacity of a water treatment facility is calculated with all filters being in service. The firm capacity is the processing capacity with one of the filters (or major processing units) out of service. The filter can be out of service for regular maintenance (e.g., filter backwashing) or for repair (e.g., media replacement). The combined firm capacity of the two filter plants (with one filter out of service) is estimated at 200 MGD; this capacity will serve Gwinnett well into the future. Eventually an additional 40 MGD of treatment capacity will be needed to provide a total firm capacity of 240 MGD to meet the projected long-term demand expected to fall well outside of this planning period.

The additional capacity will be provided at the Shoal Creek Water Filter Plant, which was designed to accommodate future expansions up to 150 MGD. Additional process trains and equipment, along with redundancy measures will likely be required. Given the current rate of growth the current capacity is expected to be adequate until late in the planning time frame, with no expansion projects expected within the next 15 years. Should growth return to that which is projected in the International Gateway Scenario, expansion would be triggered earlier in the planning time frame.

Potential Future Drinking Water Regulations

With Gwinnett's trained and state-certified operations staff, the County consistently meets compliance with all existing drinking water regulations and is well-positioned to meet future drinking water regulations. Monitoring equipment at both filter plants and in the distribution system provides confidence that water is treated to the highest standards for drinking water quality and safety.

EPA regulates compounds in drinking water according to a published list of contaminants and standards. EPA monitors compounds that are not currently regulated through the Unregulated Contaminant Monitoring Program. Every 5 years, EPA publishes a Drinking Water Contaminant Candidate List (CCL) that presents compounds that will be more closely monitored and may be considered for future regulatory action. Current treatment processes may need to be evaluated if new compounds are regulated based on this monitoring.

EPA is currently promoting a new approach to protecting drinking water and public health. Among the key aspects of EPA activities, the following should be monitored:

- EPA is planning to address contaminants as groups rather than one at a time to increase cost-effectiveness. A group of identified carcinogenic volatile organic compounds (VOC's) were selected in 2011 as the first group of contaminants to be addressed in this manner on the CCL. The next regulatory determinations of contaminants on the Contaminant Candidate List are expected in 2013
- A Regional Water Technology Innovation Cluster comprised of public and private partners was formed in 2011 to research and invest in new ways to simultaneously treat multiple contaminants in drinking water. This group will assess and develop new drinking water technologies to address health risks posed by a broad array of contaminants. More information can be found on http://wtic.udri.udayton.edu/
- EPA plans to use the authority of multiple statutes to help protect drinking water. EPA is developing pesticide health benchmarks that can be used as tools in assessing the occurrence of contaminants in drinking water (regulatory values are not available at this time)

The regulatory process is extensive and time-consuming; EPA builds in ample time for public involvement and stakeholder meetings. Gwinnett should continue to monitor the development of new regulations and drinking water treatment technologies that are being presented to address emerging contaminants. In particular, development of the following rule revisions or potential new rules should be monitored:

- Lead and Copper Rule: Long-term revision of this rule is upcoming
- Unregulated Contaminant Monitoring Rule (UCMR3): The proposed rule that supports the next cycle of unregulated contaminant monitoring was published in March 2011; sampling is planned from 2013 through 2015. Regulatory determination of these contaminants will follow

Optimization of System Operations

The Department of Water Resources is continuously exploring opportunities to optimize its operations. Recently, state-of-the-art software was added that minimizes energy usage at the filter plants (see Energy Optimization discussion).

Replacement of gaseous chlorine (used for disinfection in the treatment process) with sodium hypochlorite has been evaluated. Although gaseous chlorine has been in use for many years in the water industry, many water treatment facilities in the country have eliminated the use of gaseous chlorine for concerns about transport and security of gaseous chlorine associated with potential terrorist activities.

Sodium hypochlorite, or bleach, can be delivered to the filter plant in bulk quantities or produced onsite. A thorough evaluation of the options, including needs for storage and/or generator capacity, associated costs and benefits has been performed. The evaluation recommended onsite hypochlorite generation.

A capital project to add an Ultraviolet Disinfection Process at the Lanier Filter Plant is in the 2012 CIP. This project will provide an additional barrier of protection for inactivation of cryptosporidium and will also offer an additional treatment option for the removal of Pharmaceuticals and Personal Care Products (PPCPs) and Endocrine Disrupter Compounds (EDCs).

Summary of Water Treatment Priorities

- Monitor potential revisions of existing drinking water rules and the development of new rules on new contaminants
- Monitor development of new treatment technologies to enhance operations
- Continue existing practices on energy optimization and monitor development of new technology for enhancing operational efficiency
- Move forward with the onsite hypochlorite generation project
- Move forward with the UV Disinfection project
- Increase the Shoal Creek Filter Plant by 40 MGD (peak day basis) to meet both future water demands and water system redundancy needs (may be outside of the planning period)

ENERGY OPTIMIZATION

In 2009, Gwinnett implemented a real-time energy management and operation optimization software. The software optimizes the timing of certain water treatment and distribution operations based on variations in energy costs throughout the day. The software controls:

- water filter production rates
- raw water and high service pump scheduling (to take advantage of off-peak rates)
- booster pump station operation
- filling of tanks in the distribution system

Liquid Oxygen Evaporators for Ozone Generation (used for primary disinfection) at Shoal Creek Water Filter Plant

B.3. Water Distribution System

Treated water from Gwinnett's two filter plants is pumped into the water distribution system. The distribution system delivers water countywide through approximately 3,600 miles of pipelines (ranging in size from two inches to 78 inches in diameter), 10 storage tanks, and 13 re-pump and booster pump stations.

Existing System

Because of elevation differences across the County, the distribution system operates in two primary water pressure zones that include three smaller sub-pressure zones (Figure 2-21). The primary pressure zones (North and Central Pressure Zones) provide adequate pressure for its residents and businesses. The sub-pressure zones, within the two primary pressure zones, serve the needs of areas with large differences in elevation. The sub-pressure zone areas are served with booster pump stations (Bogan Road and Nob Hill Pressure Zones), or with pressure reducing valves to serve areas at lower elevations (South Pressure Zone).

The high service pump stations at Gwinnett's two filter plants are designed with a high degree of redundancy in case of emergencies and to provide maximum operational flexibility.

The Lanier Filter Plant supplies treated water to both the North and Central Pressure Zones and is equipped with a separate set of high service pumps dedicated to each zone. The Shoal Creek Filter Plant primarily supplies the Central Pressure Zone, but is equipped with a dedicated set of high service pumps that can deliver treated water to the Lanier Filter Plant's clearwells for further distribution.

The 10 storage tanks (9 ground and one elevated storage) provide a total of 61.15 million gallons (MG) of storage capacity in the system. All of the storage tanks have a corresponding pump station that supplies water to the surrounding areas and equalizes system water demands and pressures.

The Department of Water Resources has been using a supervisory control and data acquisition (SCADA) system to monitor and manage the tank elevations, pumping schedule, and pressure and valve settings in the distribution system. The SCADA system has been enhanced by the addition of an energy management and operation optimization software installed in late 2009. The software controls high service pump scheduling, booster pump station operation, and filling of tanks in the distribution system (described in the Energy Optimization discussion).

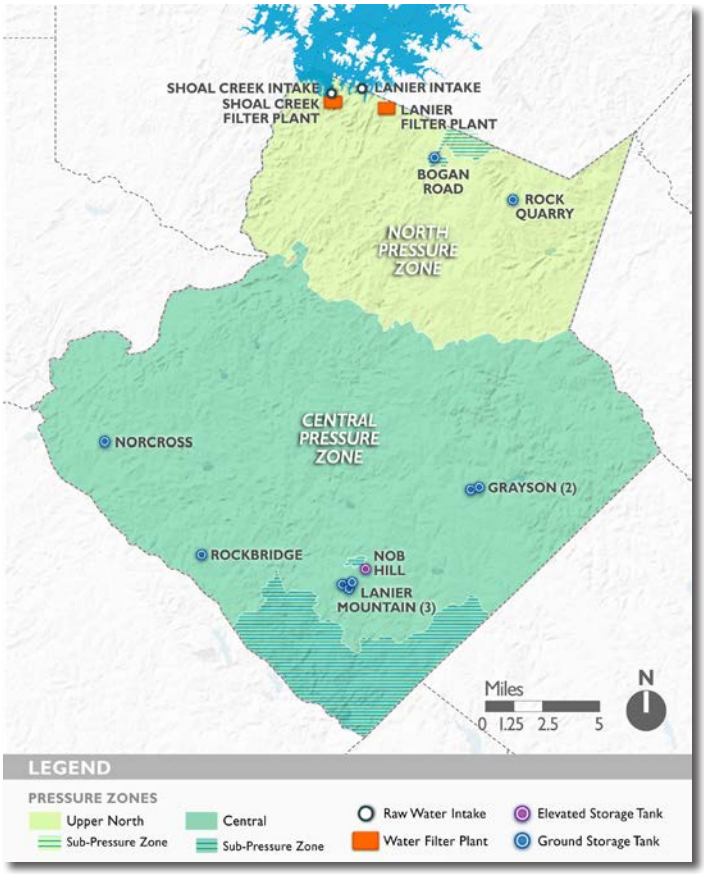
Water Distribution System Modeling Analysis

A thorough evaluation of the water distribution system was conducted using the Department of Water Resources' existing computer model to identify the improvements needed to meet the system's future water demands. DWR's existing water distribution system model was validated using representative annual average demand data from 2009. This section discusses the results of this model evaluation. It should be noted that Hydraulic Model development is an iterative process and that new software advances can significantly improve the accuracy of results. New model runs should always be performed on the most recent version of the hydraulic model to validate project need before the design of any project begins.

Distribution systems are typically designed to handle peak day demand conditions. Diurnal curves were developed based on hourly production data from the plants to simulate hourly demand conditions. The modeling analysis evaluated 8 different future water demand scenarios ranging from 131 MGD to 231 MGD on a peak day basis to identify the system improvements needed to meet the desired system operating parameters (see page 64). The interim demands between 131 MGD and 231 MGD were modeled to provide data needed to phase the implementation of the recommended projects over time.

The future water demands were distributed according to the International Gateway scenario population and employment forecasts for each of the 482 traffic analysis zones. The model evaluation compared the system performance under the future peak day demand conditions to a set of minimum operating parameters used by the Department of Water Resources.

Figure 2-21: Water Distribution System Overview



SUMMARY OF WATER DISTRIBUTION SYSTEM MODELING RESULTS (ALL SCENARIOS SHOWN ARE BASED ON PEAK DAY DEMAND)

The potential areas of concern listed below will continue into the following demand scenarios, if not addressed in the demand scenario where it is listed. These potential concerns were based on the modeling analysis.

Near-Term Concerns (131 MGD Demand Scenario, peak day basis)

- Low pressure in the western portion of the North Pressure Zone
- Low pressure in the southern portion of Central Pressure Zone east of the Lanier Mountain Tanks and south of the Nob Hill Pressure Zone
- Low pressure in area near the City of Dacula (due to higher elevation)
- Very low pressure during filling cycle of Lanier Mountain Tank in the area surrounding the tanks

142 MGD Demand Scenario

- Low pressure in the western portion of the North Pressure Zone
- Low pressure in area east of Lawrenceville (Central Pressure Zone); major transmission capacity is needed to distribute treated water to areas east and south of Lawrenceville

154 MGD Demand Scenario

- Additional high service pumping capacity needed at the Lanier Filter Plant (for serving the North Pressure Zone and for additional system redundancy)
- Low pressure in northwestern North Pressure Zone; insufficient transmission capacity to the area

167 MGD Demand Scenario

- Additional high service pumping capacity needed at the Lanier Filter Plant for the demand increase in the North Pressure Zone and for additional system redundancy (this project could be combined with the 154 MGD demand project)

182 MGD Demand Scenario

- Low pressure in the areas south of Lawrenceville and near Grayson (Central Pressure Zone); excessive draining of the Grayson Tanks (to as low as 10 percent full) was predicted
- Excessive draining of the Rockbridge Tank (to nearly 50 percent full) and low pressure during peak hour demand conditions in areas surrounding the tank
- Excessive velocity/headloss in various pipes in the North Pressure Zone

197 MGD Demand Scenario

- Low pressure in northwestern portion of Central Pressure Zone (western portion of the County near the I-85 corridor future development area) and high velocity in the two existing parallel 48-inch transmission mains that convey treated water from Lanier and Shoal Creek Filter Plants to the Central Pressure Zone
- High velocity in the supply line to the Norcross tank

215 MGD Demand Scenario

- Low pressure in the eastern portion of the North Pressure Zone (near Old Peachtree Road)
- Excessive velocity in multiple system transmission mains in western portion of Central Pressure Zone
- Additional transmission capacity is needed to serve the increased demand in the Central Pressure Zone from the Shoal Creek Filter Plant

231 MGD Demand Scenario

- Additional high service pumping capacity will be needed to accompany the expansion of the at Shoal Creek Filter Plant
- Additional transmission capacity from the expanded Shoal Creek Filter Plant will be needed to direct more flow to the Central Pressure Zone and to alleviate excessive velocity in the existing 48-inch diameter transmission mains
- Excessive velocity in an existing segment of 12-inch diameter water main along Pleasant Hill Road

Note: Specific Project descriptions are in Part 3 Implementation and Project Maps are in Appendix A Detailed Project Maps

System Operating Parameters

The system operating parameters for the water distribution system reflect components of the level of service Gwinnett is committed to providing to its customers. The level of service for Gwinnett's customers includes providing appropriate water pressure, water quality, and fire protection. The operating parameters include system pressure, pipe velocity and headloss (a measure for energy loss), fire flow supply, and the effectiveness of system storage. The minimum or maximum values for these operating parameters (Table 2-4) follow industry practices and recommendations. For example, excessive velocity in pipes can result in low system pressure and high energy loss and insufficient turnover in a water storage tank can cause water quality to deteriorate.

The system operating parameters for the water distribution system reflect components of the level of service Gwinnett is committed to provide to its customers.

Table 2-4. Water Distribution System Operating Parameters

Category	Parameter
Pipe System Velocity and Headloss	
Maximum instantaneous velocity	5 ft/s at peak day demand conditions
Maximum headloss for small diameter pipes (less than 16 inches in diameter)	6 ft/1,000 ft of pipe at peak day demand conditions
Maximum headloss for 16 to 24-inch diameter transmission mains	4 ft/1,000 ft of pipe at peak day demand conditions
Maximum headloss for 30-inch and greater diameter transmission mains	2 ft/1,000 ft of pipe at peak day demand conditions
System Pressure	
Minimum system pressure	40 pound per square inch (psi) at customer connection points under peak day demand conditions
Minimum residual pressure	20 psi at customer connection points during fire flow conditions
Maximum system pressure	200 psi at average day demand conditions
Fire Flow	
Residential areas	1,000 gallons per minute (gpm) of water for 2 hours
Commercial areas	3,000 gpm of water for 4 hours
System Storage	
Tank turnover	Drain at least 10 percent (preferably up to 25 percent) of the storage volume during the average day demand conditions
Emergency provisions	Maintain storage tank levels above 60 percent full during the peak day demand conditions

Sources include the following references and meetings with Gwinnett County personnel.

- AWWA M31 Distribution System Requirements for Fire Protection
- AWWA M32 Computer Modeling of Water Distribution Systems
- Water Distribution Systems Handbook by Larry W. Mays
- Modeling, Analysis, and Design of Water Distribution Systems by Lee Cesario (published by AWWA)
- Water Distribution Modeling by Thomas M. Walski, Donald V. Chase, and Dragon A. Savic

Modeling Results

The following sections summarize the areas where future projects may be needed based on the modeled progression of demands from 131 MGD to 231 (long-term) MGD on a peak day basis to meet the system operating parameters. The capability of the system to provide adequate fire flow protection at 231 MGD peak day conditions was also modeled. The modeling helped to identify areas where system performance could be improved by:

- Pipe additions or replacements to increase transmission capacity and maintain desired water pressure
- Operational changes such as decommissioning excess water storage capacity to increase tank turnover
- Change in pressure zone operating boundaries to maintain pressures in certain areas
- Addition of pumps to meet increasing demands

Specific projects recommended to improve system performance are described in Part 3 of this Master Plan and summarized on the following page.

Potential Future Regulations

Revisions to the 1989 Total Coliform Rule have the potential to affect the operation of and monitoring requirements for the distribution system. EPA published a proposed rule in July 2010 and the final rule is scheduled to be published in the summer of 2012 with implementation of the final rule expected in 2015.

The 1989 Total Coliform Rule is a national primary drinking water regulation and was promulgated to ensure the integrity of the drinking water distribution system and monitoring for the presence of microbial contamination.

The proposed rule places more emphasis on monitoring *E. coli* as an indicator for fecal contamination and a potentially harmful pathogen. A health goal, the maximum contaminant level goal (MCLG) and maximum contaminant level (MCL) of 0 for *E. coli*, would be established. The current MCLG and MCL of 0 for total coliform may be removed. Total coliform will continue to serve as an indicator of a potential pathway of contamination into the distribution system.

The proposed rule would require regular monitoring for microbial contamination in the distribution system. Further assessment and/or corrective actions would be required to find and fix contamination pathways, such as water main breaks or openings to storage tanks.

Asset Management

Gwinnett County maintains a water main replacement program to proactively manage potential problems such as leakage or service disruptions that may be caused by aging water mains.

The majority of Gwinnett's water distribution pipes were installed after the year 1970. Approximately 50 percent of the pipelines have been in service for more than 20 years, and 23 percent in service more than 30 years.

Approximately half of the transmission and distribution system pipelines are made of ductile iron (Figure 2-22), a durable material with a useful life of approximately 100 years when properly maintained. However, some of the smaller pipes made from other materials are not performing as intended. In particular, pipe materials that have not been performing well include poly-vinyl chloride (PVC) pipes (primarily installed prior to 1985), asbestos concrete (AC) pipe popular in the late 1970s and early 1980s, and pre-stressed concrete cylinder pipe (PCCP). Pipe materials with a poor maintenance history can no longer be installed in Gwinnett County.

The Department of Water Resources maintains a water main replacement program and has a capital fund dedicated to replace these pipe materials over time. One of the goals of the program is to avoid and eliminate the cost of repeated repairs and disruptions to the community.

In addition to the water main replacement program, the Department of Water Resources has an active asset management program that aims to operate the water distribution network assets in the most efficient and cost effective manner. The Department of Water Resources is currently assigning criticality scores to the water system assets and will begin to develop models to predict the timing for capital investments related to the pipe infrastructure. Table 2-5 summarizes the ongoing asset management activities.

In 2011, DWR implemented a pressure management initiative and created a cross-divisional pressure management team that both analyze and implement operational changes within the distribution system. The team has reduced pressures in portions of the distribution system 10 to 25%, resulting in reduced energy usage and a reduction in water main breaks.

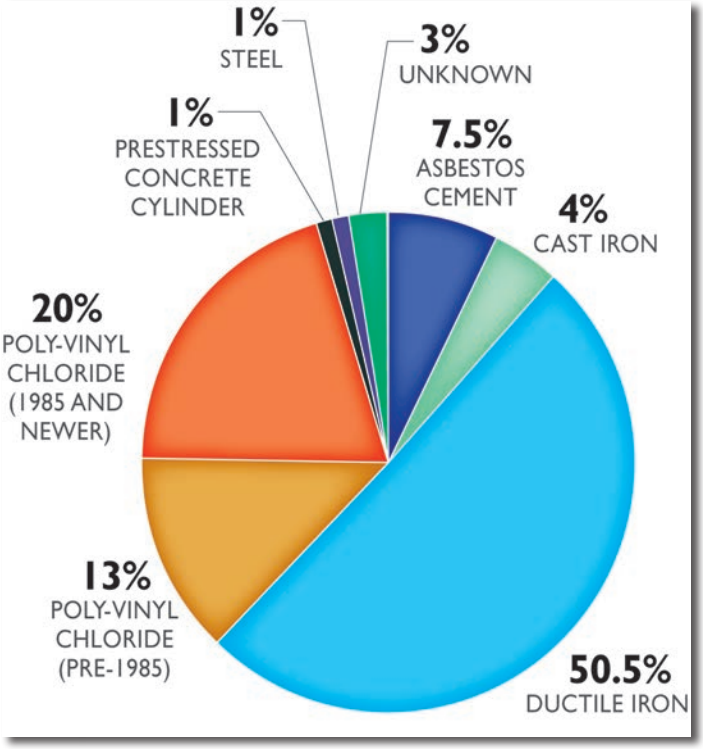


Figure 2-22: Water Distribution Pipe Materials as a Percent by Length in 2011

Table 2-5. Water Distribution System Asset Management Program Summary

Program	Description
Preventative Maintenance (detect, prevent, or mitigate pipe failure and reduce non-revenue water)	
Transmission Main Right of Way Inspections	Maintain and clear the easements to ensure access to all structures
Hydrant Testing	Flush and test pressure at fire hydrants
Valve Exercising Program	Operate in-line and check valves to test functionality
Line Flushing Program	Protect water quality against taste, odor, color, and high chlorine complaints
Meter Calibration	Test and/or replace the large and residential meters to ensure accurate readings
Predictive Maintenance (detect the onset of failure prior to reaching failure)	
Leak Detection	An ongoing leak detection program is in place. Department of Water Resources staff may be augmented by leak detection contractors, as needed
Condition Assessment	Visual inspections of the right-of-way as well as inspections of the interior of the pipe and critical crossing inspections
Cathodic Protection	Cathodic protection is installed on transmission mains to reduce corrosion. The cathodic protection is inspected to measure the level of protection and remaining life of the cathodic protection system
Rehabilitation (projects to repair or correct damage prior to failure)	
Service Line Replacements	Program to replace polybutylene service line, which is prone to failure with copper pipe (this project is close to completion)
Water Main Replacement Program	Replace substandard pipe material and pipelines prone to breakage
Looping Program	Establish redundant pipe to "loop" current dead end pipelines, where practicable, to reduce the need for line flushing and increase reliability

Summary of Water Distribution System Issues

- Current Issues: Low pressure in northwestern portion of the County, south-central portion of the County near the Lanier Mountain Tanks, and in eastern portion of the County (City of Dacula); very low pressure during the filling of the three Lanier Mountain Tanks
- Future Issues: Additional redundancy and transmission capacity to serve the North and Central Pressure Zones
- Future fire flow protection needs as system demand increases: areas with potential future deficiencies are generally along the perimeter of the County and in the area south of the Grayson tanks
- Ongoing Issues: Failing of aging pipes and replacement of unsuitable pipe materials (PVC, asbestos concrete, and pre-stressed concrete cylinder pipes)

Summary of Water Distribution System Priorities

- Implement system improvements to provide adequate pressure in various parts of the County to relieve current and future pressure concerns
- Increase redundancy for Lanier Filter Plant and to areas primarily served by the Lanier Filter Plant
- Increase high service pumping and transmission capacity from the Shoal Creek high service pump stations to Central Pressure Zone
- Implement fire flow projects to increase overall fire protection safety
- Continue existing water main replacement and asset management program and replace aging infrastructure based on timing and priority defined by the asset management program

B.4. Wastewater Collection System

This section examines the capability of the existing wastewater collection system to meet future forecasted flows for the International Gateway growth scenario. The system evaluation identified areas where improvements will be needed.

Existing System

Gwinnett County provides wastewater service to over 146,000 customers and two wholesale customers (DeKalb County and the City of Norcross). The wastewater collection system includes over 2,600 miles of sanitary sewers (ranging from eight to 72 inches in diameter), over 250 miles of pressurized force mains, over 200 pump stations, and three water reclamation facilities. In addition, the Department of Water Resources completed construction of the No Business Creek tunnel in 2010. The tunnel is approximately 12 feet in diameter, 3 miles in length, and placed at a depth reaching 200 feet below ground. The tunnel provides conveyance as well as storage and equalization during peak flow conditions to prevent sanitary sewer overflows.

In 2010, the water reclamation facilities treated a total of 50.8 MGD on an annual average basis. This quantity was conveyed by a very complex and interconnected wastewater collection system which provides great operational flexibility and redundant capacity (Figure 2-23). Of the County's 200-plus active wastewater pump stations, only 16 were modeled. The modeled pump stations are generally larger or can change the direction of flow. Figure 2-23 shows both the modeled pump stations and the smaller, developer-built pump stations. Figure 2-24 shows the modeled pump stations and their pumping arrangements during normal operations. Twelve of the 16 modeled pump stations pump to the F. Wayne Hill Water Resources Center during normal operations and the remaining 4 stations pump to the Crooked Creek Water Reclamation Facility. Nine of the modeled pump stations that pump to F. Wayne Hill Water Resources Center also can pump to either the Yellow River Water Reclamation Facility or the Crooked Creek Water Reclamation Facility, providing operational flexibility.

Wastewater Collection System Model Analysis

The Department of Water Resources' existing computer model of the wastewater collection system was used to identify areas where additional capacity will be needed to convey the projected long-term flows to one of the County's three water reclamation facilities. Opportunities to optimize flows in the system by sending flows to another water reclamation facility (also termed flow management) also were evaluated. With the complexity of the wastewater system, the model focused on the modeled pump stations and major infrastructure (sewers, force mains and interceptors) that control the flow of wastewater throughout the County.

The system-wide model was evaluated under eight different future flow scenarios ranging from a total system flow of 55 MGD to 104 MGD on an annual average day. The interim flow scenarios between 55 MGD and 104 MGD on an annual average basis were modeled to provide data needed to phase the implementation of the recommended projects over time.

Forecasted wastewater flows in the collection system model were geographically distributed to reflect the International Gateway scenario. The forecasted flows were input into the model to evaluate the capacity of the existing system to accept future flows. The evaluation compared system performances on annual average basis to a set of minimum operating parameters used by Gwinnett County (described below).

Throughout the evaluation, care was taken to "right-size" or phase projects appropriately to avoid repetitive projects in the same area (e.g., replacing a pipe twice or disrupting local traffic on multiple occasions) and to avoid building too far ahead of the need.

System Operating Parameters

The wastewater collection system performance under future flows was compared to a set of operating parameters including system capacity, velocity, and flow management (Table 2-6).

Pipe capacity was evaluated to determine if future flows would surcharge the system. Maintaining a minimum pipe velocity is required to prevent the waste solids from settling in the pipe. The maximum velocity in the pipe was evaluated because high velocity is an indicator of energy loss (costly pumping).

In addition to system operating parameters, flow management was considered as part of the modeling evaluation. Many interceptors in the system have sufficient capacity to handle future flows. Opportunities for flow diversion were investigated to maximize the use of existing capacity and to minimize proposed infrastructure costs. Maximizing the use of the three existing treatment facilities was an important part of the overall flow management strategy.

Table 2-6. Wastewater Collection System Operating Parameters

Category	Parameter
System Capacity	Water level exceeds the crown elevation of the pipe (surcharging)
Velocity (minimum)	3 feet per second
Velocity (maximum)	8 feet per second

Figure 2-23: Wastewater Collection System Overview

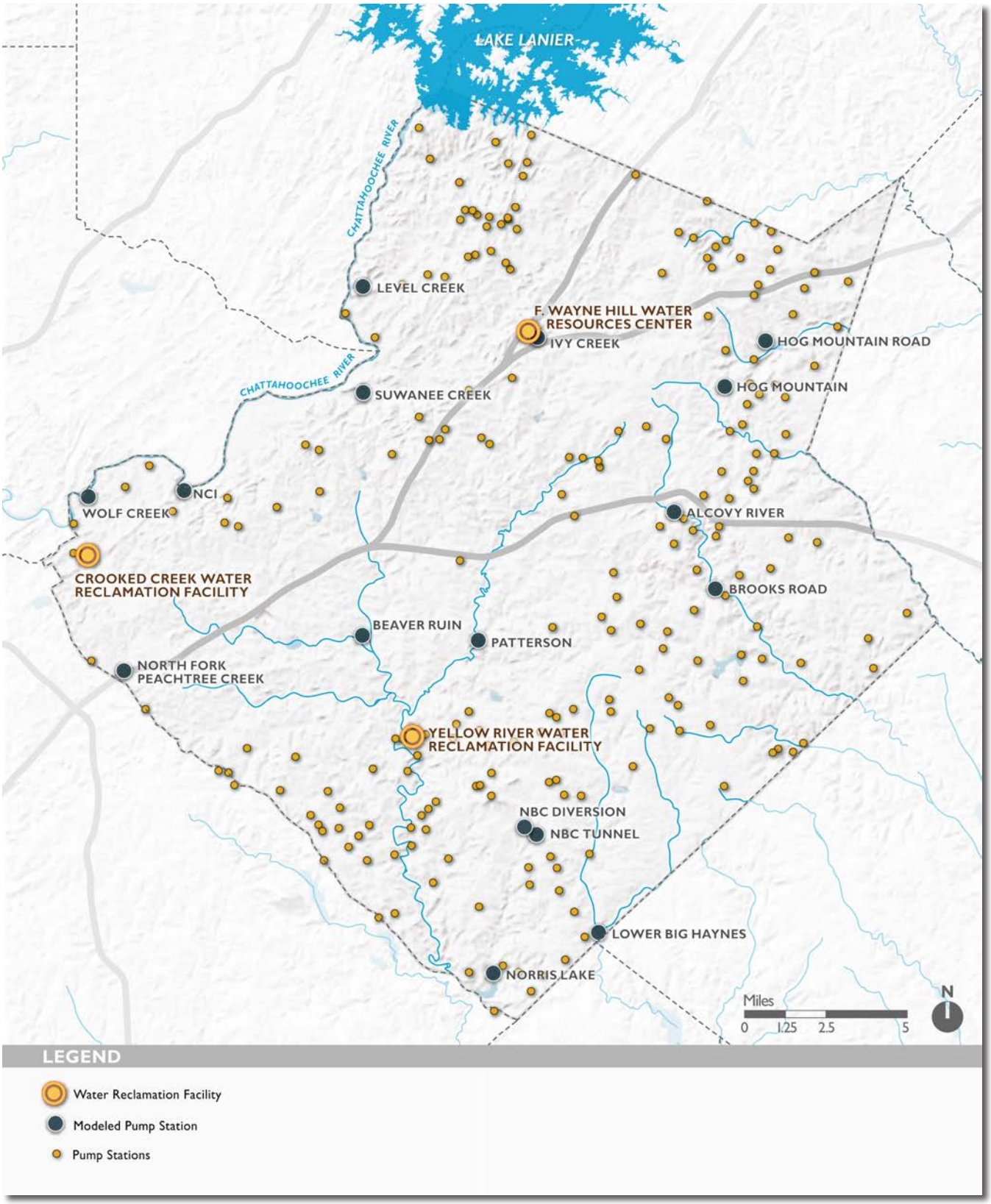
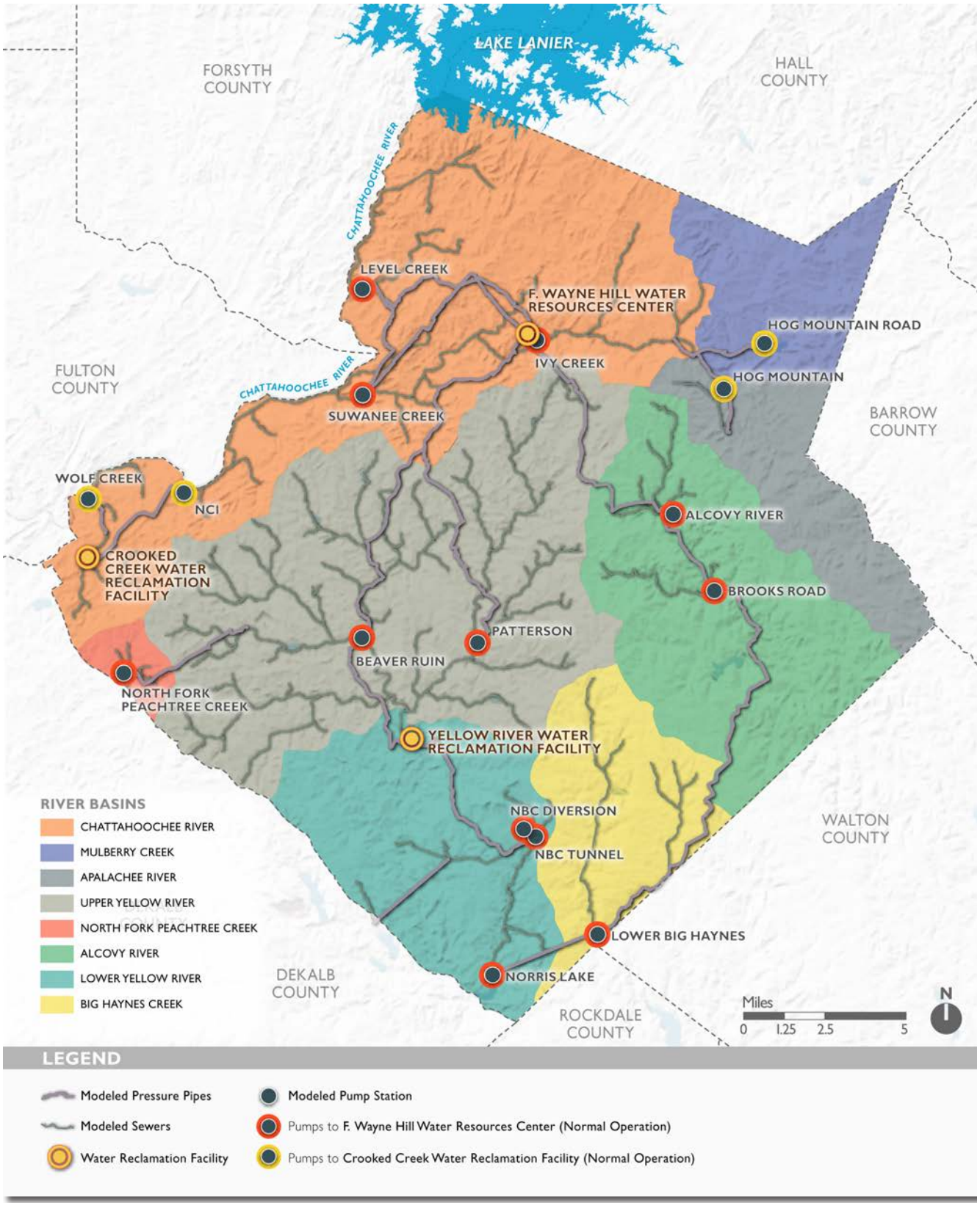


Figure 2-24: Modeled Wastewater Collection System



Modeling Results

The modeling analysis showed that the existing collection system adequately meets the County's needs and that no major infrastructure improvements are required until the system wide flows reach an annual average flow of 94 MGD (for comparison, in 2010, Gwinnett County treated approximately 51 MGD).

System improvements needed to meet the forecasted average day flow of 94 MGD and 104 MGD are summarized on the following page. Recommended projects are presented in Part 3 of this Master Plan.

Two flow management scenarios were modeled to evaluate project alternatives as described below:

Alternative A: Maximize flows to F. Wayne Hill Water Resources Center

Various upgrades to the Beaver Ruin Pump Station will be required to address future flows and aging infrastructure. However, the Beaver Ruin Pump Station is located in a densely developed area with existing underground infrastructure; construction at this location is expected to be difficult and costly. This alternative considered options to defer the upgrades to the Beaver Ruin Pump Station, however the planning level cost of this alternative was greater than the cost of the upgrades.

Alternative B: Maximize gravity flows by eliminating pump stations

Based on the analysis, the two flow management scenarios modeled are not likely to provide sufficient benefits to justify the costly and difficult system improvements that would be needed.

Regulations

No new regulations related to collection system management are anticipated in the near term. Collection system regulations are primarily related to preventing sanitary sewer overflows, when the collection system is overwhelmed and sewage is spilled to land or into a waterbody. Sanitary sewer overflows typically occur during periods of heavy rain.

To minimize sanitary sewer overflows, Gwinnett proactively implemented a Capacity, Management, Operations, and Maintenance (CMOM) program. In response to EPD's "Zero Tolerance Policy," Gwinnett and several utilities in Georgia entered an alternative voluntary consent agreement with EPD for its investment in the CMOM program. These utilities manage their CMOM program following procedures and recommendations in a CMOM manual developed through collaboration with the participating utilities and EPD. With the Department of Water Resources' personnel trained in the prevention of sanitary sewer overflows, EPD agreed to reduce the fines for accidental sanitary sewer overflow events.

The Department of Water Resources staff manages the CMOM program effectively and sanitary sewer overflow incidents have been minimal since the inception of the CMOM program.

Asset Management

In addition to meeting future flows, significant investments are likely needed to maintain and rehabilitate older portions of the wastewater collection system over the next 20 years. Of the gravity pipes, 15 percent are over 30 years old and 10 percent are made of materials with known maintenance issues (such as vitrified clay pipes). These pipes will likely need to be replaced within the timeframe of this Master Plan. Figure 2-25 shows the percentage of pipe materials, by length. The force main system is relatively new (installed in the 1980s or newer) and there have been few condition issues.

Gwinnett is a regional leader in the collection system asset management program. The County has an ongoing program that handles preventative maintenance, predictive maintenance, and rehabilitation of the collection system assets shown in Table 2-7. Most of the critical infrastructure has been assessed using Closed Circuit Television technology. Each pipe is rated based on the defects identified from the video and the criticality of the pipe to the overall system's functionality. Funding for rehabilitation is then allocated to the most critical projects.

The Department of Water Resources staff is also evaluating historical pipe performance data for the development of a pipe failure model, to help guide timing and to prioritize rehabilitation projects.

One of the long-term challenges of the collection system will be the maintenance of the 200-plus developer-built pump stations and force mains that are now the maintenance responsibility of the Department of Water Resources. Pumping uses energy and pump stations have mechanical parts that wear over time. The Department of Water Resources is evaluating several of these developer-built stations to determine if it is cost effective to replace any of these pump stations with new pipelines that would flow by gravity. In the past, the fast paced development of Gwinnett County combined with a topography that does not lend itself to inexpensive gravity sewers, has led to the installation of many developer-built pump stations. Going forward DWR should look for ways to reduce the construction of additional pump stations including revisions to internal policies, where necessary, to encourage the use of gravity flow where it is a viable option.

New technologies are developing to aid in monitoring and operation of the collection system, similar to the real-time software for optimization of the water distribution system operation. The County should monitor new technologies as they enter the market, and evaluate the application for most efficient operation of the pump stations.

Gwinnett is a regional leader in the collection system asset management program.

Table 2-7. Wastewater Collection System Asset Management Program Summary

Program	Description
Preventative Maintenance (detect, prevent, or mitigate pipe failure and reduce inflow and infiltration)	
Corrosion Control	Chemicals for corrosion control are critical in terms of maximizing the anticipated life of collection system pipes
Chemical Treatment and Cleaning	Chemical treatment (de-greasing agent and chemical root control) and/or using a hydro-jet truck to force water through pipelines are used to clean pipelines and prevent blockages
Fats, Oils, and Grease (FOG) Program	Perform inspections of commercial customers and provide education to all customers on the proper disposal of grease
Floodplain Inspections	Inspect all structures (such as manholes) located within a floodplain, especially during storm events, for inundation and/or surcharging
Predictive Maintenance (detect the onset of failure prior to reaching failure)	
Condition Assessment	Closed circuit television inspections, manhole inspections, and inspections of critical stream crossings provide information needed to rate the condition of pipelines
Smoke and Dye Testing	Smoke or dye are inserted into the system to locate pipe breaks or improper connections
Rehabilitation (projects to repair or correct damage prior to failure)	
Gravity Line Replacements	Program to replace pipes based on the condition assessment score. A number of techniques are used depending on the location, such as: Cured-in-Place Pipe (CIPP), pipe bursting, sliplining, and point repairs.
Manhole Repairs	Manhole lining, grouting, or manhole replacement

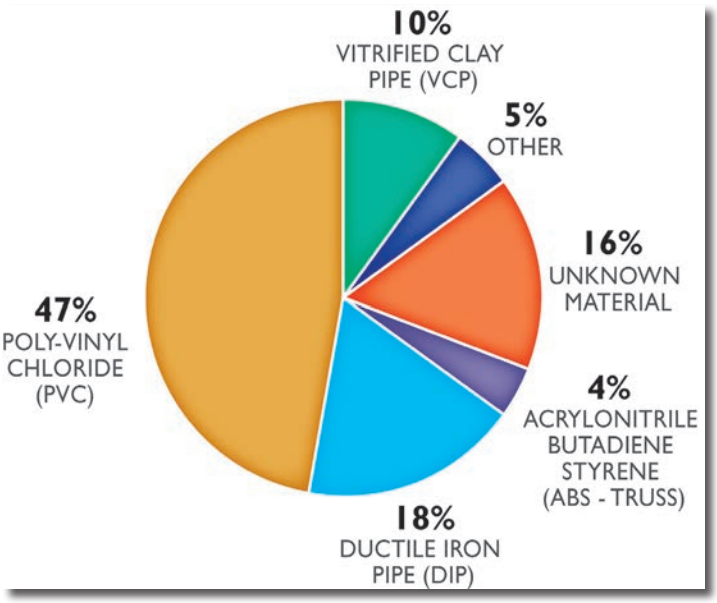


Figure 2-25: Wastewater Collection System Gravity Pipe Material as a Percentage by Length in 2011

SUMMARY OF WASTEWATER COLLECTION SYSTEM MODELING RESULTS (ALL SCENARIOS SHOWN ARE BASED ON ANNUAL AVERAGE FLOW)

The potential areas of concern listed below will continue into the following demand scenarios, if not addressed in the demand scenario where it is listed. These potential concerns were based on the modeling analysis.

Total System Flow up to 94 MGD

- The trunk sewers of the existing collection system adequately meet future system needs; no major infrastructure improvements are needed
- Smaller sewer extensions may be needed to meet local development needs

Total System Flow at 94 MGD

In this scenario, additional wastewater collection capacities would be needed in the Upper Yellow River basin and the Alcovy River basin, generally for supporting the increase in flow in the planned high density mixed-used developments and community improvement districts along major transportation corridors. The model predicted that the capacities of the following pipes were exceeded, causing surcharging:

- the interceptor flowing east to the Alcovy River Pump Station
- the gravity sewer flowing south to the Jacks Creek interceptor
- the interceptors flowing east and south to the Beaver Ruin Pump Station
- the interceptor flowing south to the Patterson Pump Station
- Smaller sewer extensions may be needed to meet local development needs

Total System Flow at 104 MGD

To meet the long-term wastewater collection need of 104 MGD, additional pumping and collection capacity will be needed in the southern and western portions of Gwinnett County. Under this flow scenario, the model predicted that the following pumping stations will require expansion:

- Beaver Ruin Pump Station
- Lower Big Haynes Pump Station
- North Fork Peachtree Pump Station

The model also indicated that the capacities of the following interceptors were exceeded under this flow scenario:

- the Beaver Ruin Pump Station inflow interceptor
- the Lower Big Haynes Interceptor
- the interceptor flowing west to the Norris Lake Pump Station
- the interceptor northwest of Peachtree Industrial Boulevard and parallel to Bay Colony Drive SE that flows north to the Crooked Creek Water Reclamation Facility
- the interceptor flowing south to the Suwanee Pump Station
- the interceptor flowing southwest to the NCI Pump Station
- the North Fork Peachtree inflow interceptor

Note: Specific Project descriptions are in Part 3 Implementation and Project Maps are in Appendix A Detailed Project Maps

Summary of Wastewater Collection System Issues

- Ongoing need for smaller sewer extensions for local developments (typically developer installed or shared cost)
- Additional capacity is needed to serve the County's wastewater collection needs beyond 94 MGD on an annual average basis
- Intensive efforts required for the operation and maintenance of the County's more-than 200 small pump stations (previously built by private developers)
- Continuous needs for repairs, rehabilitation and replacement of aging collection equipment (such as pumps) and infrastructure (pipes)

Summary of Wastewater Collection System Priorities

- Provide additional smaller sewers for local development needs through developer installed or shared cost projects
- Provide additional pumping and conveyance capacity to serve the County's wastewater collection needs beyond 94 MGD
- Evaluate efficiencies that could be gained through consolidation of the County's smaller developer-built pump stations and potential new technology in operation and management optimization for the collection system
- Continue implementation of the CMOM program to minimize sanitary sewer overflows and the asset management program to identify priorities for repairs, rehabilitation, and the replacement of aging collection system equipment and infrastructure

Closed Circuit Television Inspection of the Sewer System

Gravity Sewer Pipe Clogged with Roots

Inspection of Sanitary Sewer Manholes

Gravity Sewer Pipe Collapse

B.5. Water Reclamation and Reuse

After a decade of facility consolidation, the Department of Water Resources currently operates three water reclamation facilities: the F. Wayne Hill Water Resources Center, the Crooked Creek Water Reclamation Facility, and the Yellow River Water Reclamation Facility. The Jackson Creek Water Reclamation Facility was recently decommissioned after the completion of the current upgrade at the Yellow River Water Reclamation Facility in the summer of 2011.

Figure 2-26 shows the location of the existing treatment facilities. In 2010, the County collected approximately 51 MGD on an annual average basis of which approximately 2 MGD was treated at the DeKalb County Pole Bridge Water Reclamation Facility. Gwinnett County currently has an agreement with DeKalb County to divert up to 5 MGD of wastewater for treatment by DeKalb County. In 2009, The Department of Water Resources completed a Business Case Evaluation for the South Gwinnett Wastewater Service Area, which recommended that wastewater originating in the southwest quadrant of Gwinnett County, principally from the Lower Yellow River Basin, no longer be discharged to the Pole Bridge Facility. Instead, this wastewater would be treated in Gwinnett County at the F. Wayne Hill WRC. Further technical analysis was done in 2009, resulting in a series of infrastructure projects to divert those wastewater flows for treatment in Gwinnett. These projects will be completed and flows will be diverted by the end of 2015.

Existing Facilities

The following section provides an overview of the three major water reclamation facilities in Gwinnett County. The overview includes a brief summary of treatment processes, current (2010) treated quantities, as well as current and planned upgrades. Table 2-8 shows the permitted treatment capacity for each of the Gwinnett County water reclamation facilities in maximum monthly flow.

Table 2-8. Existing Water Reclamation Facilities and Permitted Flow (Maximum Monthly Flow, 2011)

Water Reclamation Facility	Permitted Quantity
F. Wayne Hill Water Resources Center	60 MGD
Crooked Creek Water Reclamation Facility	16 MGD
Yellow River Water Reclamation Facility	22 MGD
Total	98 MGD

METRO WATER DISTRICT WASTEWATER MANAGEMENT PLAN

Gwinnett County is a member of the 15-county Metro Water District and therefore must comply with the provisions within the District's Wastewater Management Plan (as well as the District's Water Supply and Watershed Plans). EPD performs audits of the jurisdictions within the Metro Water District to ensure compliance with the Plans, and compliance is tied to Gwinnett County's water, wastewater, and stormwater permits. Gwinnett County was audited in 2007 and was in compliance with the District's requirements.

The Wastewater Management Plan includes a number of requirements related to collection system operation and maintenance, emergency spill response, and septic systems. The Wastewater Management Plan also requires Gwinnett County to develop and update a local wastewater master plan every five years. This Master Plan addresses the District's wastewater planning requirement.

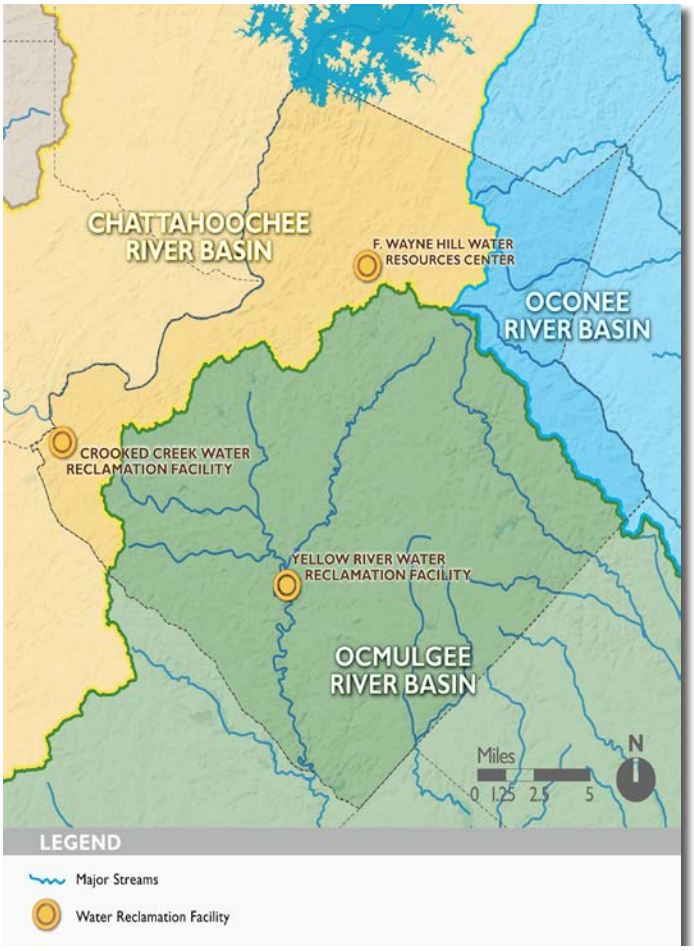


Figure 2-26: Existing Water Reclamation Facilities

F. Wayne Hill Water Resources Center

The F. Wayne Hill Water Resources Center is located near the intersection of I-985 and I-85. It is the largest wastewater treatment facility in Gwinnett County and is recognized for producing one of the highest quality effluents in the Southeastern United States. The original 20-MGD plant was constructed from 1997 to 2001; an upgrade to the current capacity of 60 MGD was completed in 2005. An aerial image of the facility is shown in Figure 2-27.

Treatment Processes. Preliminary and primary treatment processes at this facility consist of screening, grit removal, and primary clarification. Advanced secondary treatment includes biological treatment and secondary clarification. Tertiary treatment consists of two separate treatment trains, a 40-MGD train and a 20-MGD train. Both treatment trains use chemical addition for phosphorus removal. The 40-MGD treatment train consists of chemical coagulation/clarification and filtration by ultra-filtration membranes. The 20-MGD treatment train consists of solids contact coagulation (with ferric chloride)/clarification, and granular media filtration. The filtered effluent from both of the treatment trains is further treated with pre-ozonation, granular activated carbon and post-ozonation for final disinfection and filtration.

Biosolids Handling. Anaerobic digestion is used to stabilize the waste solids (sludge) from primary and secondary treatment. Centrifuges are used for dewatering the stabilized solids. Dewatered solids are disposed of in a municipal solid waste landfill.

Effluent Discharge. The F. Wayne Hill Water Resources Center is currently permitted to discharge to both Lake Lanier (40 MGD) and to the Chattahoochee River (20 MGD).

Ongoing Upgrades. Ongoing upgrades at the F. Wayne Hill Water Resources Center include the retrofitting of existing primary clarifiers, replacement of thickening centrifuges with rotary drum thickeners, a nutrient recovery system, and the installation of a combined heat and power system. This system will generate energy for use within the Water Resources Center. The Water Resources Center is also adding a new system to accept fat, oil and grease (FOG).

Figure 2-27: F. Wayne Hill Water Resources Center

Crooked Creek Water Reclamation Facility

The Crooked Creek Water Reclamation Facility is located near the City of Norcross and was constructed in 1972. Figure 2-28 shows an aerial image of the plant. The original plant (two package plants) was constructed with an initial capacity of 1 MGD. The package plants were replaced with new treatment facilities that have been expanded over time to a capacity of 16 MGD. The Crooked Creek Water Reclamation Facility discharges treated effluent to the Chattahoochee River.

Treatment Processes: Primary treatment at the facility includes influent pumping, screening, and grit removal. Secondary treatment processes include biological treatment and clarification, followed by filtration. Final treatment is provided by ultra-violet disinfection and post-aeration.

Biosolids Handling: The existing solids handling processes include waste activated sludge (WAS), thickening with a gravity thickener and dewatering with centrifuges. Dewatered solids are hauled to a municipal solid waste landfill for disposal.

Recently Completed Upgrades: Major upgrades that were recently completed at the Crooked Creek Water Reclamation Facility include a new influent pump station, a new headworks facility, and an upgrade to the existing odor control system to treat odors from the new influent pump station and the new headworks facility.

Crooked Creek Facility Plan: Additional upgrades to this facility (as well as potential treatment capacity expansion) will be proactively coordinated through the completion of a facility plan by the end of 2012. This will result in a logical schedule of projects to ensure the most efficient use of capital dollars.

Figure 2-28: Crooked Creek Water Reclamation Facility

Yellow River Water Reclamation Facility

The Yellow River Water Reclamation Facility is located near the City of Lilburn and receives flow from the central part of Gwinnett County. The plant was originally constructed in the early 1980s, and has been upgraded over the years. The plant was expanded to a treatment capacity of 14.5 MGD in 2003. The most recent upgrades, completed in 2011 and described below, brought the treatment capacity up to 22 MGD. Figure 2-29 shows an aerial view of the facility.

Recent Expansion: A major upgrade and expansion was recently completed at the Yellow River Water Reclamation Facility that expanded the treatment capacity to 22 MGD. This upgrade and expansion allowed Gwinnett County to further consolidate its wastewater treatment operations in the Yellow River basin. Five smaller wastewater treatment plants in this basin have been decommissioned in the last decade, including the Jackson Creek Water Reclamation Facility in 2011. The increased capacity replaced the 7.5 MGD of permitted capacity previously associated with the decommissioned Beaver Ruin and Jackson Creek Water Reclamation facilities.

Treatment Processes: The recent upgrade transformed the Yellow River Water Reclamation Facility into an essentially new facility with the state-of-the-art treatment technologies to provide the most environmentally sound wastewater treatment. The preliminary treatment consists of influent pumping, fine screening, and grit removal. Primary treatment consists of clarification followed by flow equalization. Secondary and tertiary treatment consists of fine screening and membrane bioreactor (MB2) activated sludge treatment. The final treatment process includes ultraviolet disinfection and post aeration.

Biosolids Handling: Waste sludge is currently pumped to the F. Wayne Hill Water Resources Center for further treatment and processing. This practice is cost-effective and is expected to be continued into the future (see further discussions on page 81).

Figure 2-29: Yellow River Water Reclamation Facility

Treatment Considerations

In addition to the management of wastewater generated by residences and businesses in Gwinnett County, the Master Plan also addresses management of septage, and fat, oil and grease (FOG), and treatment of biosolids. This section provides a summary of considerations that influence future actions related to wastewater treatment in Gwinnett County.

Septage

Approximately 27 percent of the County's households use septic tanks to manage wastewater, rather than the public sewer system. To properly maintain a septic system, the material from the tank (septage) is pumped and hauled to a treatment facility. Without proper maintenance, the septic system can fail and result in costly repairs and damage to the environment. The Department of Health recommends that septic tanks be pumped every seven years at a minimum.

Currently, the Department of Water Resources accepts (for a fee) septage pumped from septic tanks within the County at the Crooked Creek Water Reclamation Facility. The County will continue to provide treatment for septage generated in the County at the Crooked Creek Water Reclamation Facility. Because pumped septage has a higher solids and organic content than typical municipal wastewater, it must be managed carefully to avoid disruption or upset to the normal treatment processes.

The population served by septic tanks in Gwinnett is estimated to increase seven percent over the planning horizon, from 215,000 to 230,000 people. This is an increase of approximately 5,000 septic tanks for the planning horizon (based on an average of three people per household). Most of the new septic tanks are expected to be located in the low density development areas.

Based on the operational records for 2010, the frequency of septage loads accepted at the Crooked Creek Water Reclamation Facility varied widely. The accepted loads ranged from 15 loads in December 2010 to 167 loads in February 2010 and averaged 32 loads per month. Future expansion of the Crooked Creek Water Reclamation Facility should consider the variability in the treatment of the septage.

Fat, Oil and Grease (FOG)

Fat, oil, and grease (FOG), if not properly collected and disposed, can harden on the walls of collection system pipes and significantly reduce the pipe capacity. In 2010, an excess of 75 percent of the reported sanitary sewer overflows were associated with FOG. FOG contains a high percentage of volatile fatty acids which can be converted to biogas by the anaerobic digesters. There are plans to install a new system to accept FOG and other high strength waste at the F. Wayne Hill Water Resources Center. Provisions also have been included to heat the FOG stream for conversion to biogas at F. Wayne Hill's new Gas-to-Energy generator. (See page 79) These upgrades are planned to be completed by 2012.

Biosolids

Waste solids (or biosolids) generated during the wastewater treatment processes must be properly treated and disposed of. In 2009 and 2010, the processing of waste solids comprised approximately 10 percent of the total wastewater treatment cost[1]; therefore, a cost-effective management approach is important.

The waste solids at the F. Wayne Hill Water Resources Center and Crooked Creek Water Reclamation Facility are processed onsite. The waste solids from the Yellow River Water Reclamation Facility are mixed with the wastewater from the No Business Creek Pump Station, pumped to the Beaver Ruin Pump Station, and then pumped to the F. Wayne Hill Water Resources Center for treatment. After the waste solids are processed and dewatered, the stabilized cake solids from both plants are hauled away by a private contractor to a solid waste landfill for disposal.

The long-term viability of the current practice was evaluated, along with four additional options for handling the biosolids at the three facilities. Details of this evaluation are discussed on page 81 (Biosolids Treatment Evaluation). The five options evaluated ranged from solids handling facilities at each treatment plant to consolidating all solids handling at a single location, the F. Wayne Hill Water Resources Center.

Discharge and Reuse of Reclaimed Water

In determining the optimum expansion options, the benefits of returning reclaimed water to Lake Lanier must also be considered. This is important to further secure Gwinnett's position in negotiating a future water supply contract with the Corps of Engineers, and to minimize effects on the environment by limiting quantities discharged into the Yellow River (to manage the interbasin transfer to the Ocmulgee River basin).

The perceived benefits of different types of reuse in Georgia have changed in the last decade. Non-potable reuse, such as irrigation for golf courses or parks, was once encouraged to decrease the volume of effluent (and associated wastes) discharged into surface waterbodies. Currently, there is an increasing emphasis on minimizing consumptive use in Georgia. As advanced treatment technologies continue to improve effluent levels to near drinking water quality, this highly treated reclaimed water is viewed as a renewable resource. Indirect potable reuse (returning reclaimed water to Lake Lanier) is preferred over non-potable reuse as The Department of Water Resources seeks to manage Gwinnett's water resources in a sustainable manner. More information on reuse is presented on page 83, *A New Look at Reuse.*

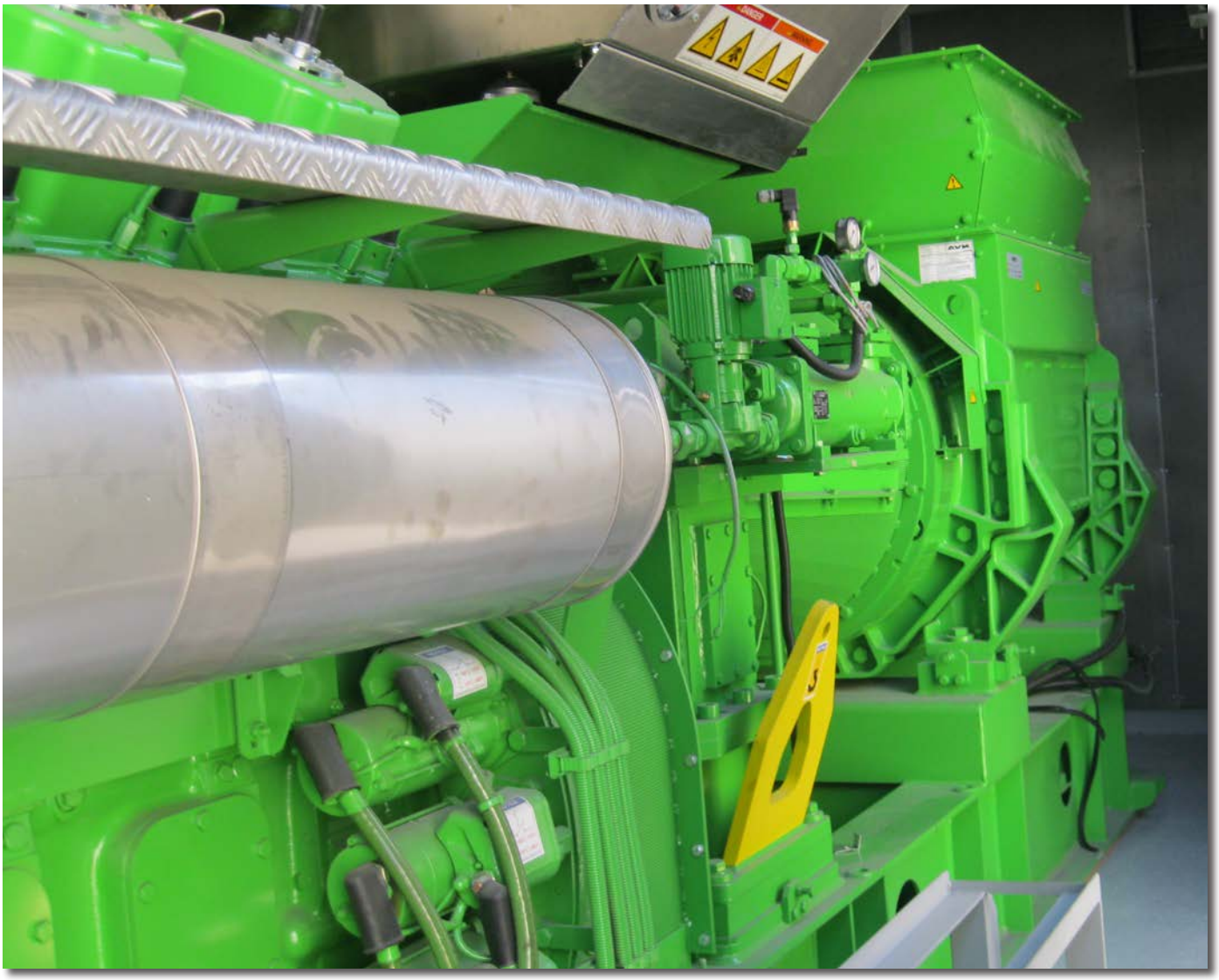
1 2009 Department of Water Resources Operations Benchmarking Report

GAS-TO-ENERGY: REDEFINING WASTEWATER

Gwinnett's Combined Heat and Power (CHP) project, a Gas-to-Energy project, utilizes digester gas to generate power, along with heat recovery to warm the facility's anaerobic digesters. The project is funded through the American Resource Recovery Act (ARRA), as administered by the Georgia Environmental Facilities Authority's (GEFA) "Green Project Reserve" Fund.

The Department of Water Resources spends over 25 percent of its annual operating expenses on energy. Actively managing power consumption is essential to controlling operating expenses and strengthens the Department of Water Resources' ability to cope with the revenue impact of reduced water sales resulting from water conservation, drought restrictions, and recent economic conditions.

The Department of Water Resources has redefined wastewater as a resource that can be processed to recover energy and nutrients. Capitalizing on wastewater as a resource (specifically biogas), the Department of Water Resources increased the energy self-sufficiency and sustainability of the F. Wayne Hill Water Resources Center.



Gas-to-Energy generator

Policy and Regulatory Considerations

The facilities in Gwinnett County are currently in compliance with all state and federal regulations. Major regulatory trends that may affect future actions include additional nutrient (phosphorus and nitrogen) removal requirements and concerns over emerging contaminants. Gwinnett should continue to monitor the development of proposed legislation or regulations that might lead to changes in treatment processes.

Nutrient Removal Requirements

Table 2-9 summarizes the phosphorus limits in the current National Pollutant Discharge Elimination System (NPDES) permits for Gwinnett's three water reclamation facilities. Gwinnett's phosphorus limits for water returned to Lake Lanier are currently the lowest in Georgia.

Following the EPA's policy on more stringent nutrient removal requirements (for nitrogen and phosphorous) across the country, the EPD continues to evaluate Numeric Nutrient Standards for major water bodies. Currently, there are phosphorus loading limits in Lake Lanier and Lake Jackson (downstream of Yellow River in the Ocmulgee River basin) and in major tributaries flowing into these lakes. In addition to phosphorus loading limits, EPD is evaluating revisions to water quality standards based on on-going modeling analyses and the water quality resource assessments conducted for the State Water Plan during 2009 to 2011. For Lake Lanier, EPD is considering a potential revision of the chlorophyll a standard (an indicator of algae growth due to excess nutrients) at the Browns Bridge Station (State Route 369) and a new nitrogen limit for Lake Lanier (based on concentration). Both revisions are for the growing season of April to October.

Table 2-9. Current NPDES Permit Limits for Total Phosphorus

Water Reclamation Facility	Total Phosphorus Limits
F. Wayne Hill Water Resources Center	0.08 mg/L (Note 1)
Crooked Creek Water Reclamation Facility	54 kg/day (Note 2)
Yellow River Water Reclamation Facility	0.3 mg/L

Notes:
1. Limit for discharges to Lake Lanier
2. The flows from the F. Wayne Hill Water Resources Center to the Chattahoochee River and the flows from the Crooked Creek Water Reclamation Facility must meet the combined effluent load limit for phosphorus for discharges to the Chattahoochee River
3. mg/L = milligrams per Liter, kg/day = kilograms per day

Solids Handling at the F. Wayne Hill Water Resources Center

A life cycle cost analysis was performed on five options for biosolids treatment as shown in the figure below. The biosolids evaluation confirmed that continuing to convey waste solids from the Yellow River Water Reclamation Facility to the F. Wayne Hill Water Resources Center by mixing these solids in wastewater is economically viable (Option 2A). For this option, the solids handling facilities at the Crooked Creek Water Reclamation Facility remain operational. This option has the lowest life-cycle cost of the five options considered (see the figure below). It also has the lowest initial cost outlay and lowest operation and maintenance costs.

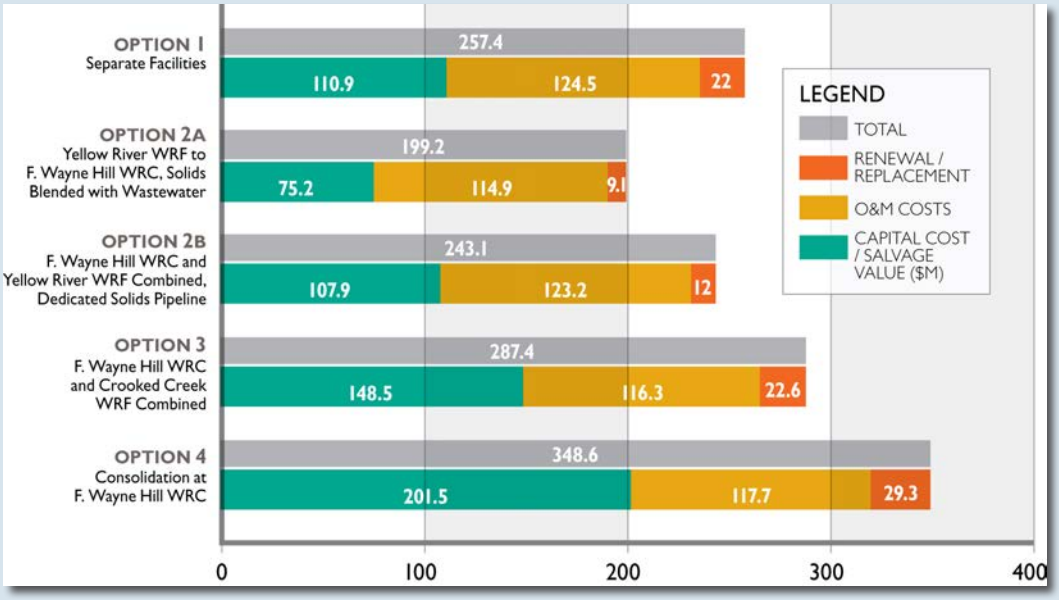
The operations and maintenance costs for this alternative are lower, in part because there will only be two facilities (versus three) to maintain. Fees associated with hauling cake solids will also be reduced because cake solids will no longer be hauled from the Yellow River Water Reclamation Facility and the additional volume of cake solids to be hauled from the F. Wayne Hill Water Resources Center will result in only a 15 percent cost increase due to economies of scale.

Gwinnett will also benefit from sending waste solids to the F. Wayne Hill Water Resource Center where the "Gas-to-Energy" system will convert the biogas generated during the digestion of waste solids into energy. The benefit of additional energy production was not large enough, however, to recommend the consolidation of the waste solids treatment from the Crooked Creek Water Reclamation Facility.

There is an inherent risk in conveying solids through a pressurized pipeline, in the rare event that the pipeline ruptures. This risk is considered manageable, particularly since Gwinnett County currently operates an extensive network of pressurized pipelines for conveying wastewater and has managed the system and risks well.

The phosphorus contained in the solids from the Yellow River Water Reclamation Facility will be transferred to the F. Wayne Hill Water Resources Center, which is required to meet extremely stringent effluent limits. The additional phosphorus load may require operational changes (such as change in chemical dosage) in the future. The influent phosphorus levels should be monitored as part of this option.

Improvements will be required at both the F. Wayne Hill Water Resources Center and Crooked Creek Water Reclamation Facility to improve efficiency and to increase the capacity of the processing units. These improvements will be discussed in Part 3 of the Master Plan.



Life Cycle Cost Analysis for Biosolids Treatment

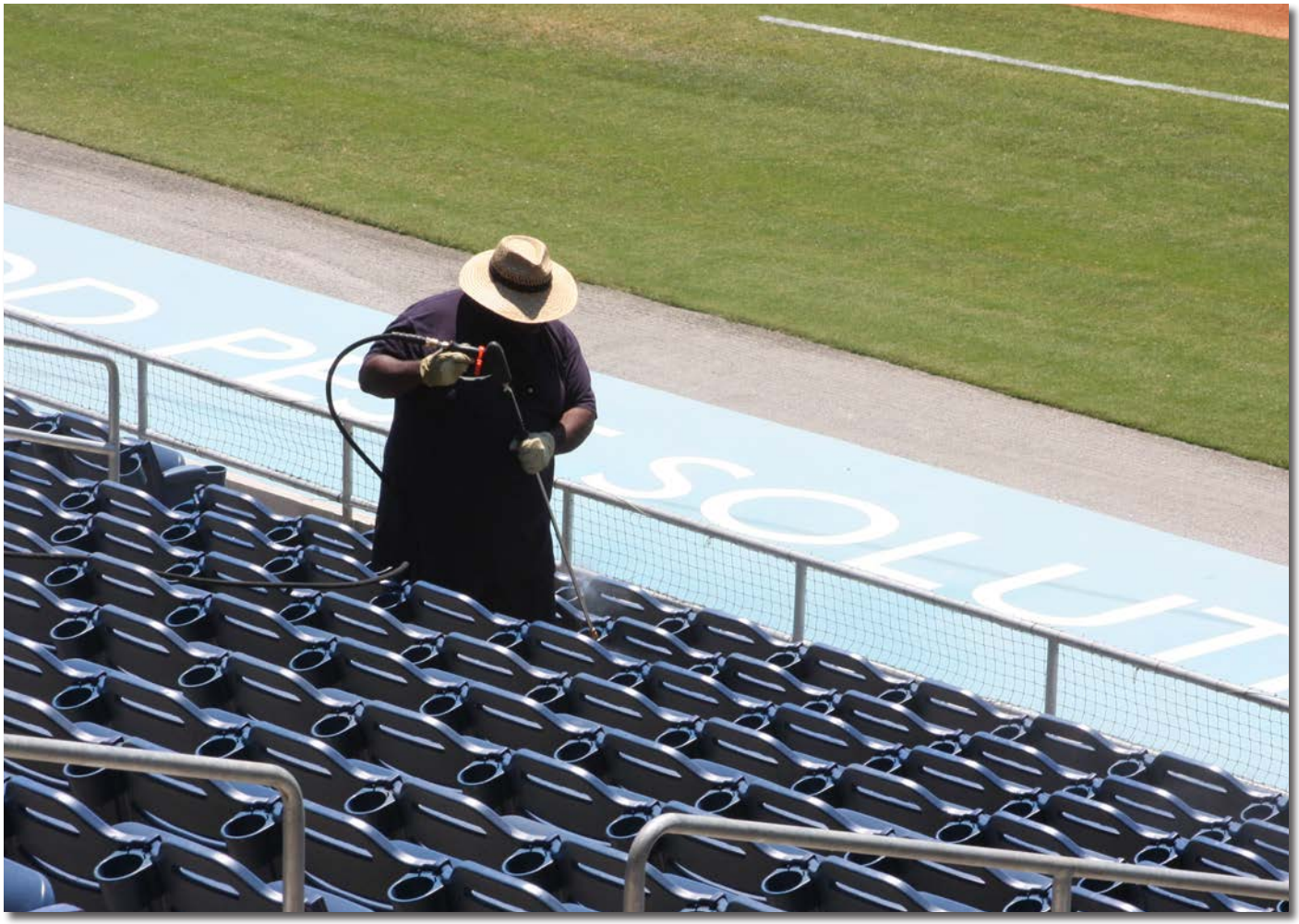
For Lake Jackson, the water quality modeling conducted for the Middle Ocmulgee Regional Water Plan (2011) indicated that increases in nitrogen loadings into Lake Jackson can be expected through the 2050 planning horizon. The models showed that the predicted increase is largely due to point source discharges upstream of Lake Jackson. EPD currently does not regulate nitrogen loadings into Lake Jackson. However, EPD may consider future nitrogen loading limits for upstream dischargers into Lake Jackson based on these results. Gwinnett should monitor the development of potential nitrogen loading and/or concentration limits, particularly for its discharge into the Yellow River.

The potential change in nutrient removal requirements could push the nutrient removal technology to a new level and increase the cost of wastewater treatment.

Contaminants of Emerging Concern (CECs)

Contaminants of emerging concern (CEC) include natural and synthetic hormones, pharmaceuticals, personal care products (PCPs), pesticides, and alkyl phenols. EPA and other agencies are studying and documenting the existence of trace levels of CECs in aquatic environments and evaluating whether there is a human health or environmental risk. These contaminants are not currently regulated. Future policy changes regarding CECs could affect the treatment and disinfection methods used in wastewater treatment plants.

Indirect potable reuse (returning reclaimed water to Lake Lanier) is preferred over non-potable reuse as it helps to sustain Gwinnett's source of drinking water

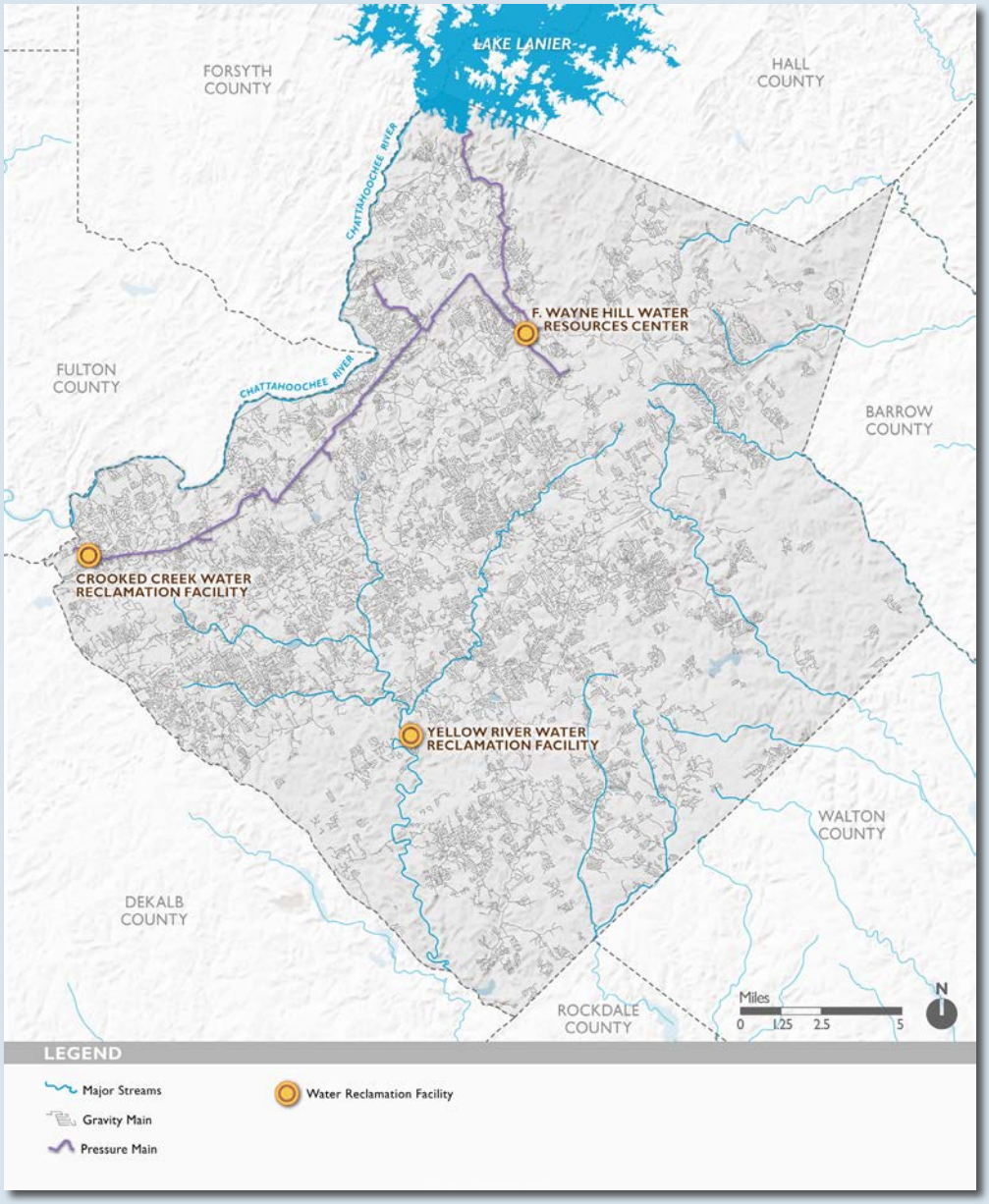


Reuse Washdown at the Gwinnett Braves Stadium

The Department of Water Resources currently practices both non-potable reuse and indirect potable reuse. The highly treated reclaimed water is returned to Lake Lanier (termed indirect potable reuse) via a 72-inch diameter pipe. The Department of Water Resources is permitted to discharge 40 MGD of reclaimed water from the F. Wayne Hill Water Resources Center to Lake Lanier.

A 48-inch diameter pipe is dedicated to deliver reclaimed water from the F. Wayne Hill Water Resources Center to its non-potable reuse customers and to the Crooked Creek Water Reclamation Facility for a combined discharge to the Chattahoochee River. The Department of Water Resources currently has 9 non-potable reuse customers that purchase approximately 0.5 MGD of reclaimed water at a highly discounted prices of $0.93 per 1,000 gallons (compared to the rate of $8.76 per 1,000 gallons for regular irrigation meters). The reclaimed water is used for irrigation at golf courses, parks, and office parks. EPD encouraged non-potable reuse in the 1990s to minimize discharges into the Chattahoochee River. However, minimizing consumptive use (such as irrigation) has become a recent focus due to water supply challenges (described in the Water Supply Challenges discussion in Part 1).

With the water supply challenges in the Metropolitan Atlanta area, the trend now is to minimize consumptive use and return additional reclaimed water to its water source for water supply credits. Therefore, Gwinnett should remain focused on the indirect potable reuse program and consider phasing out the existing non-potable reuse program. This provides the most sustainable solution to Gwinnett's future water resources challenges.



Current Reuse System in Gwinnett County

Options for Expansion

Gwinnett County's long-term wastewater flows are projected to increase to 104 MGD on an annual average basis or 114 MGD on a maximum monthly basis. An additional 16 MGD is needed for treatment capacity and permitted discharge beyond its existing treatment capacity and permitted discharge of 98 MGD (maximum monthly basis).

The County's unique wastewater collection and pumping system provides the flexibility to divert wastewater flows between the three treatment facilities. The capacity expansions can be done in stages as required based on future flows and other plant upgrade needs (e.g., if new regulations are also adopted).

Major upgrades to the Yellow River Water Reclamation Facility were just completed and no additional expansion is anticipated during this planning period. Increasing the permitted discharge quantity into the Yellow River would increase the existing interbasin transfer quantity and therefore is not currently favored. However, the plant is designed with provisions to increase the treatment capacity and treatment level by adding more membrane trains to the secondary treatment. Discharge options will be evaluated closer to the time additional capacity is needed.

The 2009 Metro Water District Wastewater Management Plan evaluated the following two future capacity expansion projects for Gwinnett County:

- Expansion of Crooked Creek Water Reclamation Facility from 16 MGD to 25 MGD permitted flow on a maximum month flow basis
- Expansion of F. Wayne Hill Water Resources Center from 60 MGD to 85 MGD on a maximum month flow basis

These two expansion options were considered the best options for future upgrades at the time, given the treatment, policy and regulatory considerations that were in existence at the time. Considering the potential need to maximize flows to Lake Lanier and a change in growth patterns a brief summary of the revised options is described below.

Rehabilitation of Crooked Creek Water Reclamation Facility

While the 2009 Metro Water District Wastewater Management Plan envisioned an expansion of both Crooked Creek and F. Wayne Hill it is worth considering the economies of scale in limiting the future expansion to a single facility. Limiting future capacity expansion to F. Wayne Hill will allow the greatest versatility in discharge location (FWH can discharge to Lake Lanier and the Chattahoochee River) as well as provide for the most efficient energy recovery options. Given these considerations, the best option is to consolidate the expansions outlined in the Metro District Plan at the F. Wayne Hill Water Resources Center.

A series of improvements have either taken place or are in some stage of implementation on some of the processes and facilities at the Crooked Creek Water Reclamation Facility. However, some of the unit processes have not been improved and are reaching the end of their useful life.

The new infrastructure consists of an influent pumping station; also a new preliminary treatment facility with band screens and grit removal. Both of these new facilities are located in new buildings and the projects included the associated odor control and various electrical and piping upgrades to accommodate them. Additionally a new Operations Center and a maintenance and warehouse building have been designed and will begin construction in 2012.

Both an Equipment Condition Evaluation and a Facility Plan for the Crooked Creek Water Reclamation Facility will be conducted on the remainder of the aging equipment at Crooked Creek. The results of these evaluations will be available late in 2012 and will outline the capital improvement needs for Crooked Creek for the next 20 years. It is anticipated that, due to the age of the equipment and processes at Crooked Creek, any process that was not recently upgraded will be recommended for replacement.

INTERBASIN TRANSFER

Interbasin transfer is defined as the withdrawal or diversion of water from one river basin, followed by the use and/or return of some or all of that water to a different river basin. Currently, all of Gwinnett County's drinking water is withdrawn from Lake Lanier (the Chattahoochee River Basin). The F. Wayne Hill Water Resources Center and Crooked Creek Water Reclamation Facility discharge water back to the Chattahoochee River Basin. The Yellow River Water Reclamation Facility discharges treated effluent to the Ocmulgee River Basin.

On January 26, 2011 the Georgia Department of Natural Resources (DNR) adopted a new rule (Rule 391-3-6-.07) governing surface water withdrawal permits that involve interbasin transfers. The rule states that the Director of EPD should consider a variety of factors before issuing a permit for a new interbasin transfer. These considerations include the effect that such transfers may have on the donor basin and the environment; other factors include water conservation and options evaluated to reuse reclaimed water.

The existing interbasin transfer (through the permitted discharge to the Yellow River) is unlikely to be challenged. The high quality effluent from the Yellow River Water Reclamation Facility supplements the flow into the Ocmulgee River Basin and benefits downstream water needs. Any actions that decrease the current flows into the Basin may be challenged. Gwinnett will likely be required to return any future increases in wastewater discharge (beyond the permitted quantity) to the Chattahoochee Basin, rather than increasing the interbasin transfer to the Ocmulgee Basin.

Expansion of F. Wayne Hill Water Resources Center

With no expansion at Crooked Creek, an expansion of the F. Wayne Hill Water Resources Center may be required at an earlier date than originally anticipated. As the flows start to increase a Business Case Evaluation should be performed to analyze the cost effectiveness of expanding F. Wayne Hill in stages as opposed to one large expansion project. The ultimate expansion will be an additional 34 MGD. This expansion will increase the total treatment capacity in Gwinnett County to 132 MGD on a maximum monthly flow basis and can serve the County well beyond the 20-year planning period.

The primary advantages of expanding this facility is the capability to increase return flows to Lake Lanier, consolidation of solids handling and the potential for energy recovery. One of the disadvantages is that the power use and chemical costs for wastewater at the F. Wayne Hill Water Resources Center are high, in part because the effluent limit is the most stringent. However, the additional energy cost will be substantially offset by utilizing the energy recovery processes available at this facility.

This plan does differ from the 2009 Metro Water District Plan recommendation and as such Gwinnett County should submit an update to the District following completion of the Crooked Creek Facility Plan.

Summary of Issues and Priorities

- Expand treatment capacity by 16 MGD to address long-term treatment needs beyond current permitted capacity of 98 MGD
- Plan for rehabilitation and equipment replacement at the Crooked Creek Water Reclamation Facility
- Maximize indirect potable reuse (return to Lake Lanier) to sustain Gwinnett's long-term water supply need; discourage or phase out non-potable reuse to minimize consumptive loss
- Minimize interbasin transfers by returning additional future effluent to either Lake Lanier or the Chattahoochee River
- Continue sending biosolids from the Yellow River Water Reclamation Facility to F. Wayne Hill Water Resources Center for further treatment and disposal. Upgrade biosolids handling facilities at the F. Wayne Hill Water Resources Center to process long-term projected biosolids quantities
- Continue monitoring of regulatory development trends for effluent nutrient limits, especially for potential nitrogen limits in Lake Lanier and in Lake Jackson, and potential regulations for contaminants of emerging concerns
- Continue the use of the Crooked Creek Water Reclamation Facility for the disposal and treatment of septage (high strength waste material from septic tanks)

Part 2 presented the planning evaluations and results conducted for the Master Plan. Part 3 presents the recommended actions.

Raw water valve

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Part 3: Implementation

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Part 3: Implementation

Implementation of the Master Plan includes a number of capital projects and policies that are recommended to Keep Gwinnett a Preferred Place and support implementation of the Unified Plan.

Part 3 of the Master Plan presents the list of recommended actions needed to support the International Gateway scenario of the Unified Plan and to Keep Gwinnett a Preferred Place. The recommended actions are based on the system analysis presented in Part 2 as well as the community priorities and driving forces presented in Part 1.

In addition to presenting the recommended actions and capital projects, Part 3 outlines a flexible approach to timing the implementation of the recommended actions.

The section titled "Monitoring and Updating the Plan" presents recommendations for system-wide monitoring to support the implementation of the Master Plan capital projects, as well as the frequency for updates to the Master Plan.

A. OVERVIEW

The recommended actions are presented by system component: water supply, water treatment, water distribution system, wastewater collection system, and water reclamation. The recommended actions include programs and capital projects. Recommended policies are presented by policy category.

One of the driving forces outlined in Part 1, "Just in Time Implementation" (Part 1.C.5) identified some of the uncertainties that may impact the timing of recommended water and wastewater infrastructure actions. The factors that may impact project timing include:

- Development Patterns: The International Gateway scenario was the foundation for the Master Plan and changes in the location of growth will require another look at infrastructure needs
- Water Demands: Future water demands may be higher or lower than expected. If water conservation is more successful than planned, the actual water demands may be lower than forecasted. If the development patterns shift to more water-intensive uses, then actual water demands may be higher than forecasted. The fluctuation in water demands will have a corresponding impact on water-usage based revenue
- Septic Systems: Changes in the use of septic systems could adjust the timing for wastewater collection system and water reclamation projects. If redevelopment does not convert areas currently served by septic systems to sewer, the actual flows will be lower than forecasted. If sewer is allowed to extend into the Rural Estates Character Area, the flows may be higher than forecasted in that portion of the County

Typically, master plans assign a start date to each recommended action. The start dates are based on when the water and wastewater projections (such as those presented in Part 2) are expected to exceed the system limits. If the development patterns (and therefore the projections) are not achieved, the projects could be built in advance of the need, thereby resulting in unused capacity.

Waste Activated Sludge Storage Tanks and Thickener at Crooked Creek Water Reclamation Facility

The traditional date-based approach worked well in the past, as Gwinnett experienced consistent fast-paced growth. As Gwinnett matures, the Unified Plan anticipates a greater level of variability in the rate of development. Therefore, the Master Plan recommends a flexible approach for implementation.

The recommended implementation approach presented in the Master Plan, associates the project timing with measurements of system conditions (e.g., flow and water pressure) instead of a date. As the flow or water pressure approaches the system limit, project implementation will begin.

- The implementation actions are not arranged by a due date but rather are associated with a measurement that reflects the system's limit or the point when additional investments will be needed
- The priorities established for each system component extend beyond capital projects to acknowledge the value received from continuing existing programmatic actions (e.g., asset management, water conservation)
- System monitoring at specific locations plays an important role as data will be used to trigger the implementation of the recommended capital projects

B. RECOMMENDED ACTIONS

For each system component, the Master Plan presents the following:

- system priorities (from Part 2)
- recommended actions
- recommended capital projects
- community priorities (from Part 1)

The system priorities reflect the most pressing matters based on the evaluations performed in Part 2. The priorities are also presented in terms of recommended actions, capital projects, and policies (presented in section C).

A number of capital projects for each system component are recommended based on the priorities. The capital projects in the Master Plan include the construction, expansion, renovation, or replacement of water and wastewater infrastructure. This recommended infrastructure will be needed to meet the anticipated demands for the International Gateway scenario.
The details for each recommended capital project include:

- project identifier (see "Understanding the Project Identifiers" on the next page)
- project summary
- planning level cost
- system limit that reflects the capacity threshold of the existing system at a specific location (i.e., the system measurement at which the project is needed)

Lanier High Service Pump Station

UNDERSTANDING THE PROJECT IDENTIFIERS

The capital projects in this Part are assigned a specific identifier. Each project is assigned a 2-letter identifier that is based on the system component:

- WS = water supply
- WT = water treatment
- WD = water distribution
- WC = wastewater collections
- WW = wastewater (water reclamation)

The projects are also assigned a number. In general, the numbers reflect the chronological order that the projects are anticipated. The chronological order is based on the computer modeling of the overall system-wide demands. Therefore if one portion of the County grows at a faster rate than anticipated in the water distribution and wastewater collection system computer models the number may not reflect the project order.

In some instances projects are also assigned a single letter at the end, which indicates the order for phased projects. There are several instances where a larger project could be divided into smaller pieces and implemented over time. For example a pump station may be expanded to add one pump at a lower system demand and an additional pump added at a later system demand. These projects share the same number, based on the chronological order for the first recommended project. The first expansion would be assigned the letter "A" and subsequent phases "B", "C", etc.

The projects are numbered (and lettered) in this fashion to clearly show the projects that could be completed in more than one phase. The Department of Water Resources may choose to complete a multi-phased project at one time to minimize community disruptions or take advantage of a special funding source. As the Department of Water Resources moves to a pay-as-you-go program, however, there may be an advantage to spreading capital costs out over time by phasing projects.

PLANNING LEVEL COSTS

The planning level costs presented in the Master Plan reflect the magnitude of anticipated costs for preliminary planning purposes. Detailed cost estimates would be performed for capital projects as part of detailed project planning, budgeting, and design prior to construction.

For capital projects with costs greater than $2 million, a Business Case Evaluation will be performed. The Business Case Evaluation process includes a more detailed planning level cost calculation that will be used for capital improvement planning and budgeting.

The planning level costs are based on unit costs and the number of units associated with that project. The unit costs were based on experience with construction projects in Gwinnett County, where possible.

For distribution and collection system pipeline projects, each pipe diameter had a different unit cost. For pumping projects, two different unit costs were used based on the amount of planned additional pumping capacity. Projects with increases in capacity less than 10 MGD used a unit cost of $0.50 per gallon and all other projects used a unit cost of $0.15 per gallon.

A contingency factor of 25 percent was added to the calculated planning level costs to account for future uncertainties.

SYSTEM LIMITS

Most of the capital projects are assigned a system limit, which represents a maximum system capacity at a specific monitoring location. These monitoring locations are labeled with a letter identifier and number:

D = Demand and flow monitoring (water system)
P = Pressure monitoring (water system)
F = Flow monitoring (collection system)

The monitoring locations are shown on the figures that identify the project locations. The monitoring locations are described in greater detail in the Monitoring and Updating the Plan section.

B.1. Water Supply Recommendations

There are six water supply priorities which result in one recommended capital project to address future water supply needs.

Water Supply Priorities:

- Pursue an additional 42 MGD of withdrawal beyond the current permitted withdrawal of 150 MGD (issued on monthly-average basis)
- Increase the total firm pumping capacity of the Shoal Creek Raw Water Intake Pump Station by the addition of one 30-MGD raw water pump
- Continue using Lake Lanier as the County's main raw water supply source and pursue negotiation of a storage contract with the Corps of Engineers
- Implement additional water conservation practices as required in the Enhanced Water Conservation Program
- Seek full or maximum credits for the return of reclaimed water from the F. Wayne Hill Water Resources Center to Lake Lanier
- Consider developing supplemental water supply sources for needs beyond 2030

The actions recommended to support the water supply priorities are shown in Table 3-1. One capital project was recommended to meet the water supply priorities as shown in Table 3-2 and in Figure 3-1.

Community Priorities Addressed:

1. Protect public health, quality of life, and the environment and comply with existing regulations
2. Be regional leaders in good stewardship of water resources
3. Plan for water and sewer capacity proactively to support economic development activities
5. Coordinate with stakeholders to support the County's objectives and the Unified Plan
6. Provide a high level of service at a responsible cost to customers (with effective and efficient management)
7. Employ responsible long-term planning and financing for major projects
8. Consider regional opportunities for leadership and coordination with the Metro Water District and the State

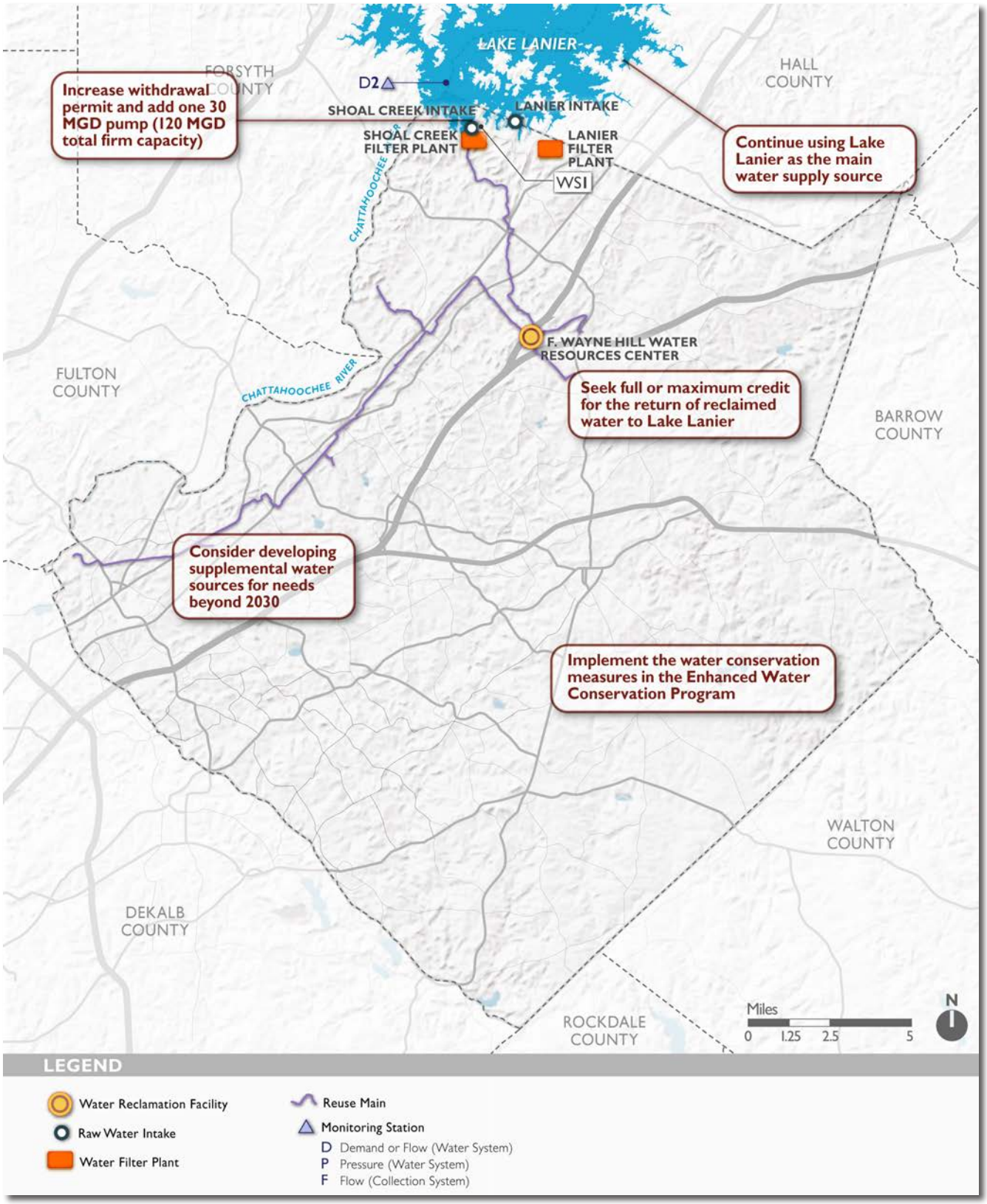
Table 3-1. Water Supply Actions

#	Project Description	Type	Responsible Group
1	Continue implementing the County's legal strategy to secure a storage contract with full credit for returns from the F. Wayne Hill Water Resources Center	Policy	DWR Directors Law Department
2	Continue implementation of the Enhanced Water Conservation Program, as required by the Metro Water District. Provide sufficient funding and staffing for implementation	Program	DWR Infrastructure Development
3	Track water demands	Program	Strategic Infrastructure Planning/DWR
4	Apply for an increase to permitted water withdrawal from Lake Lanier from 150 MGD to 192 MGD (monthly average) as needed to meet future demands	Policy	DWR Directors

Table 3-2. Water Supply Capital Projects

#	Project Description	Planning Level Cost	System Limit
WS1	Increase water withdrawal capacity from Lake Lanier by 42 MGD on a monthly average basis to meet future demands. Increase firm pumping capacity at the Shoal Creek Raw Water Pump Station from 90 to 120 MGD by adding a new 30 MGD pump. Leverage return flows to Lake Lanier from the F. Wayne Hill Water Resources Center for a storage-based contract	$42 M	150 MGD monthly average basis at location D2

Figure 3-1 Water Supply Priorities and Monitoring Locations



B.2. Water Treatment Recommendations

There are six water treatment priorities that result in one recommended capital project to address future water demands..

Water Treatment Priorities:

- Increase the Shoal Creek Filter Plant by 40 MGD (peak day basis) to meet both future capacity and redundancy needs
- Monitor potential revision of existing drinking water rules and development of new rules on new contaminants
- Monitor development of new treatment technologies to enhance operations
- Continue existing practices on energy optimization and monitor development of new technology for enhancing operational efficiency
- Move forward with the onsite hypochlorite generation project
- Move forward with the UV Disinfection project

The actions recommended to support the water distribution system priorities are presented in Table 3-3. One capital project was recommended to meet the water treatment priorities as shown in Table 3-4 and in Figure 3-2.

Community Priorities Addressed:

1. Protect public health, quality of life, and the environment and comply with existing regulations
2. Be regional leaders in good stewardship of water resources
3. Plan for water and sewer capacity proactively to support economic development activities
4. Provide a high level of service at a responsible cost to customers (with effective and efficient management)
5. Employ responsible long-term planning and financing for major projects

Table 3-3. Water Treatment Actions

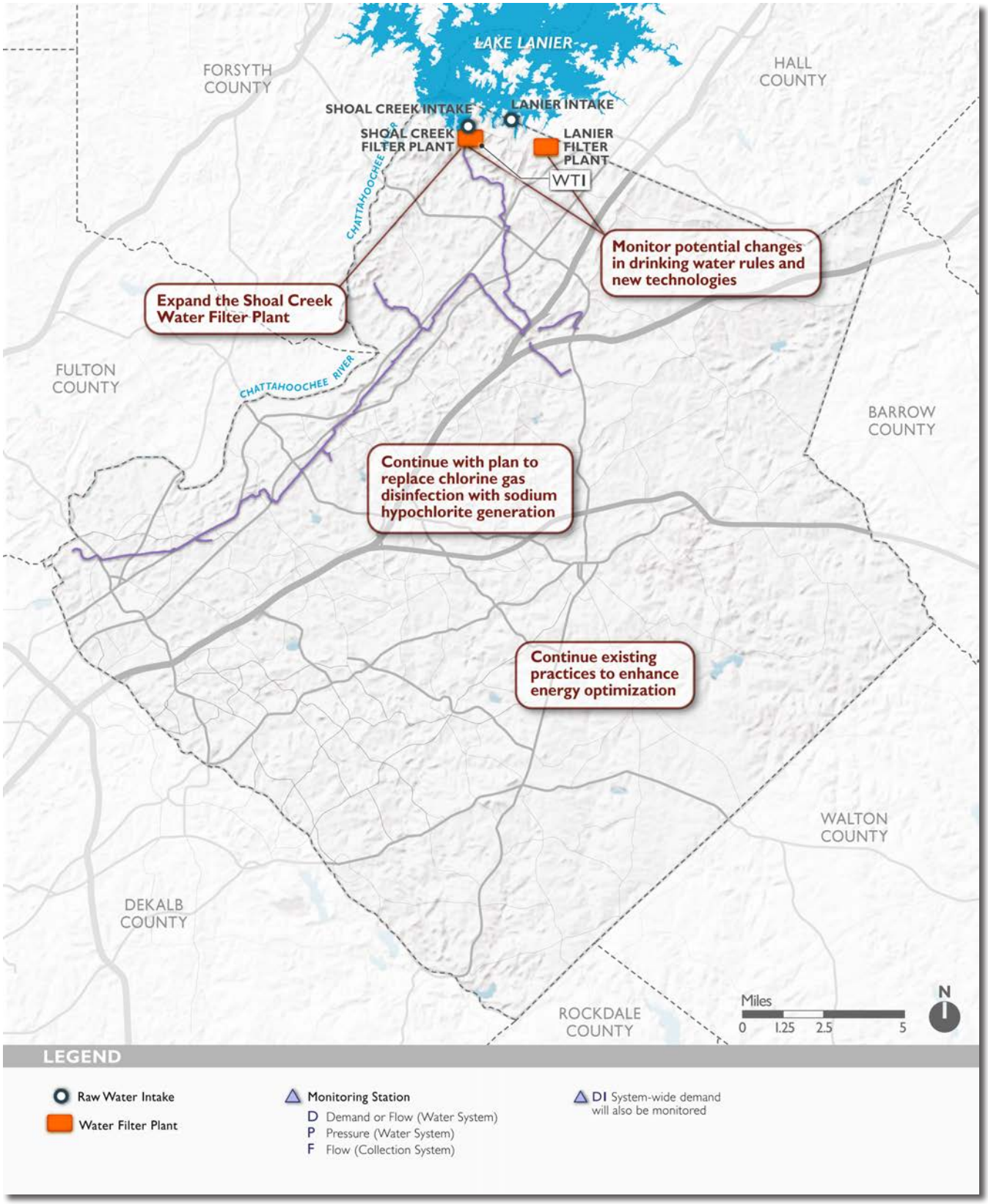
#	Project Description	Type	Responsible Group
1	Track water demands	Program	Strategic Infrastructure Planning/DWR
2	Increase the Shoal Creek Filter Plant capacity as needed	Capital	DWR Operations
3	Monitor development of drinking water rules and technologies that may benefit Gwinnett customers	Program	DWR Operations
4	Continue programs to maintain efficient operations	Program	DWR Operations

Table 3-4. Water Treatment Capital Projects

#	Project Description	Planning Level Cost	System Limit
WT1	Expand the firm capacity of the Shoal Creek Filter Plant by at least 40 MGD (to 102.5 MGD) to meet the combined system peak day demand of 240 MGD and provide additional redundancy	$56 M	200 MGD at location D1

Yellow River

Figure 3-2: Water Treatment Priorities and Monitoring Locations



B.3. Water Distribution Recommendations

There are four water distribution system priorities and these priorities translate into a total of 16 recommended water distribution system projects, listed in Table 3-6 and shown in Figure 3-3.

Water Distribution System Priorities:

- Implement system improvements to provide adequate pressure in various parts of the County to relieve current and future pressure concerns
- Increase redundancy for Lanier Filter Plant and to areas primarily served by the Lanier Filter Plant
- Increase high service pumping and transmission capacity from the Shoal Creek high service pump stations to Central Pressure Zone
- Continue existing water main replacement and asset management program and replace aging infrastructure based on timing and priority defined by the asset management program

The actions recommended to support the water distribution system priorities are presented in Table 3-5.

Community Priorities Addressed:

1. Protect public health, quality of life, and the environment and comply with existing regulations
2. Be regional leaders in good stewardship of water resources
3. Plan for water and sewer capacity proactively to support economic development activities
4. Develop strong maintenance and rehabilitation programs to improve reliability and lower costs
5. Provide a high level of service at a responsible cost to customers (with effective and efficient management)
6. Employ responsible long-term planning and financing for major projects

Table 3-5. Water Distribution System Actions

#	Project Description	Type	Responsible Group
1	Track water demands and water pressure using available data	Program	Strategic Infrastructure Planning/DWR
2	Implement recommended capital projects as needed	Capital	DWR Infrastructure Development/DWR Operations
3	Continue ongoing asset management and leak detection programs to maintain efficient operations	Program	DWR Asset Management

Ultraviolet Injector at Crooked Creek Water Reclamation Facility

Table 3-6. Water Distribution System Capital Projects

#	Project Description	Planning Level Cost	System Limit
WD1A	Convert the existing 54-inch diameter transmission main that connects the Shoal Creek-Lanier high service pump station to the Lanier Filter Plant clearwell into a transmission main to address velocity and headloss near-term challenges. The pipeline currently provides partial redundancy but when re-purposed will provide additional service to the western portion of the North Pressure Zone. If this project is combined with additional pumping capacity, the Shoal Creek Filter Plant could serve all of the North Pressure Zone under an emergency situation	$12.7 M	2.4 MGD on a peak day basis at location D3
WD1B	Install approximately 14,800 feet of 42-inch diameter transmission main from Sycamore Road to Cumming Highway along Buford Dam Road and Suwanee Dam Road. This transmission main is a continuation of Project WD1A along the northwestern boundary of the North Pressure Zone	$ 7.1 M	40 pounds per square inch (psi) at location P1
WD1C	Install approximately 15,100 feet of a parallel 36-inch transmission main to connect to Project WD1B near the intersection of Cumming Highway and Suwanee Dam Road. The pipeline will follow Suwanee Dam Road until near the intersection of Suwanee Dam Road and Level Creek Road. This transmission main serves the western portion of the North Pressure Zone	$5.3 M	40 psi at location P2
WD2	Expand the Nob Hill Pressure Zone into the Central Pressure Zone, east of the Lanier Mountain Tanks. This project addresses a concentrated area of low pressures attributed to higher elevations in this area. This project also includes upgrades to the Nob Hill pump station to accommodate the additional demand	$1 M	40 psi at location P3
WD3	Create a new pressure zone near the City of Dacula to address the lower pressures in this higher elevation area by installing two pressure reducing valves (PRVs) between the North Pressure Zone and Central Pressure Zone	$140,000	40 psi at location P4
WD4	Decommission one of the three Lanier Mountain Tanks and reduce the volume of storage used in the remaining two tanks from 15 MGD to 7 MGD to eliminate low pressures. These three tanks operate at a higher hydraulic grade line than the other tanks in the Central Pressure Zone. Consequently, the pressures drop when the tanks are being filled	N/A	40 psi at location P3
WD5A	Replace approximately 32,200 feet of existing main with a 54-inch diameter main. This project starts near the intersection of Buford Drive and Old Peachtree Road and extends along Buford Drive to Hurricane Shoals Road, and then parallels Hurricane Shoals Road to the Maltbie Street intersection. Approximately 18,000 feet of new 48-inch main continues from this intersection to below Lawrenceville near the intersection of Moon Road and Scenic Highway	$33.9 M	40 psi at location P5
WD5B	Install 25,700 feet of new 48-inch diameter transmission main near the intersection of Loganville Highway and Herring Road. This is a continuation of project WD5A to meet increased demands in the Central Pressure Zone. This transmission main is the primary supply to the Grayson Water Tanks and will address low pressures in this area and support filling of the Grayson Water Tanks	$15.9 M	50 psi at location P6

Table 3-6. Water Distribution System Capital Projects

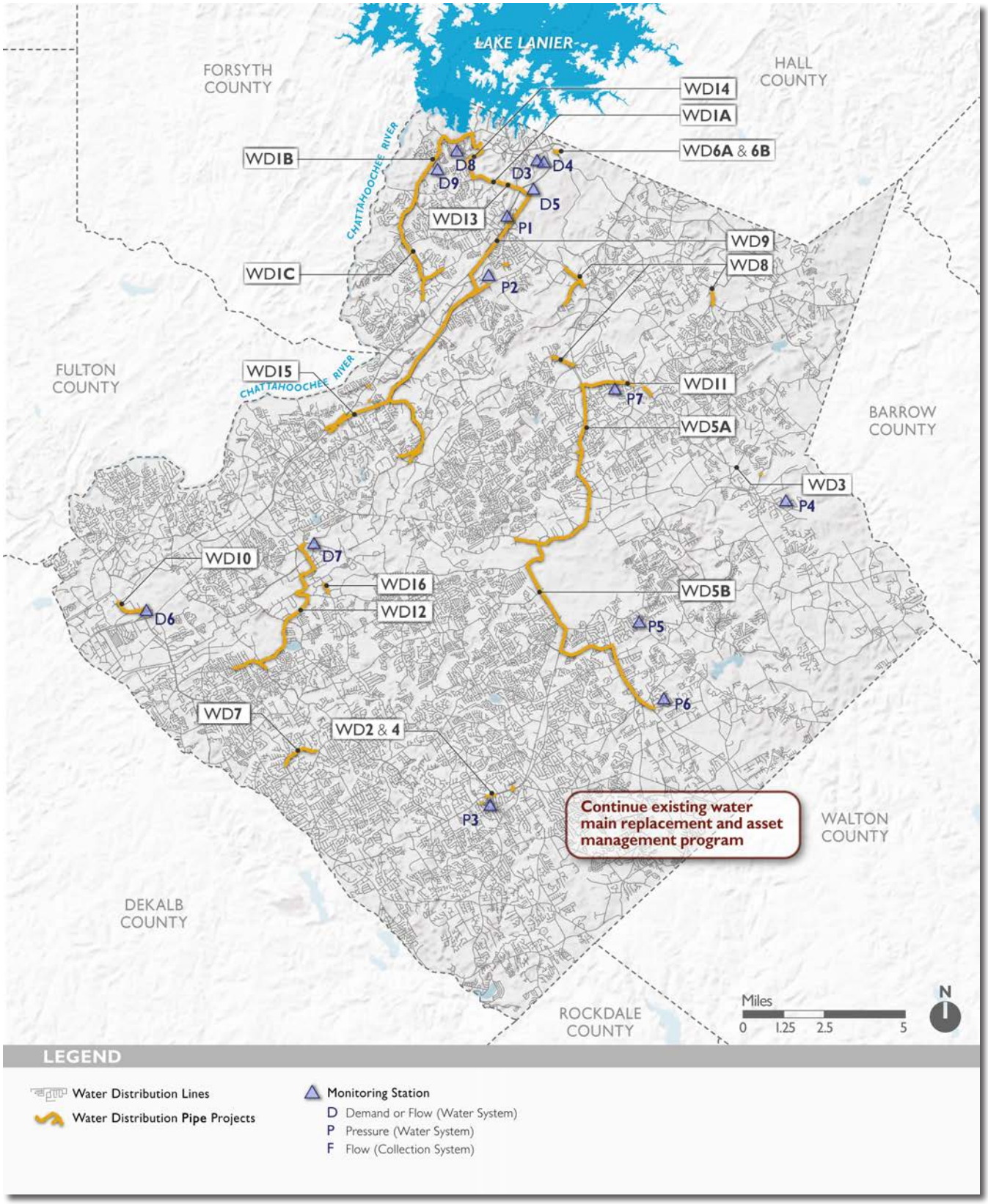
#	Project Description	Planning Level Cost	System Limit
WD6A	Increase the firm capacity of the Lanier North High Service Pump Station from 50 MGD to a firm capacity of 60 MGD at 230 feet TDH (total dynamic head). The project can be accomplished by replacing two of the existing pumps with 35 MGD pumps (one of which will be a standby pump), while leaving one of the existing 25 MGD pumps in operation	$1.9 M	50 MGD demand at location D4
WD6B	This project continues the upgrades to the Lanier North High Service Pump Station by replacing the third of the existing 25 MGD pumps with a new 35 MGD pump. The three upgraded pumps will meet the peak day demands for the North Pressure Zone through the 2030 planning horizon	$1.9 M	60 MGD demand at location D4
WD7	Install approximately 6,400 feet of parallel 24-inch diameter transmission main along the north branch of the existing 16-inch loop parallel to Arcado Road to fill the Rockbridge Tank	$1.7 M	90-percent full under peak month demand
WD8	Install 27,100 feet of 12-inch diameter distribution main in the North Pressure Zone to improve system pressure	$5.1 M	54 MGD demand at location D4
WD9	Install 44,200 feet of a parallel 72-inch diameter transmission main extending from the existing manifold from the Lanier and Shoal Creek Filter Plants (includes one 60-inch and two 48-inch transmission mains) near the intersection of Little Mill Road and Peachtree Industrial Boulevard. The new main extends south along Peachtree Industrial Boulevard and Buford Highway and connects to an existing 48-inch diameter pipeline along Old Peachtree Road at the intersection of Buford Highway and Wildwood Road	$136.2 M	91 MGD combined flow at location D5
WD10	Install approximately 5,200 feet of parallel 16-inch diameter transmission main along Jimmy Carter Boulevard to the Norcross Tank. This pipeline provides additional capacity needed to fill the Norcross tank	$1.4 M	4.5 MGD over a 24 hour period at location D6
WD11	Install approximately 7,800 feet of 24-inch diameter transmission main along Old Peachtree Road between Buford Drive and Sunny Hill Road. This project addresses high pipe velocities and low pressures	$2.7 M	44 psi at location P7
WD12	Install 9,700 feet of 48-inch diameter pipe from Project WD9 to the intersection of Davenport Road and Old Norcross Road continuing to the intersection of Beaver Ruin Road and Steve Reynolds Boulevard. This pipeline transitions to 9,000 feet of 30-inch diameter pipe that extends to the intersection of Steve Reynolds Boulevard and Lilburn Road. This project also includes two short segments of parallel 16-inch transmission main along Indian Trail Lilburn Road NW and Singleton Road NW	$16 M	41 MGD over a 24- hour period at location D7
WD13	Install a parallel 60-inch diameter transmission main (approximately 1,580 feet) from the Shoal Creek Central High Service Pump Station to the manifold with the 48-inch diameter transmission main to the Central Pressure Zone. This project will address energy losses in this pipeline and also provide capacity to support future expansions at the Shoal Creek Filter Plant	$26.2 M	63 MGD over at 24 hour period at location D8
WD14	Install an additional 35 MGD pump at the Shoal Creek High Service Pump Station, bringing the firm capacity to 105 MGD at 300 feet total dynamic head (TDH)	$6.6 M	70 MGD over a 24 hour period at location D8

Table 3-6. Water Distribution System Capital Projects

#	Project Description	Planning Level Cost	System Limit
WD15	Install several small sections of main near the site of the decommissioned Duluth Water Tank. Install approximately 500 feet of 48-inch diameter transmission main along Sugarloaf Parkway to connect to the pipeline along Buford Highway with the pipeline along Chattahoochee Drive. Install approximately 2,900 feet of 16-inch diameter main from Peachtree Industrial Boulevard to the northwest side of the new 48-inch diameter main and from the southeast side of the new 48-inch diameter main along Buford Highway. Install 2,600 feet of 30-inch diameter main along Chattahoochee Drive to Sugarloaf Parkway. Install 6,300 feet of 30-inch diameter main along Buford Highway from the new 48-inch main to South Scales Road.	$6 M	44 MGD over a 24 hour period at location D9
WD16	Install approximately 1,500 feet of parallel 12-inch diameter transmission main along Pleasant Hill Road between Crestwood Parkway/ Koger Boulevard and Sweetwater Road	$410,000	41 MGD over a 24 hour period at location D9

Discharge from the water production process

Figure 3-3: Recommended Water Distribution System Priorities and Monitoring Locations



B.4. Wastewater Collection System Recommendations

There are four wastewater collection system priorities and these priorities translate into a total of 14 recommended capital projects.

Wastewater Collection System Priorities:

- Provide additional smaller sewers for local development needs through developer installed or shared cost projects
- Provide additional pumping and conveyance capacity to serve the County's wastewater collection needs beyond 94 MGD
- Evaluate efficiencies that could be gained through consolidation of the County's smaller developer-built pump stations and potential new technology in operation and management optimization for the collection system
- Continue implementation of the CMOM program to minimize sanitary sewer overflows and the asset management program to identify priorities for repairs, rehabilitation, and the replacement of aging collection system equipment and infrastructure

The actions recommended to support the wastewater collection system priorities are presented in Table 3-7. The projects recommended to meet the wastewater collection system priorities are shown in Table 3-8 and on Figure 3-4.

Community Priorities Addressed:

1. Protect public health, quality of life, and the environment and comply with existing regulations
2. Be regional leaders in good stewardship of water resources
3. Plan for water and sewer capacity proactively to support economic development activities
4. Develop strong maintenance and rehabilitation programs to improve reliability and lower costs
5. Provide a high level of service at a responsible cost to customers (with effective and efficient management)
6. Employ responsible long-term planning and financing for major projects

Table 3-7. Wastewater Collection System Actions

#	Project Description	Type	Responsible Group
1	Track wastewater flows	Program	Strategic Infrastructure Planning/DWR
2	Implement the recommended capital projects as needed	Capital	DWR Operations
2	Continue to evaluate consolidation of existing small pump stations	Program	DWR Operations
3	Continue ongoing asset management, Capacity, Management, Operations, and Maintenance (CMOM), and inflow and infiltration reduction programs to maintain efficient operations	Program	DWR Operations/ Asset Management

Sludge return

Table 3-8. Wastewater Collection System Capital Projects

#	Project Description	Planning Level Costs	System Limit
WC1	Increase firm pumping capacity at the Alcovy River Pump Station from 7.3 MGD to 10 MGD to avoid surcharging	$1.7 M	2.9 MGD at F1
WC2	Replace an existing 10-inch diameter gravity flow pipe with approximately 2,500 feet of 12-inch diameter pipe and 1,000 feet of 15-inch diameter pipe just above the Jacks Creek interceptor to prevent surcharging	$1.6 M	0.7 MGD at F2
WC3	Replace approximately 1,200 feet of existing 10-inch diameter gravity pipe with a 12-inch diameter pipe near Boyette Drive NW (near the connection with the existing 12-inch diameter pipe). Immediately downstream, replace 1,200 feet of existing 12-inch diameter pipe near Britt Road NW with a 15-inch diameter pipe to connect to the exiting 15-inch diameter pipe	$1.2 M	1.0 MGD at location F3
WC4	Replace approximately 370 feet of 8-inch diameter sewer with a new 12-inch diameter sewer between Live Oak Parkway, Oakbrook Drive NW, and Hampton Ridge Road to increase the capacity of flows into the Beaver Ruin Pump Station to avoid surcharging	$170,000	Note 2
WC5	Replace approximately 1,570 feet of 10-inch diameter pipe with a 12-inch diameter pipe. There are two sections of pipe, one located just north and the other just south of Sugarloaf Club Drive near the intersection with Thurleston Lane	$700,000	0.9 MGD at location F4
WC6	Replace approximately 390 feet of an existing 12-inch diameter sewer with a 15-inch diameter sewer just east of Falcon Creek Drive NW to join the existing 15-inch diameter sewer. This project also includes replacing 760 feet of existing 15-inch diameter sewer with an 18-inch diameter pipe, located approximately 1,500 feet south of the first segment of pipe	$700,000	1.3 MGD at location F5
WC7	Increase the firm pumping capacity at the Beaver Ruin Pump Station from 30 MGD to 40 MGD. A portion of the flows from the Beaver Ruin Pump Station will bypass the Pump Station and flow by gravity to the Yellow River Water Reclamation Facility. The upgrade of Beaver Ruin Pump Station is expected to be difficult due to the existing dense development and underground infrastructure in this area. This project may require rehabilitation of the Sweetwater Creek trunk sewer (48-inch) which will be used to bypass flows from the Beaver Ruin Pump Station. This project is consistent with the recommendations in the South Gwinnett Facility Plan	$1.9 M	15 MGD at location F6
WC8A	Increase the firm pumping capacity at the Lower Big Haynes Creek Pump Station from 12 MGD to 16 MGD	$2.5 M	4.8 MGD at location F7
WC8B	Replace approximately 230 linear feet of existing 12-inch diameter sewer with a new 15-inch diameter pipe just south of Hillside Drive SW	$450,000	Note 2
WC9	Replace approximately 230 feet of existing 8-inch diameter pipe with a 10-inch diameter pipeline near Hapsburg Court SW	$115,000	Note 2
WC10	Replace approximately 710 feet of 8-inch diameter sewer located northwest of Peachtree Industrial Boulevard and parallel to Bay Colony Drive SE with a 12-inch diameter sewer. This project connects to the existing 12-inch diameter sewer	$370,000	Note 2
WC11	Replace approximately 1,720 feet of existing 24-inch sewer flowing south towards the Suwanee Creek Pump Station with a 30-inch sewer	$1.6 M	3.8 MGD at location F8

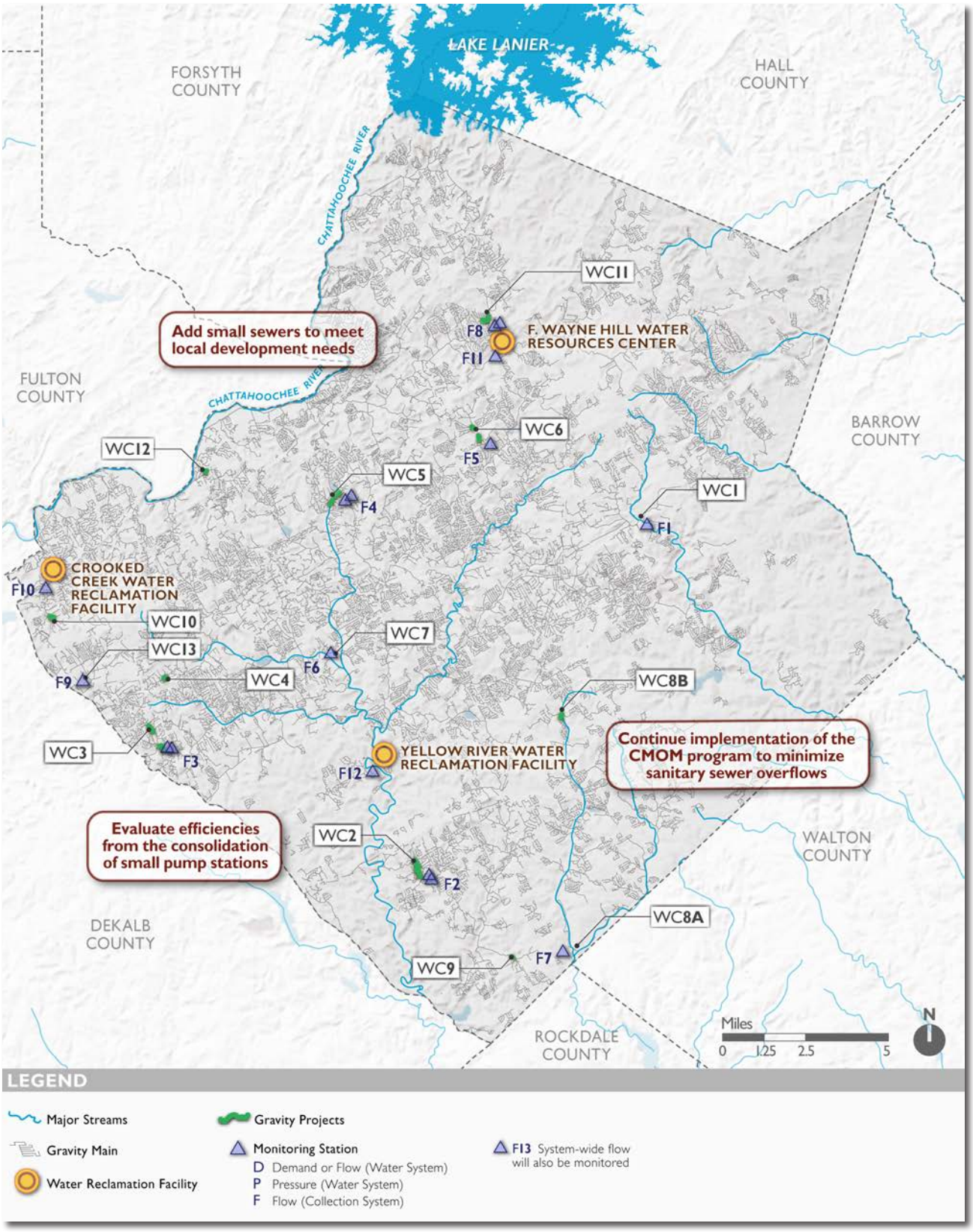
Table 3-8. Wastewater Collection System Capital Projects

#	Project Description	Planning Level Costs	System Limit
WC12	Replace approximately 250 feet of existing 15-inch diameter sewer with an 18-inch diameter sewer located just southwest of the intersection of Peachtree Industrial Boulevard and Pleasant Hill Road	$180,000	Note 2
WC13	Increase firm pumping capacity at North Fork Peachtree Creek Pump Station from 7.3 MGD to 10 MGD. This pump station is located near the intersection of Button Gwinnett Drive NW and Crescent Drive NW and to the west of I-85	$3.1 M	3.6 MGD at location F9

Notes:
1. System limits for the wastewater collection projects are presented as peak hour flows
2. System limits were not identified for projects with capital costs less than $0.5 million. These projects should be completed as funds and resources are available or based on operational challenges

Patterson Pump Station under construction:
Collection system capital project construction is critical to maintaining the desired level of service

Figure 3-4: Recommended Wastewater Collection System Priorities and Monitoring Locations



B.5. Water Reclamation Recommendations

There are seven water reclamation priorities and five recommended water reclamation capital projects.

Water Reclamation Priorities:

- Expand treatment capacity by 16 MGD to address long-term treatment needs beyond current permitted capacity of 98 MGD
- Plan for rehabilitation and equipment replacement at the Crooked Creek Water Reclamation Facility
- Maximize indirect potable reuse (return to Lake Lanier) to sustain Gwinnett's long-term water supply need; discourage or phase out non-potable reuse to minimize consumptive loss
- Minimize interbasin transfers by returning additional future effluent to either Lake Lanier or the Chattahoochee River
- Continue current biosolids practices at the Yellow River Water Reclamation Facility. Upgrade biosolids handling facilities at the F. Wayne Hill Water Resources Center to process long-term projected biosolids quantities
- Continue monitoring of regulatory development trends for effluent nutrient limits, especially for potential nitrogen limits in Lake Lanier and in Lake Jackson, and potential regulations for contaminants of emerging concerns
- Continue the use of the Crooked Creek Water Reclamation Facility for the disposal and treatment of septage (high strength waste material from septic tanks)

The actions recommended to support the water reclamation priorities are presented in Table 3-9. The projects recommended to address the wastewater treatment priorities are shown in Table 3-10 and on Figure 3-5.

Community Priorities Addressed:

1. Protect public health, quality of life, and the environment and comply with existing regulations
2. Be regional leaders in good stewardship of water resources
3. Plan for water and sewer capacity proactively to support economic development activities
4. Develop strong maintenance and rehabilitation programs to improve reliability and lower costs
5. Provide a high level of service at a responsible cost to customers (with effective and efficient management)
6. Employ responsible long-term planning and financing for major projects
7. Consider regional opportunities for leadership and coordination with the Metro Water District and the State

Table 3-9 Water Reclamation Actions

#	Project Description	Type	Responsible Group
1	Track wastewater flows and biosolids using available data	Program	Strategic Infrastructure Planning/DWR
2	Implement the recommended treatment and biosolids capital projects as needed	Capital	DWR Infrastructure Development
3	Budget for the rehabilitation of the Crooked Creek Water Reclamation Facility	Program	DWR Infrastructure Development
4	Optimize returns to Lake Lanier	Program	DWR Directors
5	Develop a program to accept fats, oil, and grease for a fee from Gwinnett businesses	Program	Water Reclamation

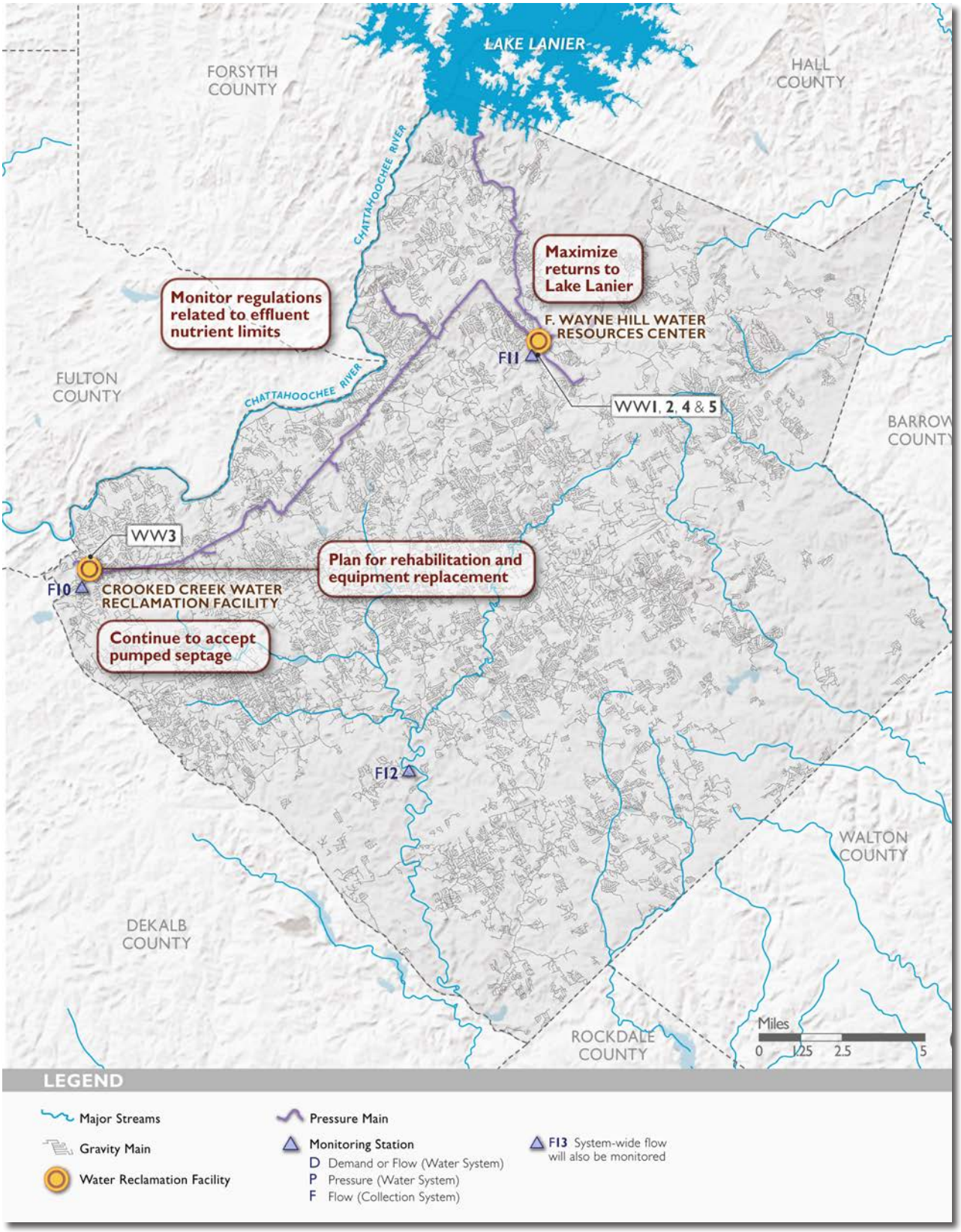
Table 3-10. Water Reclamation Capacity Projects

#	Project Description	Planning Level Cost	System Limit
WW1	Expand the F. Wayne Hill Water Resources Facility from 60 MGD to 69 MGD on a maximum monthly basis. This project will require additional permitted discharge capacity in the Chattahoochee River and will trigger an audit by the Georgia Environmental Protection Division for compliance with the Metro Water District Plans	$135 M	16 MGD at F10 or 98 MGD at F13
WW2	Expand the F. Wayne Hill Water Resources Center from 69 MGD to 94 MGD on a maximum monthly basis. This project will require additional permitted discharge capacity in Lake Lanier and will trigger an audit by the Georgia Environmental Protection Division for compliance with the Metro Water District Plans. The Department of Water Resources should seek credit for the return flows to Lake Lanier to allow for the additional withdrawal of water supply needed in this same time period	$375 M	60 MGD at F11 or 107 MGD at F13
WW3	Install three new thickeners (2 duty and one standby) and dewatering centrifuges at the Crooked Creek Water Reclamation Facility. Each thickener unit should be designed to handle 400 gallons per minute and each dewatering centrifuge should be designed to handle 200 gallons per minute	$13.6 M	12.5 MGD at F10 or 62.8 MGD at F13
WW4	Continue the ongoing replacement of the existing thickening equipment at the F. Wayne Hill Water Resources Center to address operational issues. Install a total of 3 million gallons of anaerobic digester capacity and ancillary equipment to handle additional waste solids blended with wastewater pumped from the Yellow River Water Resources Center	$47.7 M	50 MGD combined at F11 and F12
WW5	Add solids handling capacity at the F. Wayne Hill Water Resources Center to handle increasing demands. Install a 0.8-MGD solids storage tank, new 2-MG anaerobic digester and ancillary equipment, expand the biological treatment system, and add a new dewatering centrifuge. These upgrades will handle planned solids from both the F. Wayne Hill Water Resources Center and the Yellow River Water Resources Center through 2030	$43.4 M	56 MGD combined at F11 and F12

Notes:
1. System limits for the water reclamation projects are presented as maximum monthly flow

F. Wayne Hill Water Resources Facility

Figure 3-5: Recommended Water Reclamation Priorities and Monitoring Locations



C. RECOMMENDED POLICIES

A number of existing and new policies are required to support the implementation of the Master Plan. Some of these policies such as the water and sewer design standards have already been adopted. Some of the policies, such as the strategic placement of sewers, will require actions from the Gwinnett County Board of Commissioners. This section presents an overview of the key policies and recommended interventions to support this Master Plan.

C.1. Water and Sewer Design Standards

The water and wastewater infrastructure that is built by developers is typically donated to the Department of Water Resources for long-term operations and maintenance following construction. Therefore, it is important that the infrastructure is built following Gwinnett County standards and practices to minimize future maintenance expenses.

The County maintains a set of design standards for water and wastewater infrastructure on the Planning and Development Department website. These standards include: Sanitary Sewer Pump Station and Force Main Design and Construction Standards for Developer Installed Systems, Sanitary Sewer Installation Regulations and Specifications for Development Projects, Water System Design and Construction Standards for Development Projects, and Backflow Prevention. The Planning and Development Department works with the Department of Water Resources to ensure the standards are followed starting in the design phase, through construction, and until the infrastructure is donated to the Department of Water Resources to operate and maintain.

These design standards should be reviewed and updated as needed to reflect industry best practices, or at least once every five years. As this policy is tied to the development process, the Strategic Infrastructure Planning Division within the Planning and Development Department should be involved with DWR in this review and update process.

C.2. Interceptor Policies

The Unified Plan recommends implementing policies to support the strategic placement of sewers (Policy A.I.3) in areas identified for revitalization and economic development. The eastern portion of Gwinnett County is largely unsewered and the Unified Plan recommends limiting future extension of the sewer system into this area (See Figure 1-1). This Master Plan is consistent with the vision in the Unified Plan with new infrastructure focused in areas anticipated for mixed-use, employment, office, educational and hospital expansions.

The Unified Plan also identified a number of "interventions," or policies that are needed to promote and drive the preferred development patterns envisioned for the County (shown in Table 3-11). These interventions have not yet been adopted.

The Department of Water Resources has three existing policies associated with the strategic location of sanitary sewers and the location of septic systems:

- Interceptor planning guidelines
- Private disposal of wastewater ordinance
- Sewer petition policy

These policies are outlined below along with recommended modifications to these policies that are recommended to remain consistent with the Unified Plan.

Interceptor Planning Guidelines: These guidelines establish the parameters that must be considered when private developers wish to install infrastructure in partially sewered and unsewered portions of Gwinnett County (outlined on page 109).

Private Disposal of Wastewater: The Gwinnett County Code of Ordinances includes requirements related to the private disposal of wastewater (Part II, Chapter 114-89) in areas where public sewer is not available. Any private individual septic tanks must be installed in compliance with the Gwinnett County Environmental Health Department requirements. This ordinance also prohibits the installation of privately-financed wastewater disposal plants or septic systems serving more than one residential property. In neighboring counties, these large private systems have not been properly maintained and the water and wastewater utility has assumed the responsibility for their long-term maintenance. To avoid the financial and public health challenges associated with these facilities, the County prohibits these systems by ordinance.

Sanitary Sewer Petition Policy: The Gwinnett County Sanitary Sewer Petition Policy describes the criteria, procedures, participation, and cost-sharing for customers interested in connecting to public sewer. This policy requires that a minimum of 70% of the property owners that would be served by the sewer extension, agree to the sewer petition. Under this policy, one-third of the extension cost is borne by the property owners and the remaining cost is paid by the Department of Water Resources. The policy includes an exception that there can be no participation by the County in the payment of sewer system development charges, or the extension of sewers to undeveloped land.

C.3. Pump Station Policies

The Department of Water Resources' collection system relies on over 200 pump stations that convey wastewater in areas where gravity-based wastewater flows are not feasible. While pump stations are needed to provide the extensive coverage of centralized sewer that the County enjoys, pump stations can be maintenance and cost intensive. If pump stations fail, the consequences are likely to be sanitary sewer overflows.

The Department of Water Resources is currently evaluating a number of small pump stations to determine whether gravity piping the flows to another location would have a lower life-cycle cost than continued operation of the existing pump station. Approximately 40 pump stations are being evaluated and several pump stations will likely be decommissioned as a result. These pump stations are small and if decommissioned, the flows will most likely be diverted to the same interceptor system; therefore their closure is not expected to impact the recommendations in this Master Plan.

With the expense and liabilities associated with pump stations, it is important that Gwinnett County policies discourage the use of pump stations where gravity flow is a reasonable option. The existing Pump Station Policy (outlined under Guidelines on the following page) outlines the standards that private developers must follow to install a new pump station in the County.

The Gwinnett County Code of Ordinances also discourages the use of small pump stations through system development charges including the pumping station phase-out charge (Part II, Chapter 114-117), the sewage pumping station operations and maintenance and replacement charge (Part II, Chapter 114-119), and exemptions (Part II, Chapter 114-120). The phase-out charge covers some or all of the cost that would be incurred were the pump station to be decommissioned and replaced with a gravity solution. The operations and maintenance charge is intended to recover the projected future costs to operate and maintain the sewage pumping station over a 20-year planning period. Exemptions or reductions to these fees may be issued if a development reduces and/or maintains the same total number of existing pumping stations.

Table 3-11. Strategic Placement of Sewer Policy Recommendations

Recommended Action	Primary Responsible Party
Establish guidelines to limit the transfer of wastewater across sewer basin boundaries in the eastern area of the County (to include limiting the construction of developer built wastewater pump stations and force mains as well as tunnel gravity sewers)	Board of Commissioners
Identify specific boundaries and limit the extension of sewer into the areas of eastern Gwinnett County and to begin reserving sewer capacity for office, mixed -use and hospital expansion uses identified in the Unified Plan	Board of Commissioners
Modify sewer extension policy to prevent or limit new connections	Department of Water Resources
Evaluate the most appropriate zoning district to rezone properties that will have limited or no sewer. Consider creating new zoning districts	Department of Planning and Development
Rezone areas not served by sewer that will have limited or no sewer service	Board of Commissioners

Yellow River Reclamation Facility

SUMMARY OF INTERCEPTOR PLANNING GUIDELINES

These existing guidelines require that developers must:

- Design and build interceptor sewers and pump stations based on full build-out conditions as outlined in a master plan for the site and/or development project. The site master plan should include all future project phases
- Design the interceptor sewers, pump stations, and force mains to prevent sanitary sewer overflows. As such, the developer must account for flows imported from other basins and also account for inflow and infiltration. The interceptors should be designed to meet peak hour flows through 2050
- Assume interceptors have a 50-year lifespan.
- Maximize gravity flow by directing flow within each individual sub-basin to the lowest elevation
- Place main interceptors within 7,500 feet of the outermost portion of a sub-basin and an interceptor. At no point would a connection to a main interceptor exceed a straight-line distance of 7,500 feet
- Comply with state, county, and local environmental laws including stream buffer requirements at a minimum. Avoid wetland encroachment, whenever possible. Minimize clearing widths. Preserve as much forested stream buffer as feasible (without incurring extraordinary installation costs and without forcing condemnation of the easement). Re-plant disturbed areas as quickly as possible with non-invasive plant material
- Consider the needs and interests of individual landowners and preserve property value and aesthetics to the extent practicable

SUMMARY OF PUMP STATION GUIDELINES

The Pump Station Guidelines establish the parameters that must be followed by private developers planning to install new pump stations in Gwinnett County. Specifially, the developer must:

- Follow the most current version of the Department of Water Resources Pump Station Standardization Guidelines. The pump station should include channel grinders and electric submersible motors. Pump stations should be designed to facilitate future maintenance including the removal of pumps, motors, and other mechanical equipment
- Design pump stations to meet peak hour flows projected 20 years into the future with a 20 year lifespan
- Use a peak flow to average annual flow ratio for small pump stations (less than 1.0 MGD flow) based on the "Ten States Standards" manual. For larger pump stations, use a 3.0 peak to average annual flow ratio. This is consistent with the South Gwinnett Facility Plan
- Pump station structures, electrical and mechanical equipment should avoid the 100 year flood
- Provide multiple pump units. Where only two units are provided, they should be of the same size. Units should have capacity such that, with any unit out of service, the remaining units will have capacity to handle the design peak flow. Pump stations supplying water reclamation facilities should be designed to operate at varying delivery rates. All pumps should be tested and certified in writing by the manufacturer. These tests should include a hydrostatic test and an operating test
- Pump stations should include devices suitable for indicating, totalizing, and recording flow. Flow measurement should be configured to measure the duration of individual and simultaneous pump operation
- Surge relief and surge anticipation valves should be installed where necessary
- Equip the pump station with remote telemetry capability that reports metered flows, power failure, pump failure, sump pump failure, high- and low- level alarms, pump runtime and any cause of pump station malfunction to the assigned staff. The pump station should have backup telemetry systems with a redundant power supply
- Design force mains to meet a peak hour flow for 2050 with a 50-year lifespan
- Design force mains to maintain a cleansing velocity of at least 2.5 feet per second. Force mains should be equipped with air and vacuum relief valves at the high points in the force main
- The force main layout must accommodate a total dynamic head (TDH) below 400 feet between suction intake and discharge to minimize system surcharge
- New force mains or tunnels should be designed to be routed to a water reclamation facility

D. TIMEFRAME AND SCHEDULING

The infrastructure projects recommended in the Master Plan are needed to support implementation of the Unified Plan. These projects need to be completed in advance of growth and development, however building too far ahead of the need is poor fiscal management and can result in operational challenges (as described in Part 1). Therefore, project timing was a major focus area of this Master Plan.

As previously mentioned the timeframe for implementing the recommended actions is tied to system measurements (flow or pressure) versus a specific date. A few parameters that will guide decision makers in determining when to start a particular project are defined below and illustrated in Figure 3-6.

The ***system limit*** is the point at which the project needs to be operational to meet the demands or flows. Each project will need to be started in advance of the system limit in order to be available ahead of the forecasted demands.

The ***project duration***, or the time needed to complete a given capital project, will guide the project timing. This duration should include all aspects of the project such as planning, Business Case Evaluation (if necessary), permitting, design, easement acquisition, equipment procurement and construction and start up activities. The project duration will vary based on the nature of the project.

The ***trigger point***, or the point at which a capital project needs to be started to ensure an "on time" completion, can be calculated for each project. The trigger point is based on the project duration, the system limit, and recent system measurements that affect the project. A process for calculating the trigger point is presented in the "Monitoring Progress towards System Limits" section on page 122. In addition to the project information, the trigger point may also be impacted by ***influences***.

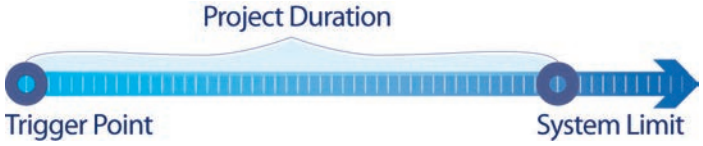


Figure 3-6: Project Scheduling Terms and Relationship

In addition to these parameters, the system monitoring data described in section F will be used to determine the ***rate of change*** in the system. If there is a rapid rate of change, the project trigger point will be sooner than if the monitoring data shows a slower rate of change. The system rate of change is an indicator of the impact that development has on demand.

D.1. System Influences

There are a number of potential influences that could impact the project timing by stalling, accelerating, or changing the trigger point for a given project. Some of the potential influences include:

Development-related influences

- Major water-using industry, employer or development coming to or leaving Gwinnett
- Major changes to the location of growth presented in the International Gateway scenario

Regulatory influences

- Major changes in court rulings for Lake Lanier water storage/ withdrawal conditions
- Major changes in EPD policy or regulations, such as the interbasin transfer policy
- Major changes in EPD permit conditions for withdrawals or discharges
- Major changes in Metro Water District policies or requirements, such as additional conservation requirements, interconnection, or interbasin transfer policy

Technology influences

- Availability of new technology that increases efficiency and/or addresses system challenges

Financial influences

- Major changes in the cost of existing operations (e.g., electrical, chemical or disposal costs)
- Availability of funding or favorable financing conditions
- Major decrease in anticipated revenues as the result of drought, conservation, or other factors

Operational influences

- Major changes in the existing level of non-revenue water (e.g., an increase in system leakage) and/or inflow and infiltration
- Major changes in wastewater flow management practices, such as the elimination of a regional pump station
- The creation of new pressure zones
- Availability of interim operations that could allow deferral of a project
- Major changes in the level of service expectations of the Department of Water Resources customers, such as higher fire flow protection requirements for a specific industry
- Significant decrease in per capita and/or per employee water use

The influences and project parameters that affect one recommended action may not affect others. Similarly, the influences and project parameters may change over time. Therefore, the influences and project parameters should be reviewed as part of determining the trigger point.

The Strategic Infrastructure Division will be responsible for monitoring progress towards the trigger points and alerting the Department of Water Resources that a project is needed. Once the Strategic Infrastructure Division triggers a project, the Department of Water Resources will follow the existing processes and procedures for project planning, design, and construction. The existing process includes a Business Case Evaluation (discussed on page 112). The Business Case Evaluation process narrows the scope of a given project to identify the project with the lowest life cycle cost that meets the project objectives.

ESTIMATING PROJECT DURATION

There are a number of project-specific parameters that will affect the project duration. These parameters may include:

- Extent of environmental permitting and environmental impact analysis required
- Extent of temporary construction or permanent easements needed
- Presence of subsurface challenges such as bedrock or other utility lines
- Complexity of the project design
- Need for a Business Case Evaluation
- Availability of funding through the capital improvement planning process
- Desired "safety factor" to account for unknown circumstances

The Strategic Infrastructure Division will work with the Department of Water Resources to estimate the project duration for each recommended capital project in order to calculate the trigger for implementation.

MONITORING PROGRESS TOWARD SYSTEM LIMITS

The trigger point will be estimated for the recommended capital projects based on the rate of progress in the system measurements towards the system limit.

For example, if the flows in the collection system are doubling every year, then a system limit will be reached sooner than if the flows are increasing at a slower rate of one-percent per year.

The trigger point can be estimated based on system monitoring data, project duration and knowledge of possible influences as outlined in the steps below.

1. Plot the system measurement over time to determine the growth rate (slope of the line)
2. Estimate the project duration (see Estimating Project Duration above)
3. Identify any influences that will impact the project trigger point and/or the project duration
4. Calculate the trigger point
5. Adjust the trigger point if needed to address any influences (identified in Step 3)

A detailed set of instructions for calculating the trigger point is included in Appendix C along with example calculations.

Yellow River Water Reclamation Facility

E. FUNDING

The recommended actions in the Master Plan will primarily be funded by water and wastewater revenues. Grant funds will be maximized, where available. The Department of Water Resources benefitted from debt financing during the previous decades as it allowed the system to expand to meet the needs. Now that the Department of Water Resources is entering a period of system maintenance and rehabilitation, there is a shift in funding from debt financing to a pay-as-you-go approach. The long range planning in this Master Plan is more important under a pay-as-you-go approach as sufficient time is needed to accrue the necessary funds.

One of the community priorities is to "Provide a high level of service at a responsible cost to customers". As part of the current planning and funding process for larger capital projects (projects over $2 million), the Department of Water Resources conducts a Business Case Evaluation. The Business Case Evaluation considers the life cycle costs for a number of alternatives that meet the stated project objectives (described in more detail in "The Business Case Evaluation Process" below). The project recommended at the conclusion of the Business Case Evaluation process is then submitted for inclusion in the Department of Water Resources' 5-year capital improvement budget.

The Citizens Advisory Panel established community priorities for the Master Plan. One of these priorities was to "Provide a high level of service at a responsible cost to customers."

The Business Case Evaluation process is one example of the Department of Water Resources' efforts to minimize project costs while maximizing project benefits.

THE BUSINESS CASE EVALUATION PROCESS

The Department of Water Resources conducts a Business Case Evaluation (BCE) for all capital projects with an anticipated cost greater than $2 million, for certain specialized projects, or if requested by the Department Director. The goal of the BCE is to identify the project with the lowest life-cycle cost that meets all of the stated objectives. The BCE considers the triple bottom line (financial, social, and environmental impacts). There is a well-documented process for conducting a BCE to provide a complete and unbiased review of alternatives and identify the best project.

The BCE process is performed by a committee picked for the evaluation based on their specialized knowledge and/or perspective related to the recommended project. This committee participates throughout each step of the process.

One of the important factors in the BCE is the consideration of longer term needs, also called "right sizing." The "right sizing" evaluation considers whether another expansion will be needed in the near term future and how to consolidate projects to reduce costs. The evaluation presented in Part 2 of this plan has consolidated projects where practicable. Influences and changes in the anticipated rate of growth may result in additional opportunities for consolidation.

Most of the projects identified in this Master Plan will require a BCE because they exceed the $2 million cost threshold. If the capital cost of a recommended action is lless than $2 million, this phase will generally be skipped following the existing Department of Water Resources procedures.

A BCE should be started early enough so that the project can be completed before the system limit is reached.

If project implementation is delayed for more than one year following completion of a BCE, the BCE may need to be revisited and changed as appropriate before proceeding with the project.

F. MONITORING AND UPDATING THE PLAN

Measuring and evaluating progress is an important component of any plan. For the Master Plan, water and wastewater system monitoring will provide an assessment of how growth patterns have translated into water demands and wastewater flows. The monitoring data will be used to trigger the recommended capital projects (listed in Part 3.B). The system monitoring data also will provide a basis for reviewing the assumptions used during planning and guiding future updates to the Master Plan.

This section summarizes the system monitoring needed to support the recommended capital projects as well as a discussion of future updates to the Master Plan.

F.1. System Monitoring

The Department of Water Resources currently monitors the water and wastewater systems in a number of locations for a variety of operational and regulatory needs. In addition to this ongoing monitoring, several new permanent monitoring locations are recommended. The monitoring data will be used to calculate the rate of change at the specified location to guide the timing for the recommended capital projects.

There are three main types of system monitoring that are recommended (shown in Figure 3-7): water system flow/demand monitoring (Table 3-12), water system pressure monitoring (Table 3-13), and wastewater collection flow monitoring (Table 3-14). These monitoring types are numbered based on the type of monitoring: D = water distribution flow monitoring, P = water distribution pressure monitoring, and F = wastewater collection flow monitoring.

Existing monitoring locations were used for the recommended capital projects, where practicable, to reduce the number of new monitoring locations needed. Where possible, the name or identifier associated with current monitoring locations is provided in Tables 3-12 through 3-14.

Water System Monitoring

Monitoring recommendations for the water distribution system improvements generally include:

- Pressure Monitoring: The pressure monitoring data will be used to determine the minimum pressure in that location during a period of peak demand over the course of a year. This reflects the lowest pressure at that location, which is a conservative value. Pressure monitoring can be permanent or temporary, so long as the data reflects the period of minimum annual pressure. A permanent pressure monitor/gauge can be installed at the specific locations recommended in Table 3-13 and monitored remotely through the County's SCADA system. If permanent metering is not possible, portable pressure data recorders, typically installed on fire hydrants or similar system appurtenances, can be used to measure pressure
- Flow monitoring: The flow monitoring data will be used to determine the peak daily flow during a period of high demand (or flow) over the course of a year. In most cases, the flow monitoring stations are already in place. Some of the water demand data and wastewater flow data is also available through the SCADA system. The collection system data is available through FlowWorks which facilitates data collection and trend analysis. For one of the projects, flow monitoring is recommended for the supply line to a storage tank. A new flow meter may need to be installed in this location

Collection System Flow Monitoring

Flow meters already exist for most of the recommended projects. The flow meters should be monitored in a manner that allows the data to be stored over an extended period and easily retrieved, such as through the SCADA system. The peak daily flow during periods of peak usage or high rainfall seasons should be monitored annually against the pipe capacity to determine the optimal time for initiating recommended projects.

Measuring and evaluating progress is an important component of any plan. For the water and wastewater system, monitoring will provide an assessment of how growth patterns have translated into water demands and wastewater flows.

F. Wayne Hill Water Resources Facility

Table 3-12. Water System Flow/ Demand Monitoring Locations

#	Monitoring Location Description	Project Number (s)	New or Previous Monitoring Location
D1	Total system-wide water demand	WP1	SCADA data
D2	Total water withdrawn from Lake Lanier	WP2	SCADA data
D3	Flow meter on the 12-inch diameter transmission main leaving the Lanier North High Service Pump Station	WD1A	SCADA data
D4	Total flow leaving the Lanier North High Service Pump Station	WD6A, WD6B, WD8	SCADA data
D5	Flow meter on the flow meters for both 48-inch diameter transmission mains at the intersection of Peachtree Industrial Boulevard and Little Mill Road	WD9	New
D6	Flow meter on the supply line to the Norcross Tank	WD10	SCADA data
D7	Flow meter on the south branch of the 48-inch transmission main at the intersection of Old Norcross Road and Davenport Road	WD12	New
D8	Flow meter on the total discharge from the Shoal Creek Central High Service Pump Station	WD13, WD14	SCADA data
D9	Flow meter on the new 72-inch transmission main installed for project WD9	WD16	New

Table 3-13. Water System Pressure Monitoring Locations

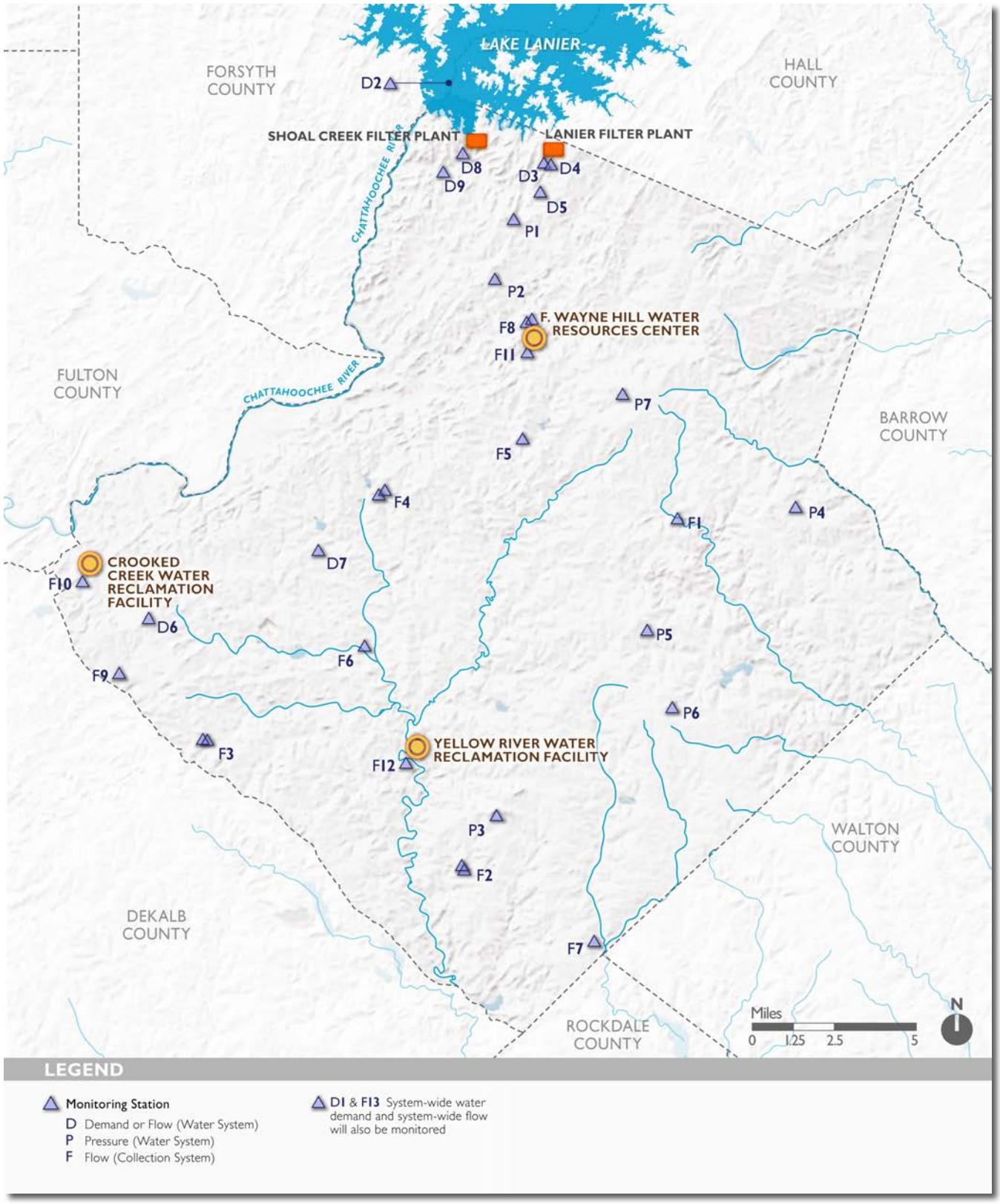
#	Monitoring Location Description	Project Number (s)	New or Previous Monitoring Location
P1	Fire hydrant near the intersection of Hillcrest Drive and Hillcrest Glenn Drive	WD1B	New
P2	Fire hydrant along North Price Road approximately 700 feet north of Woodward Mill Road	WD1C	New
P3	Fire hydrant at the end of Highpoint Court	WD2, WD4	New
P4	Fire hydrant at the north intersection of Eastside Drive and Hill Circle	WD3	New
P5	Fire hydrant along Rafington Drive between Cassie Walk Lane and Ludwick Lane	WD5A	New
P6	Fire hydrant located at the end of Meadow View Court	WD5B	New
P7	Fire hydrant at the northeastern corner of Wilford Drive	WD11	New

Table 3-14. Collection System Flow Monitoring Locations

#	Monitoring Location Description	Project Number (s)	New or Previous Monitoring Location
F1	Influent flow at the Alcovy River Pump Station	WC1	SCADA data
F2	Flow meter at either Manhole #241377or #241325	WC2	GM-191
F3	Flow meter at either Manhole #236449or #236484	WC3	GM169
F4	Flow meter at either Manhole #210028or #210124	WC5	GM160 or GM232
F5	Flow meter at Manhole #205913	WC6	New
F6	Influent flow at the Beaver Ruin Pump Station	WC7	SCADA data
F7	Influent flow at the Lower Big Haynes Creek Pump Station	WC8A	SCADA data
F8	Flow meter at either Manhole #404583 or #404585	WC11	New
F9	Influent flow at the North Fork Peachtree Creek Pump Station	WC13	SCADA data
F10	Influent flow at the Crooked Creek Water Reclamation Facility	WW1, WW3	SCADA data
F11	Influent flow at the F. Wayne Hill Water Resources Center	WW2, WW4, WW5	SCADA data
F12	Influent flow at the Yellow River Water Reclamation Facility	WW4, WW5	SCADA data
F13	Total system-wide flow	WW1 – WW5	SCADA data

Wastewater flow meter being installed in manhole

Figure 3-7: Recommended System Monitoring Locations



F.2. Plan Review and Update

The Master Plan is based on the vision for future development and a number of assumptions based on recent water use and wastewater flow patterns. As new information becomes available and implementation of the Unified Plan progresses, it will be important to reflect on any changed conditions or new influences in order to confirm that the recommended actions are still needed to support development and the Unified Plan.

At a minimum, the recommendations and assumptions within the Master Plan must be revisited and updated every 5 years to comply with the Metro Water District requirements. A major revision may be needed if there is a significant change in water supply. Aside from this potential major change, changes in the details of recommended capital projects are considered minor. Minor revisions may be made between adoption of the Master Plan and the next 5-year update.

Lake Sidney Lanier: Sole water supply for more than 800,000 people in Gwinnett County, Georgia

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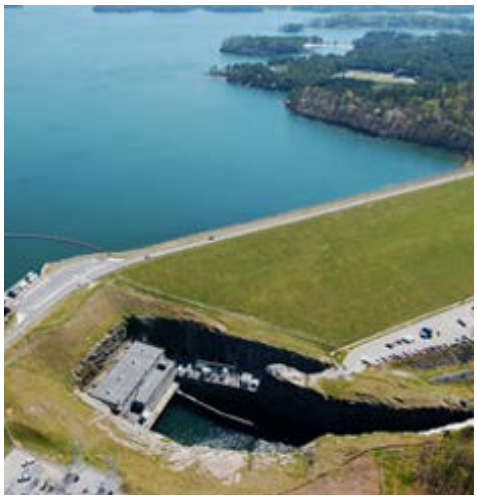
Appendices

2030 Water and Wastewater Master Plan



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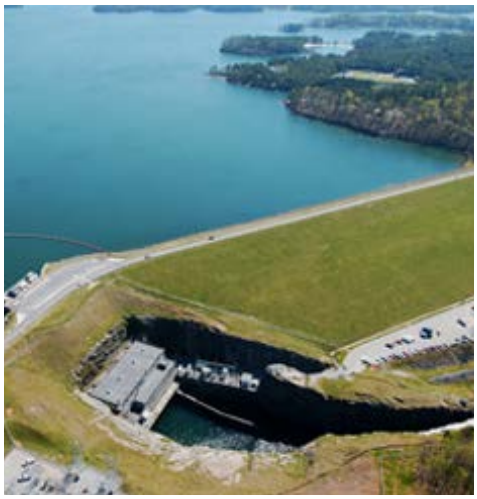
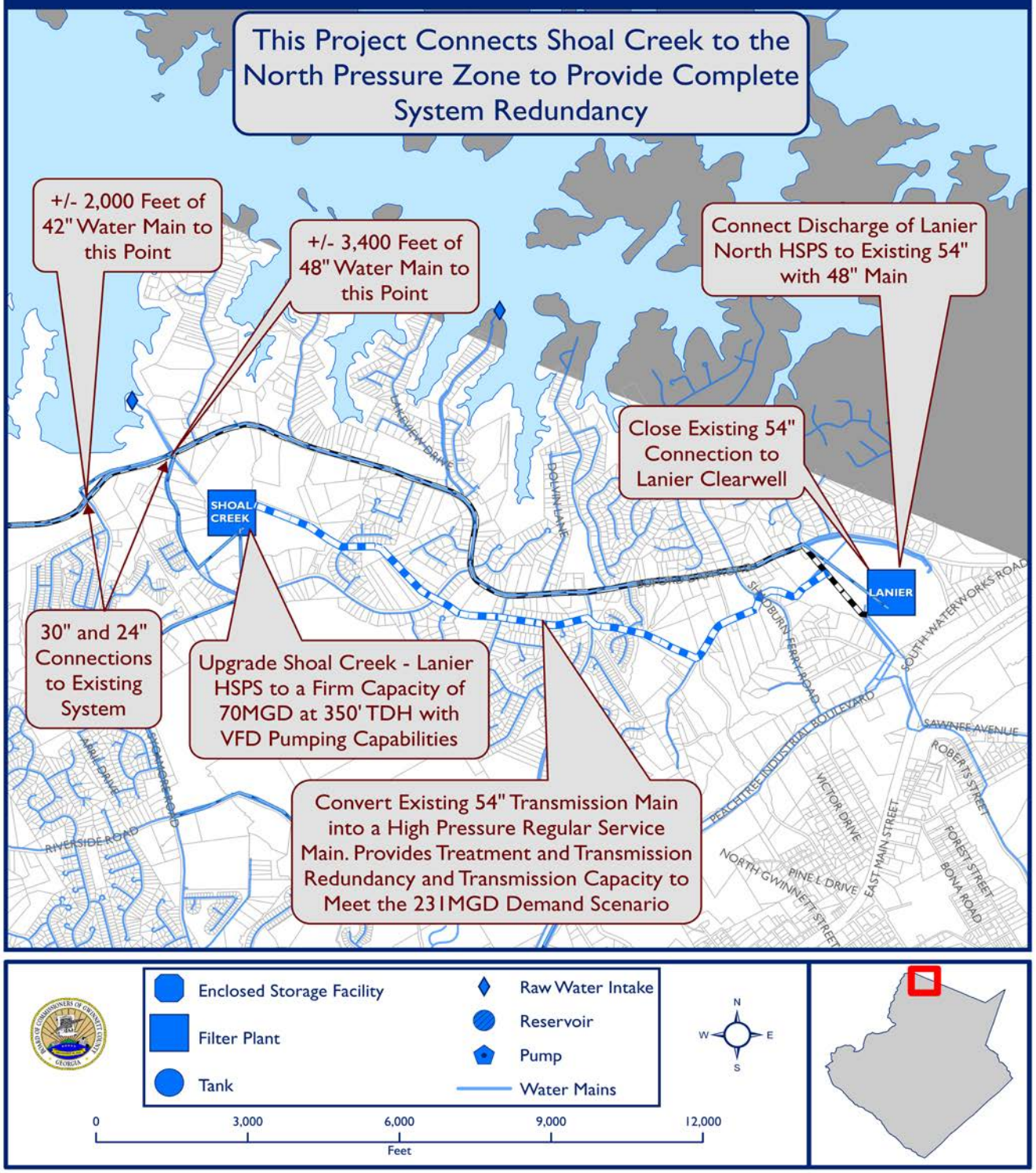
Appendix A
Detailed Project Maps

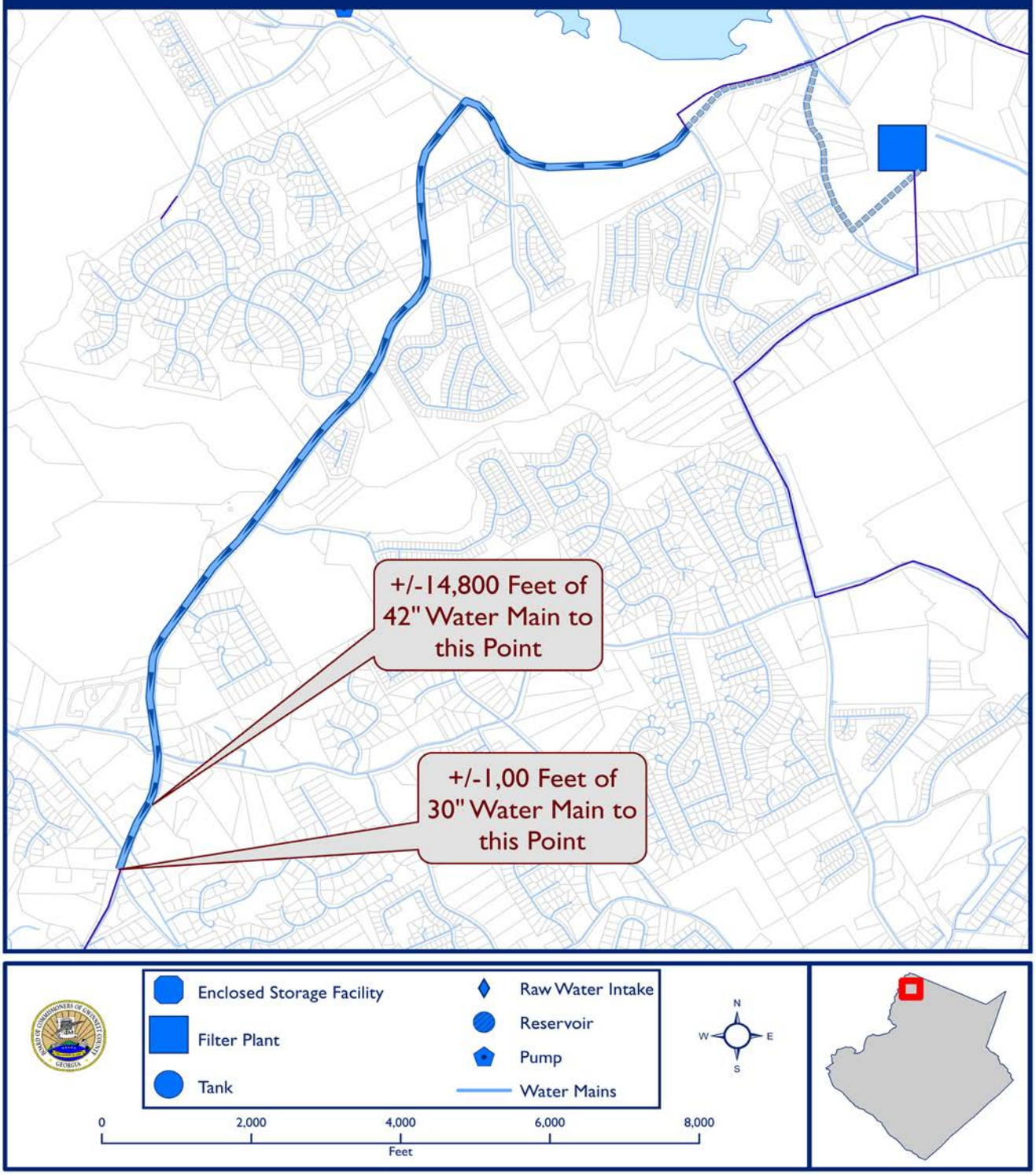
2030 Water and Wastewater
Master Plan



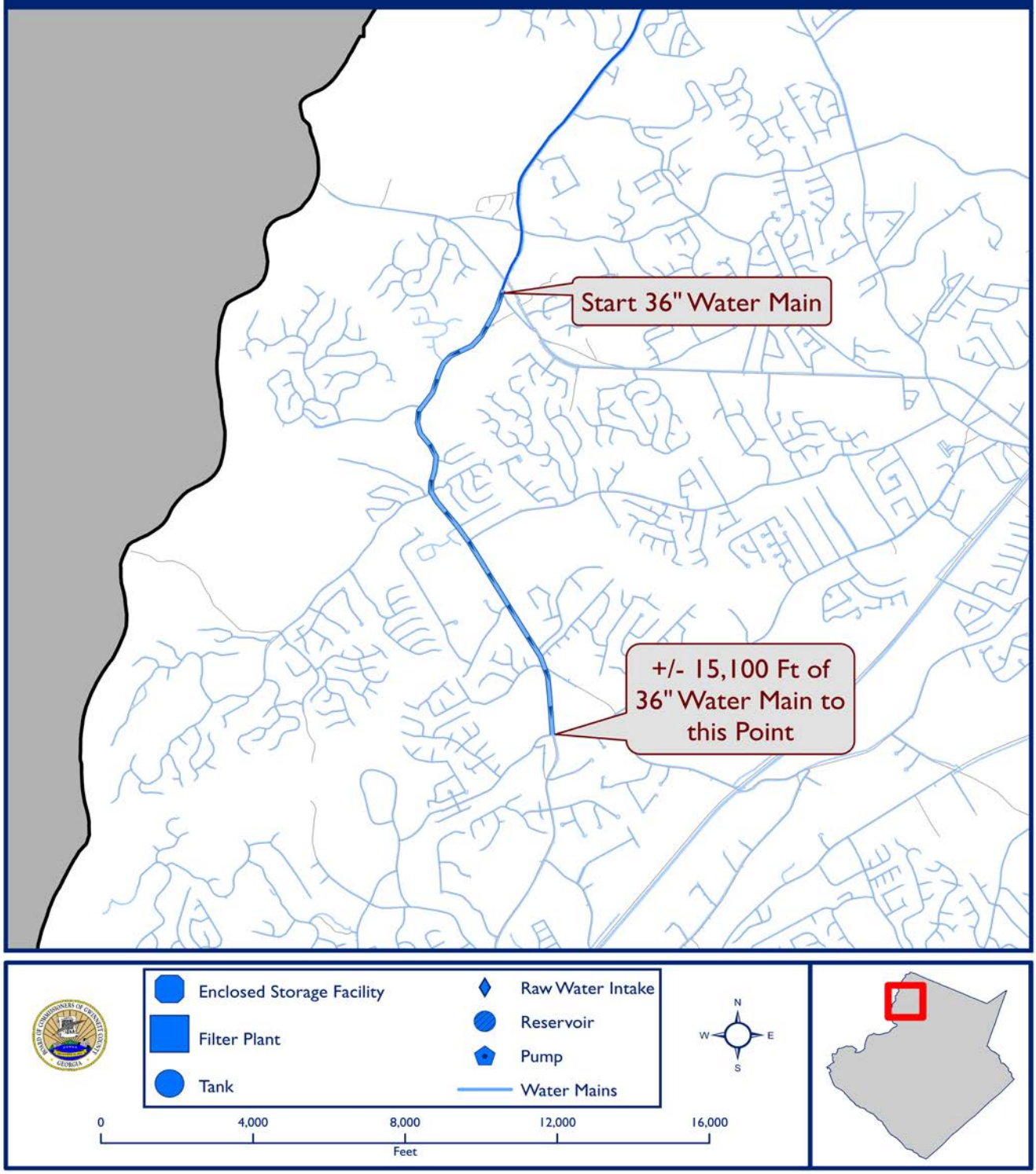
TM7.3 - WD1A


This Project Connects Shoal Creek to the North Pressure Zone to Provide Complete System Redundancy
+/- 2,000 Feet of 42" Water Main to this Point
+/- 3,400 Feet of 48" Water Main to this Point
Connect Discharge of Lanier North HSPS to Existing 54" with 48" Main
Close Existing 54" Connection to Lanier Clearwell
SHOAL CREEK
LANIER
30" and 24" Connections to Existing System
Upgrade Shoal Creek - Lanier HSPS to a Firm Capacity of 70MGD at 350' TDH with VFD Pumping Capabilities
Convert Existing 54" Transmission Main into a High Pressure Regular Service Main. Provides Treatment and Transmission Redundancy and Transmission Capacity to Meet the 231MGD Demand Scenario
LAKEVIEW DRIVE
DOLVIN LANE
SHOALBURN FERRY ROAD
SOUTH WATERWORKS ROAD
SAWNEE AVENUE
ROBERTS STREET
PEACHTREE INDUSTRIAL BOULEVARD
VICTOR DRIVE
EAST MAIN STREET
FOREST STREET
BONA ROAD
NORTH GWINNETT STREET
PINE L DRIVE
LAGIL DRIVE
RIVERSIDE ROAD
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
3,000
6,000
9,000
12,000
Feet

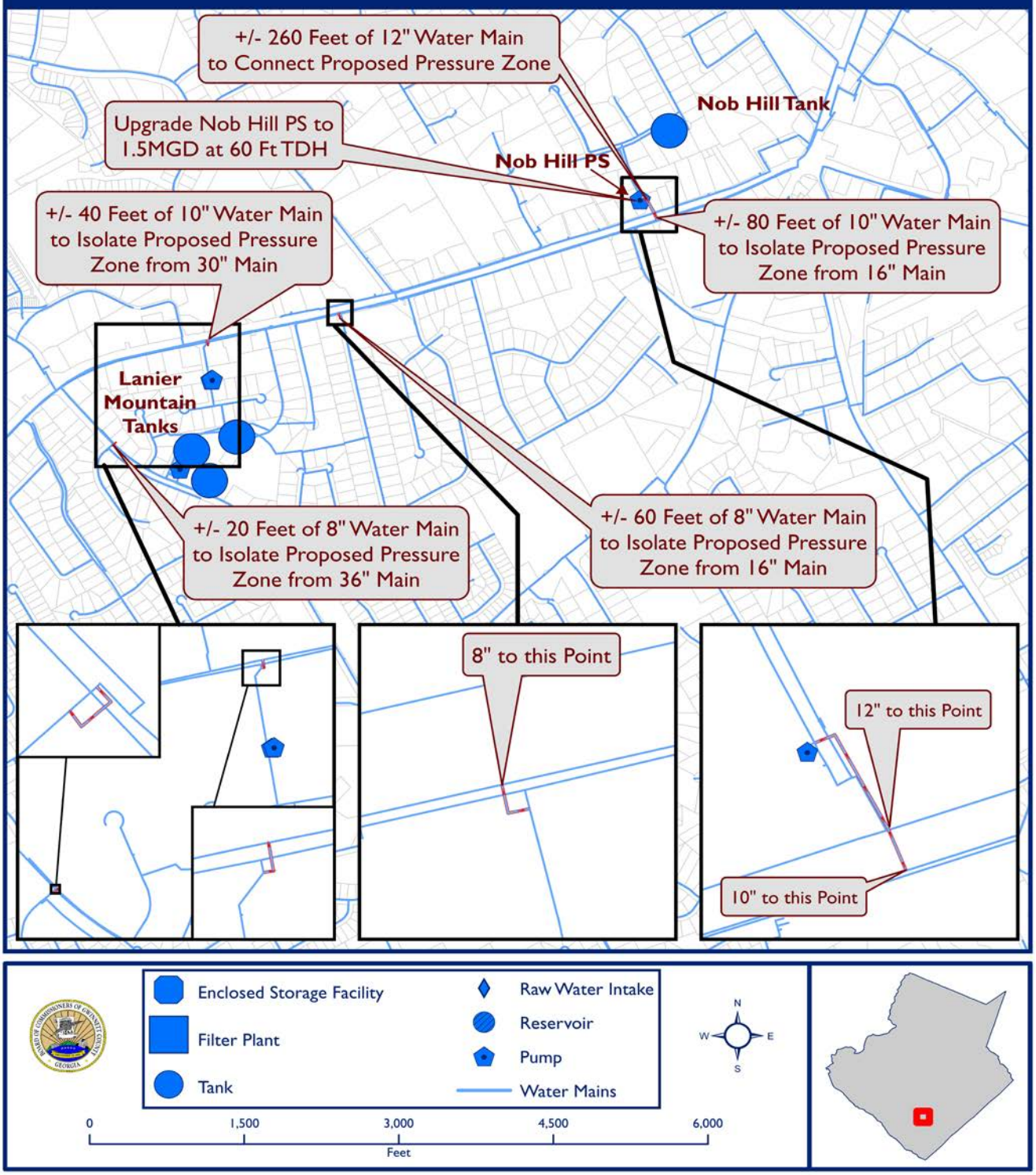
TM7.4 - WD1B


+/-14,800 Feet of 42" Water Main to this Point
+/-1,00 Feet of 30" Water Main to this Point
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
2,000
4,000
6,000
8,000
Feet

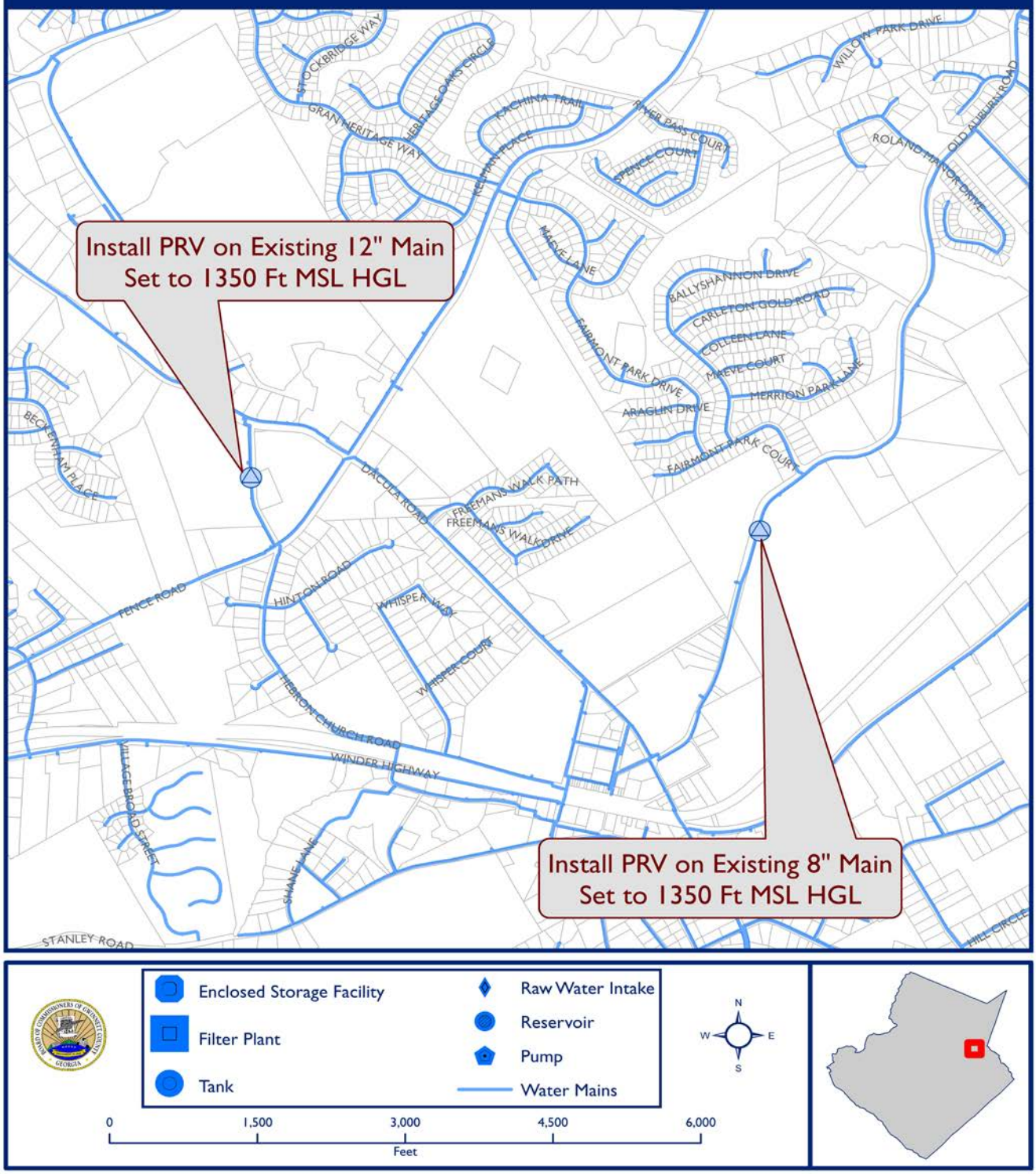
TM7.5 - WD1C


Start 36" Water Main
+/- 15,100 Ft of 36" Water Main to this Point
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
4,000
8,000
12,000
16,000
Feet

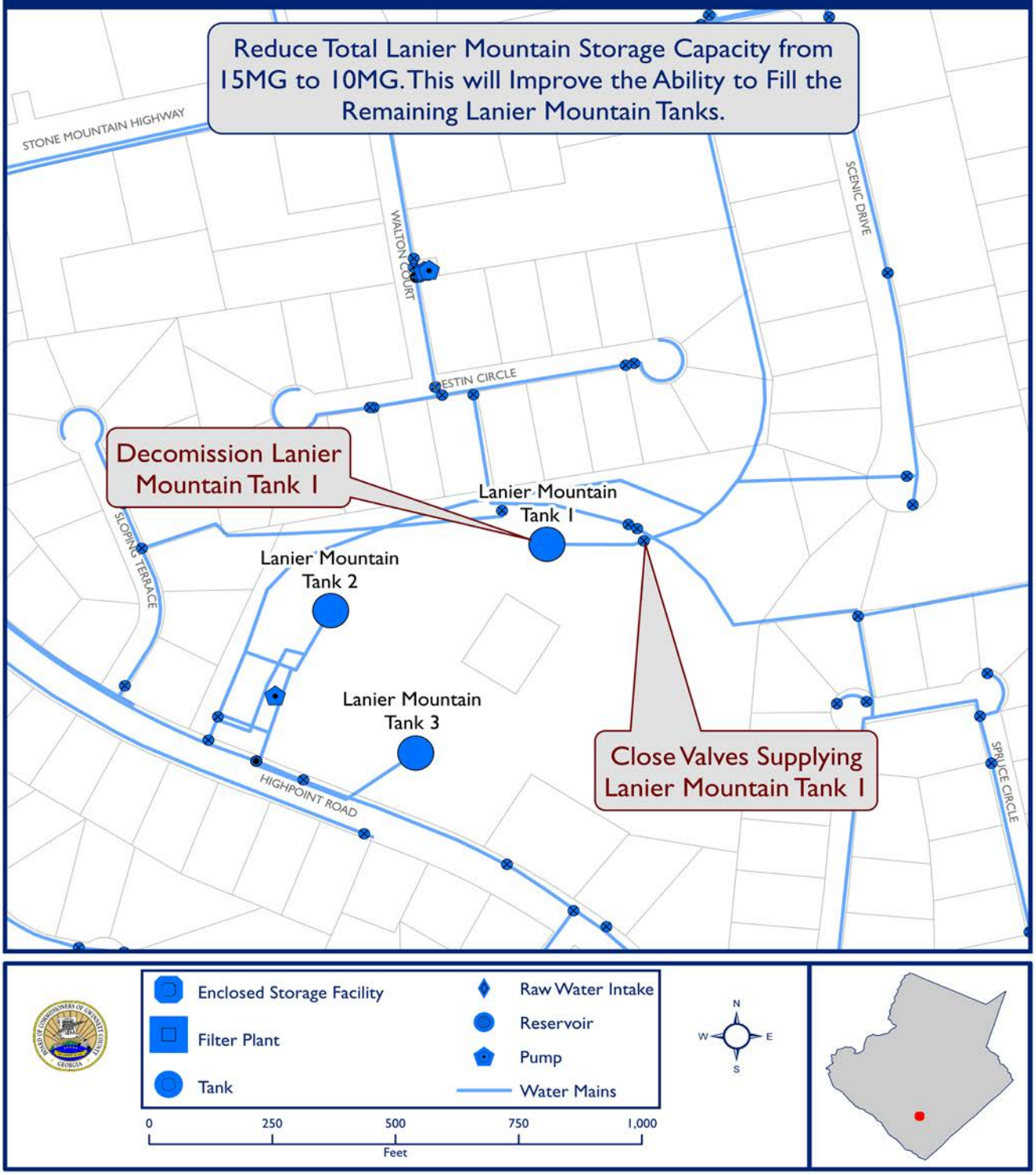
TM7.3 - WD2


+/- 260 Feet of 12" Water Main to Connect Proposed Pressure Zone
Upgrade Nob Hill PS to 1.5MGD at 60 Ft TDH
Nob Hill Tank
Nob Hill PS
+/- 40 Feet of 10" Water Main to Isolate Proposed Pressure Zone from 30" Main
+/- 80 Feet of 10" Water Main to Isolate Proposed Pressure Zone from 16" Main
Lanier Mountain Tanks
+/- 20 Feet of 8" Water Main to Isolate Proposed Pressure Zone from 36" Main
+/- 60 Feet of 8" Water Main to Isolate Proposed Pressure Zone from 16" Main
8" to this Point
12" to this Point
10" to this Point
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
1,500
3,000
4,500
6,000
Feet

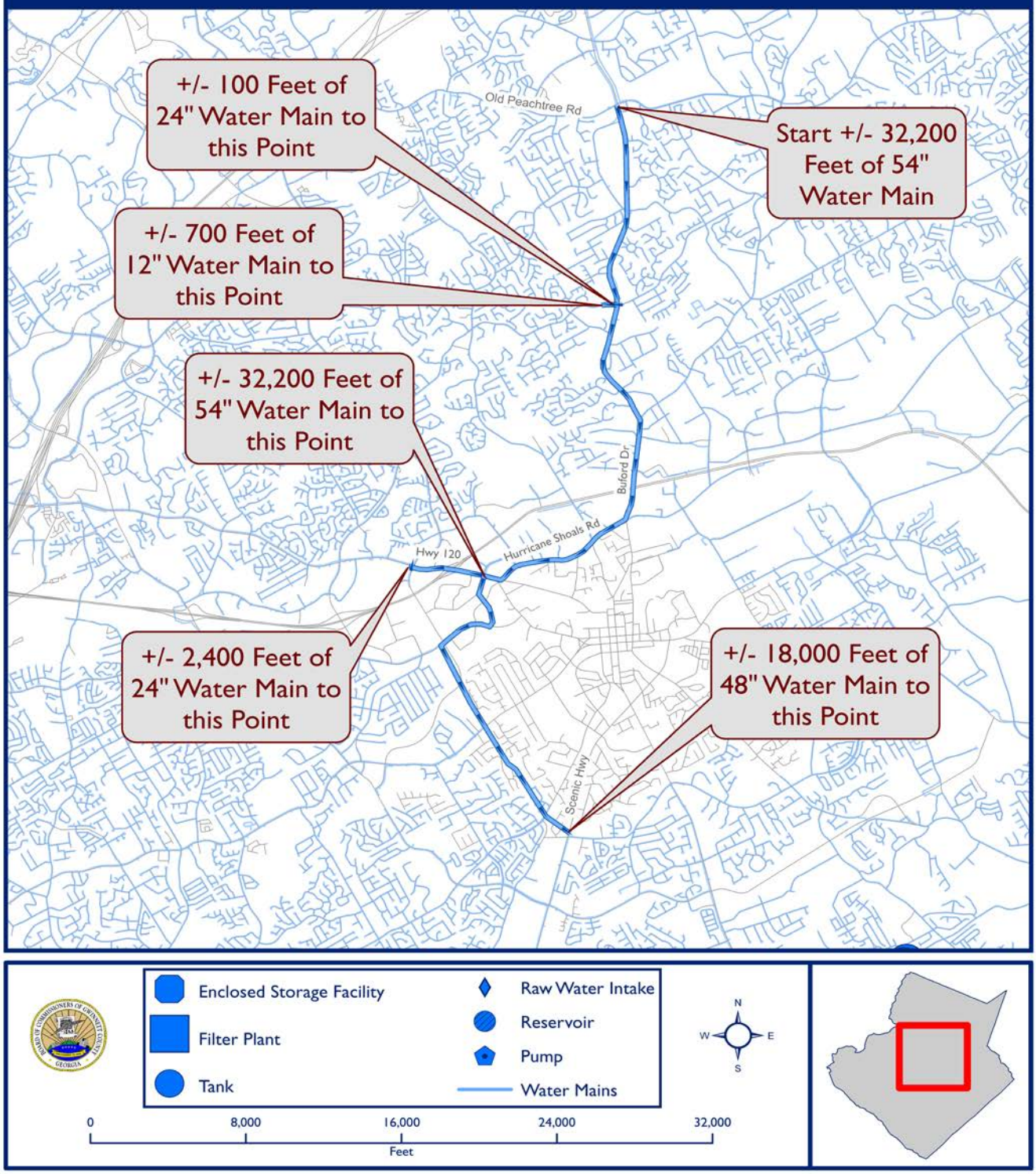
TM7.3 - WD3


Install PRV on Existing 12" Main
Set to 1350 Ft MSL HGL
Install PRV on Existing 8" Main
Set to 1350 Ft MSL HGL
STOCKBRIDGE WAY
GRAN HERITAGE WAY
HERITAGE OAKS CIRCLE
KACHINA TRAIL
INNER PASS COURT
SPENCE COURT
WILLOW PARK DRIVE
ROLAND MANOR DRIVE
OLD AUBURN ROAD
MACE LANE
BALLYSHANNON DRIVE
CARLETON GOLD ROAD
COLLEEN LANE
MAEVE COURT
MERRITON PARK LANE
FAIRMONT PARK DRIVE
ARAGLIN DRIVE
FAIRMONT PARK COURT
BECKETTAN PLACE
DRACULA ROAD
FREEMANS WALK PATH
FREEMANS WALK DRIVE
FENCE ROAD
HINTON ROAD
WHISPER WAY
WHISPER COURT
HEBRON CHURCH ROAD
WINDER HIGHWAY
VILLAGE BROAD STREET
SHANE LANE
STANLEY ROAD
HILL CIRCLE
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
1,500
3,000
4,500
6,000
Feet

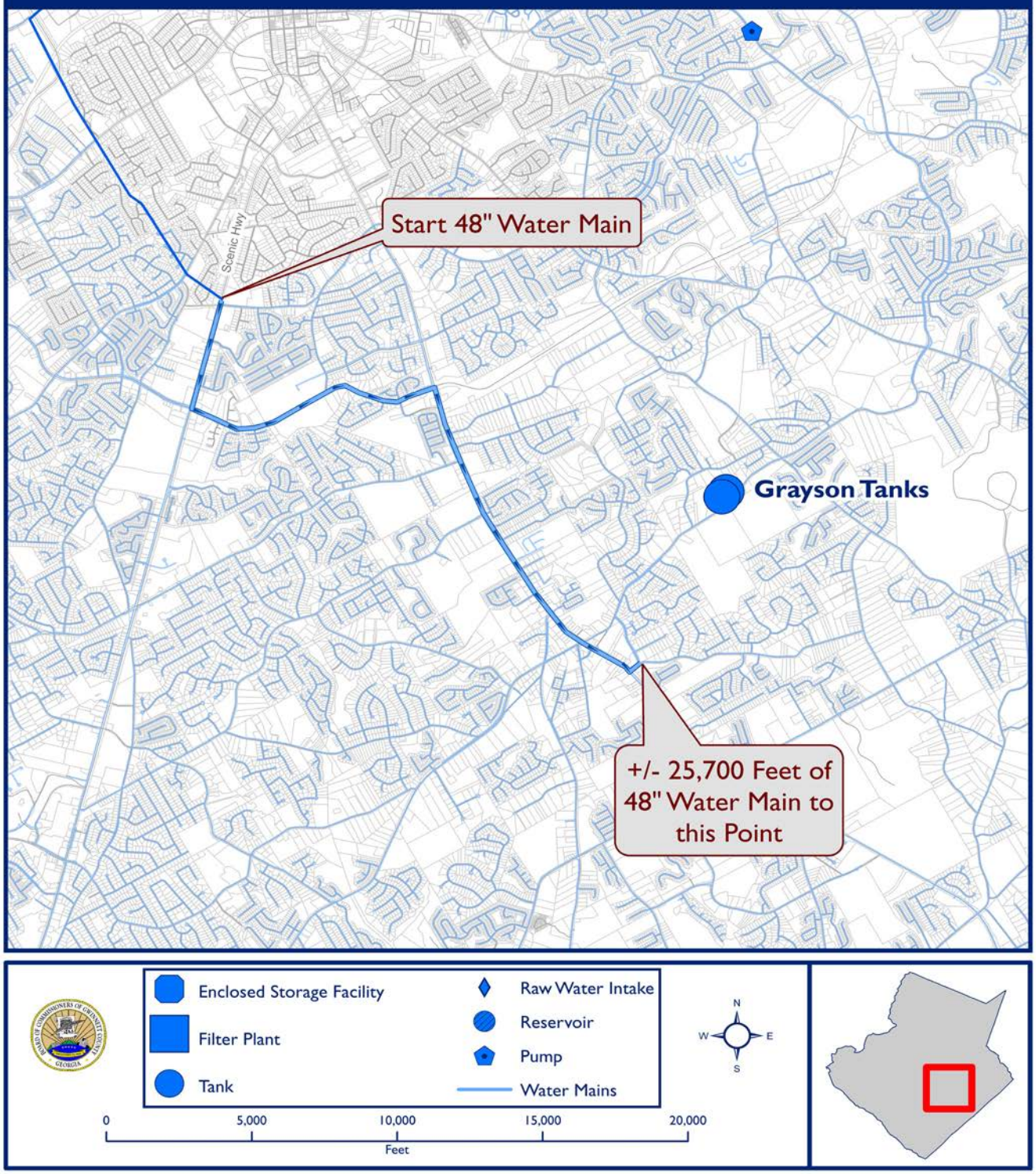
TM7.3 - WD4


Reduce Total Lanier Mountain Storage Capacity from 15MG to 10MG. This will Improve the Ability to Fill the Remaining Lanier Mountain Tanks.
STONE MOUNTAIN HIGHWAY
WALTON COURT
SCENIC DRIVE
ESTIN CIRCLE
Decomission Lanier Mountain Tank 1
Lanier Mountain Tank 1
Lanier Mountain Tank 2
Lanier Mountain Tank 3
SLOPING TERRACE
HIGHPOINT ROAD
SPRUCE CIRCLE
Close Valves Supplying Lanier Mountain Tank 1
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
0
250
500
750
1,000
Feet
N
W
E
S

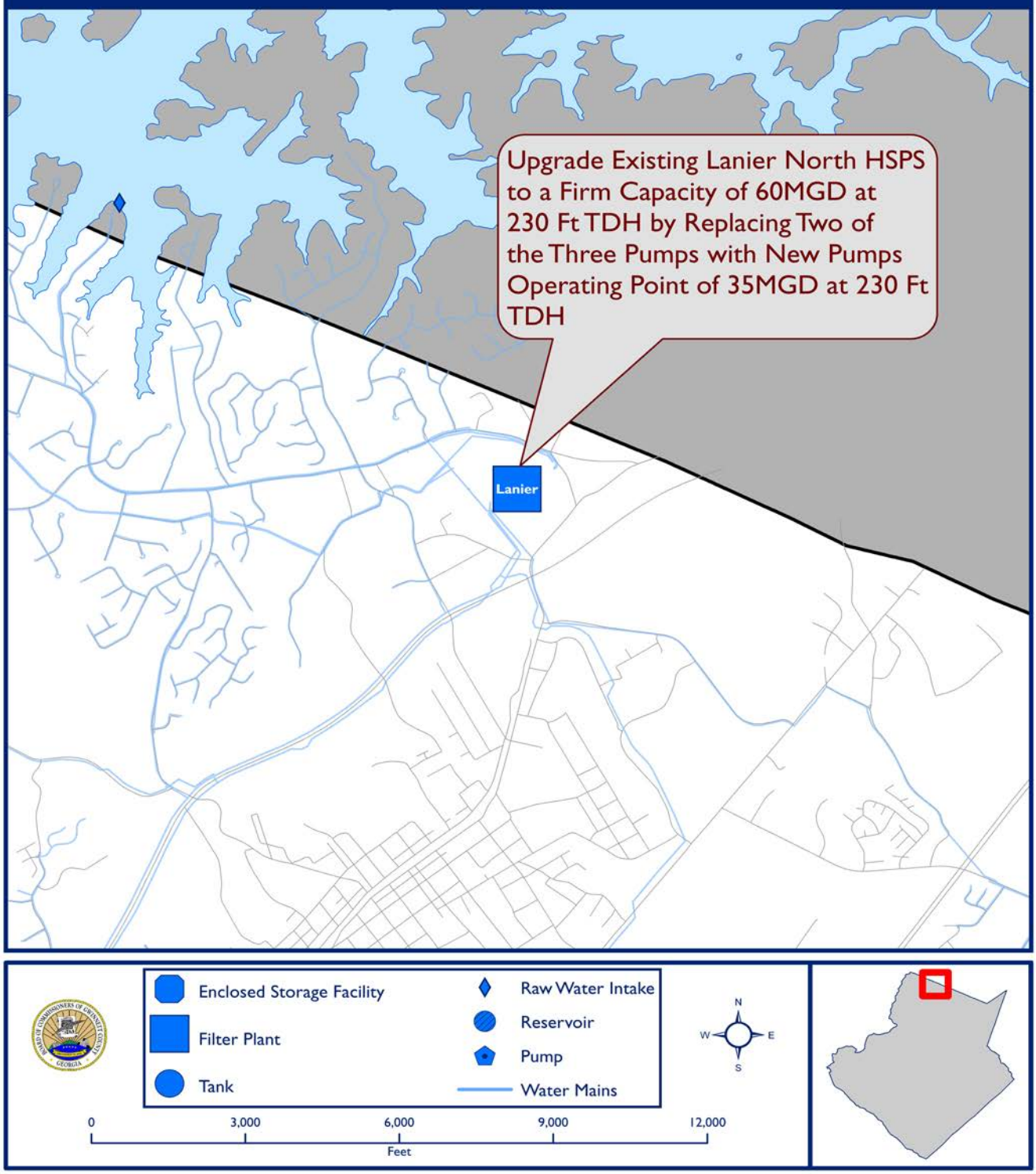
TM7.4 - WD5A


+/- 100 Feet of 24" Water Main to this Point
Start +/- 32,200 Feet of 54" Water Main
+/- 700 Feet of 12" Water Main to this Point
+/- 32,200 Feet of 54" Water Main to this Point
+/- 2,400 Feet of 24" Water Main to this Point
+/- 18,000 Feet of 48" Water Main to this Point
Old Peachtree Rd
Buford Dr
Hurricane Shoals Rd
Hwy 120
Scenic Hwy
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
8,000
16,000
24,000
32,000
Feet

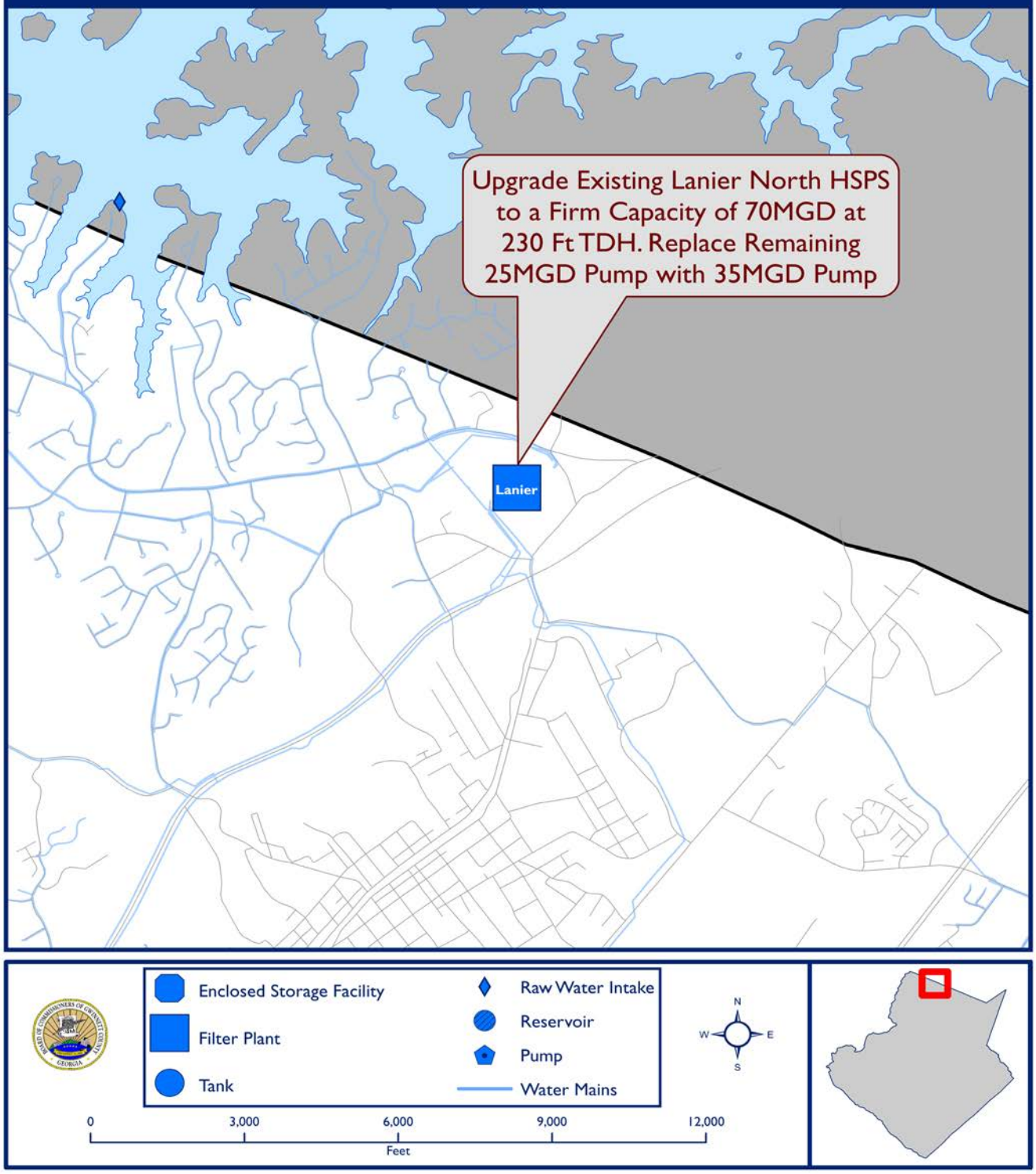
TM7.7 - WD5B


Start 48" Water Main
Scenic Hwy
Grayson Tanks
+/- 25,700 Feet of 48" Water Main to this Point
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
5,000
10,000
15,000
20,000
Feet

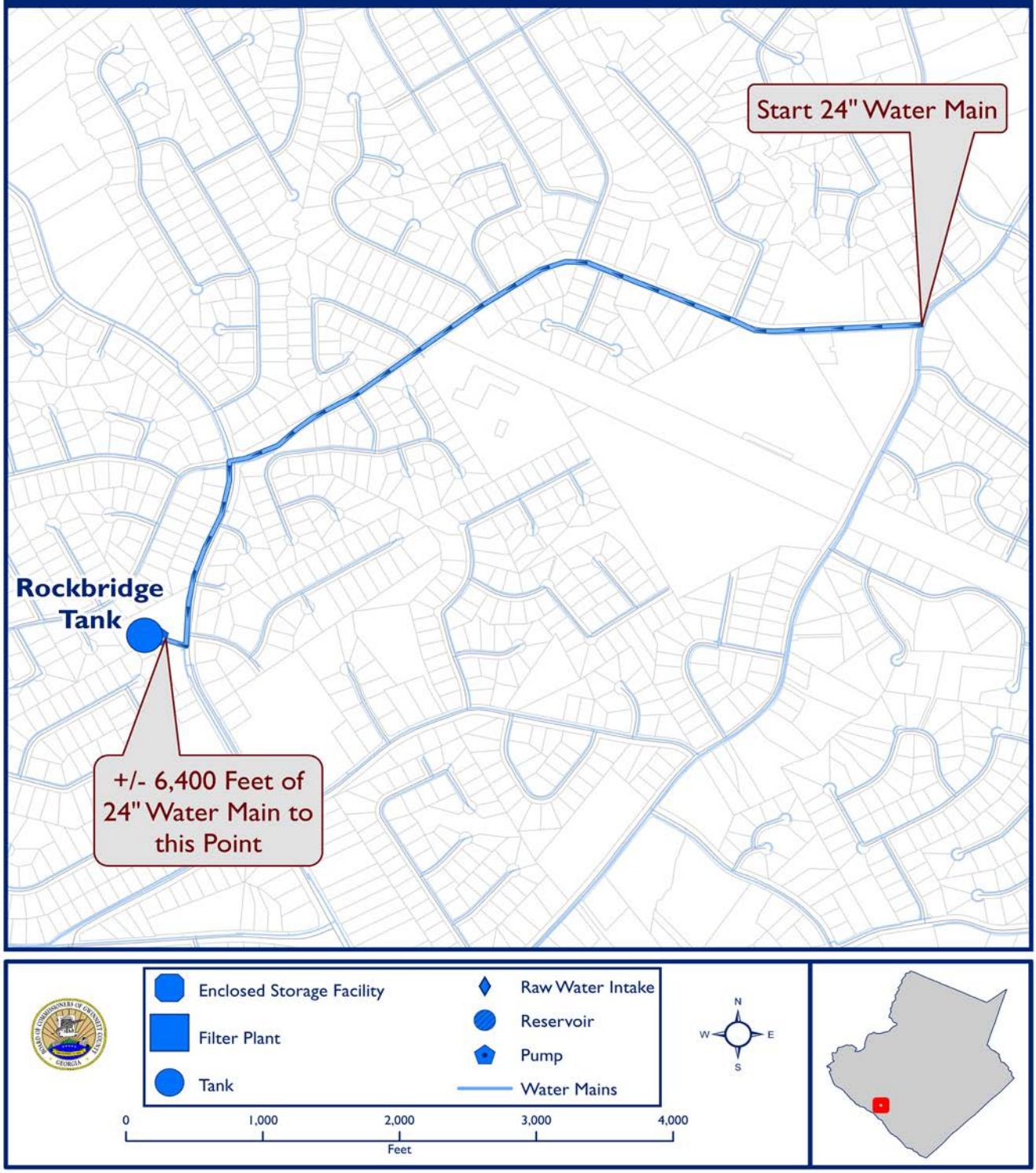
TM7.5 - WD6A

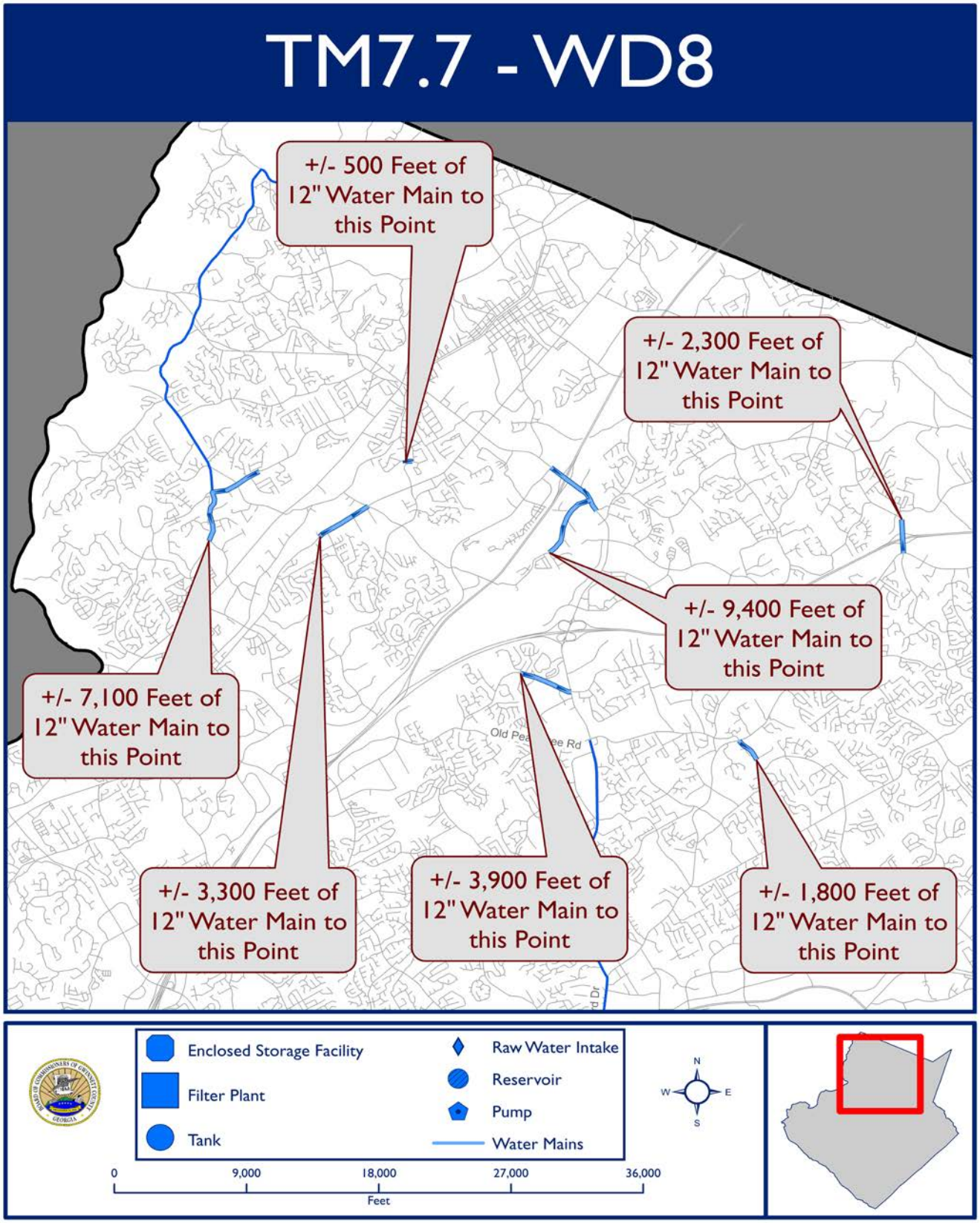

Upgrade Existing Lanier North HSPS to a Firm Capacity of 60MGD at 230 Ft TDH by Replacing Two of the Three Pumps with New Pumps Operating Point of 35MGD at 230 Ft TDH
Lanier
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
3,000
6,000
9,000
12,000
Feet

TM7.6 - WD6B

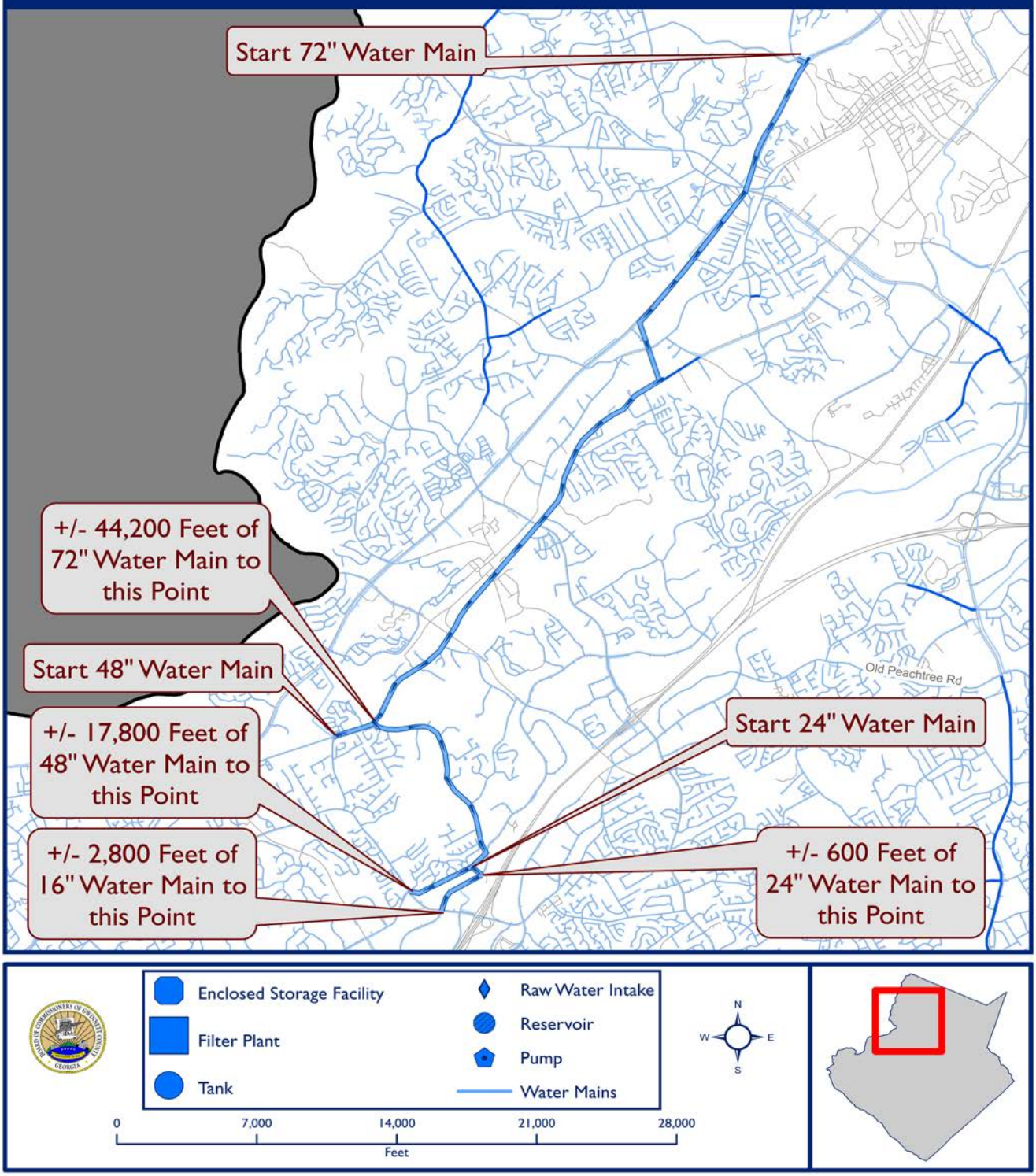

Upgrade Existing Lanier North HSPS to a Firm Capacity of 70MGD at 230 Ft TDH. Replace Remaining 25MGD Pump with 35MGD Pump
Lanier
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
3,000
6,000
9,000
12,000
Feet

TM7.7 - WD7

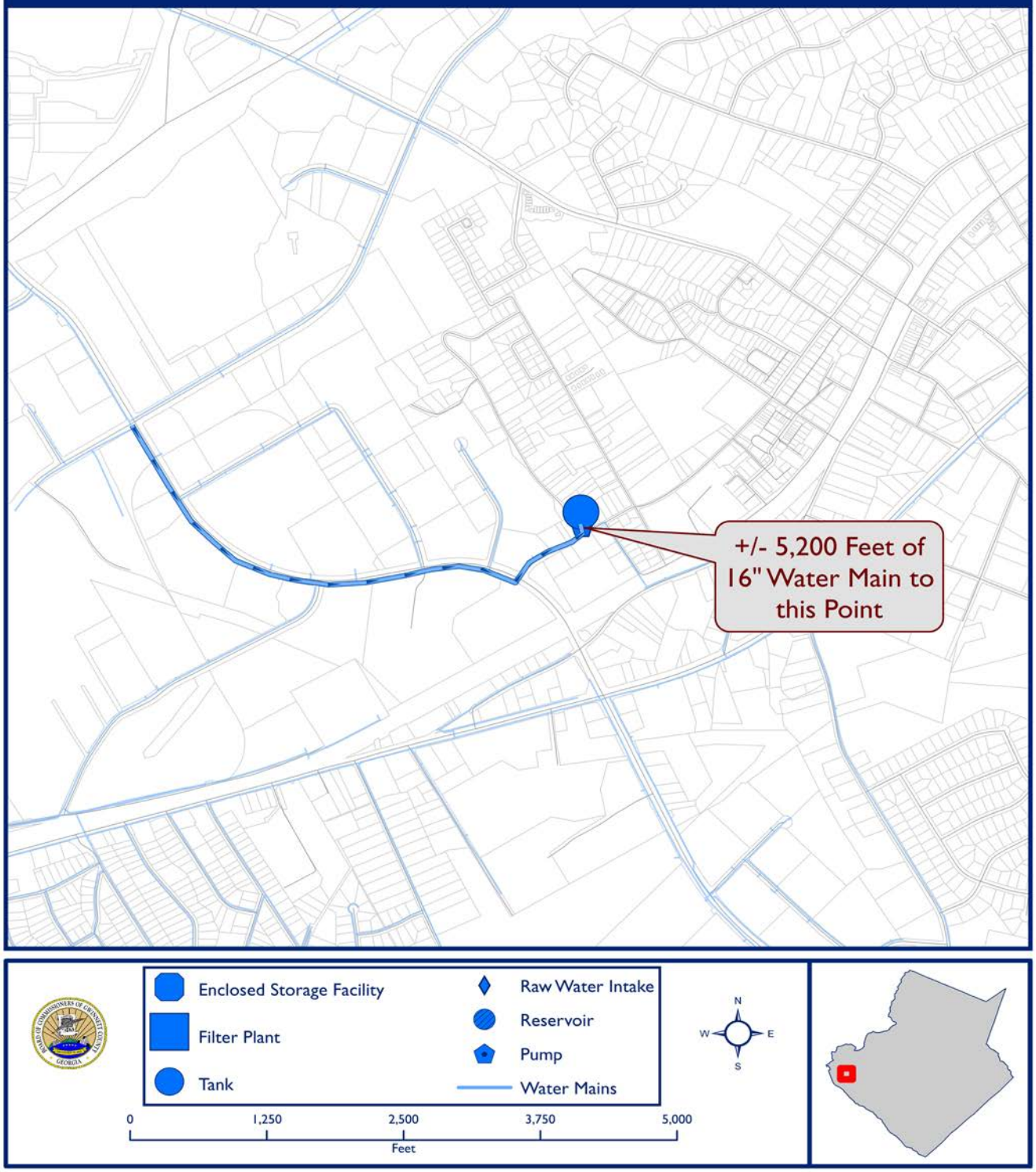

Start 24" Water Main
Rockbridge Tank
+/- 6,400 Feet of 24" Water Main to this Point
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
1,000
2,000
3,000
4,000
Feet


TM7.7 - WD8
+/- 500 Feet of 12" Water Main to this Point
+/- 2,300 Feet of 12" Water Main to this Point
+/- 9,400 Feet of 12" Water Main to this Point
+/- 7,100 Feet of 12" Water Main to this Point
+/- 3,300 Feet of 12" Water Main to this Point
+/- 3,900 Feet of 12" Water Main to this Point
+/- 1,800 Feet of 12" Water Main to this Point
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
9,000
18,000
27,000
36,000
Feet

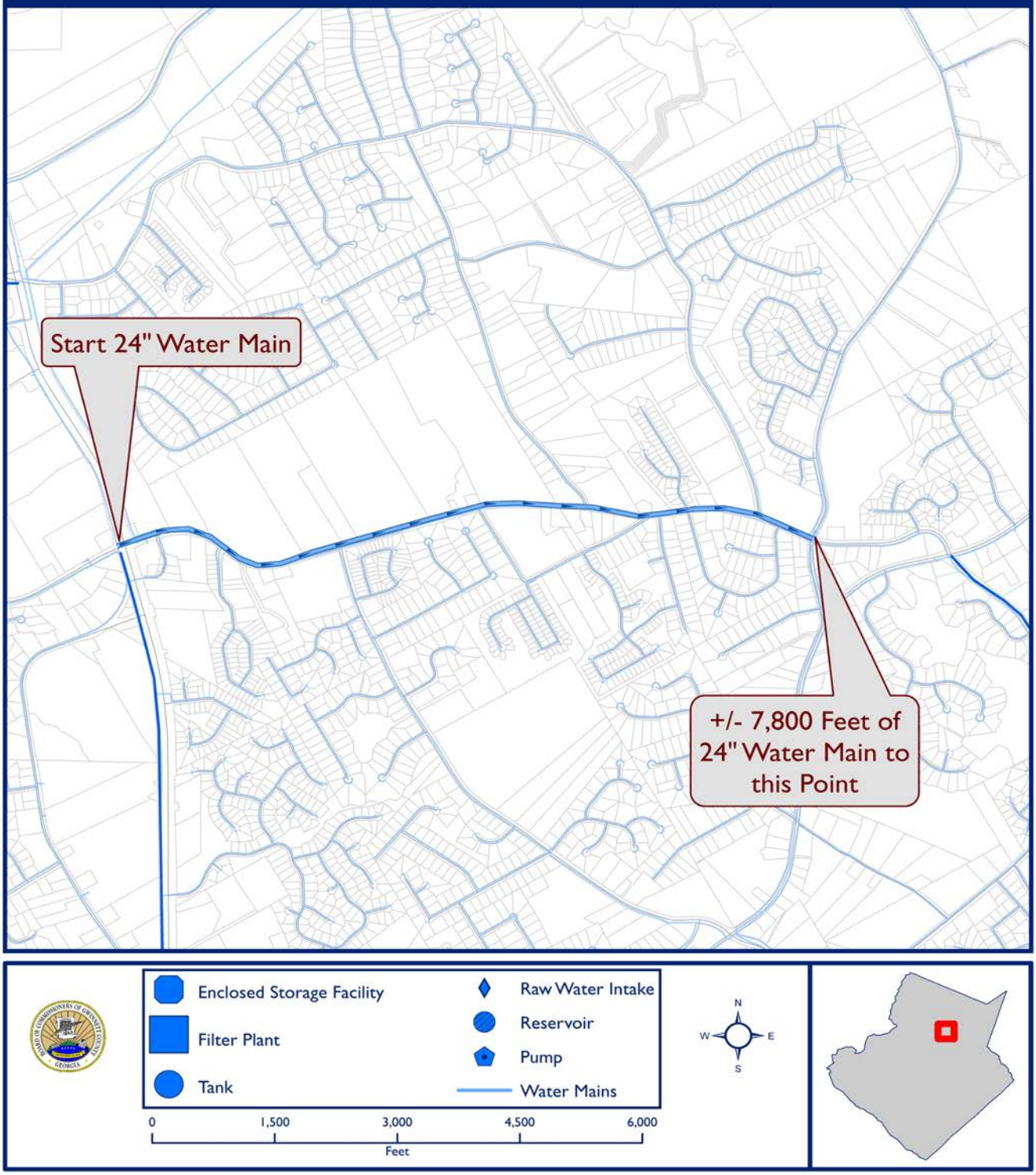
TM7.8 - WD9


Start 72" Water Main
+/- 44,200 Feet of 72" Water Main to this Point
Start 48" Water Main
+/- 17,800 Feet of 48" Water Main to this Point
+/- 2,800 Feet of 16" Water Main to this Point
Start 24" Water Main
+/- 600 Feet of 24" Water Main to this Point
Old Peachtree Rd
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
7,000
14,000
21,000
28,000
Feet

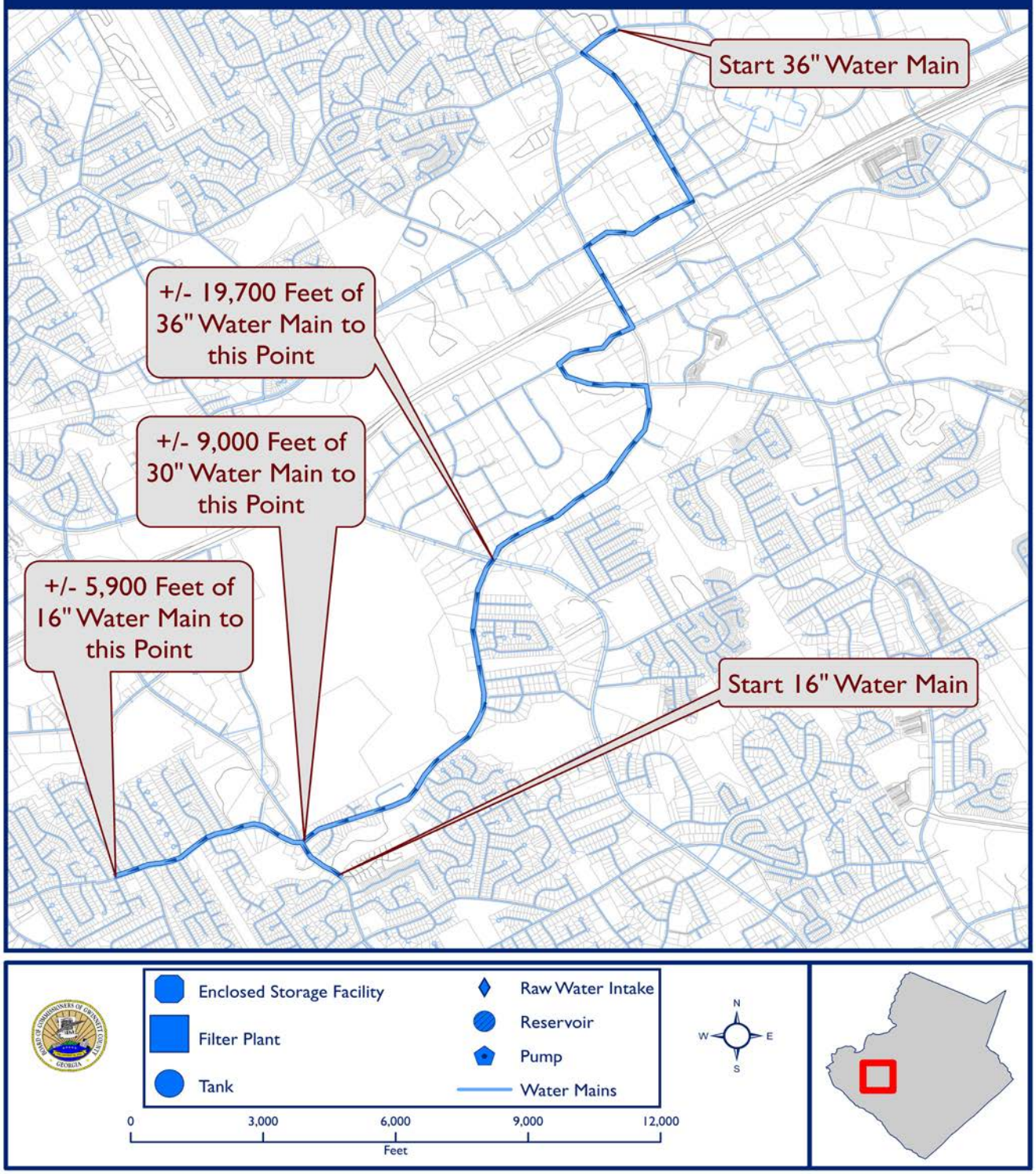
TM7.8 - WD10


+/- 5,200 Feet of 16" Water Main to this Point
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
1,250
2,500
3,750
5,000
Feet

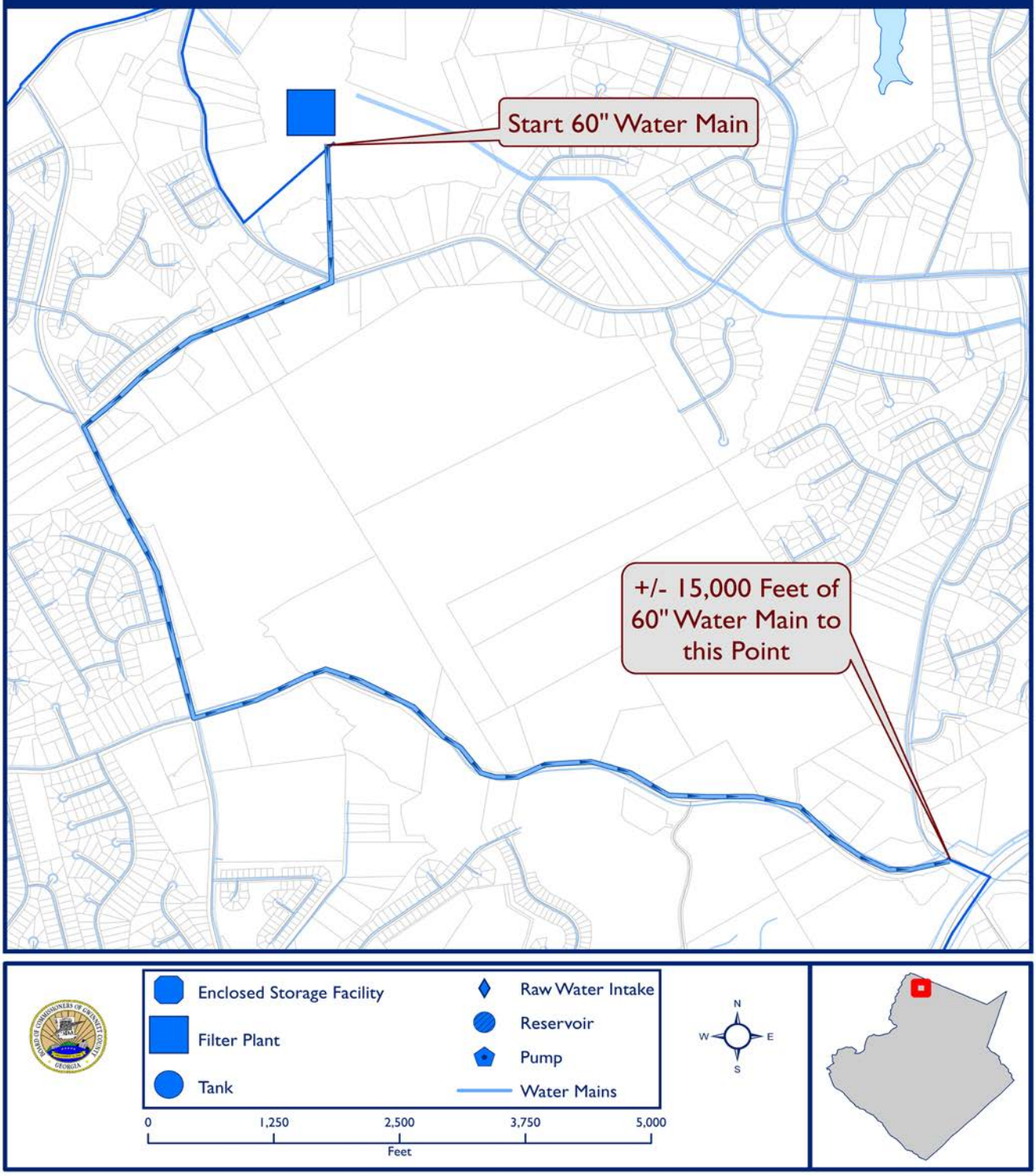
TM7.9 - WD11


Start 24" Water Main
+/- 7,800 Feet of 24" Water Main to this Point
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
0
1,500
3,000
4,500
6,000
Feet
N
W
E
S

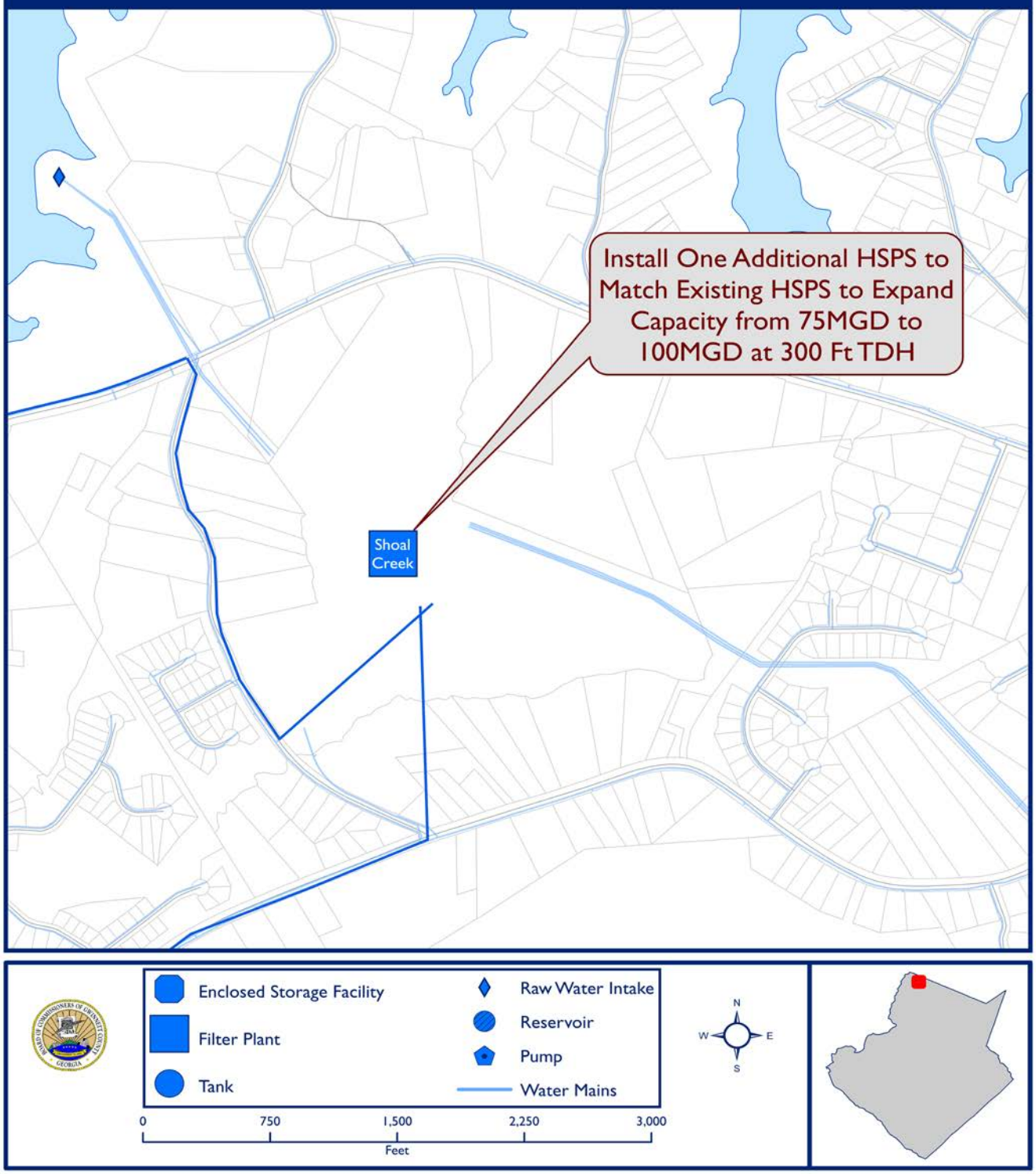
TM7.9 - WD12


Start 36" Water Main
+/- 19,700 Feet of 36" Water Main to this Point
+/- 9,000 Feet of 30" Water Main to this Point
+/- 5,900 Feet of 16" Water Main to this Point
Start 16" Water Main
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
3,000
6,000
9,000
12,000
Feet

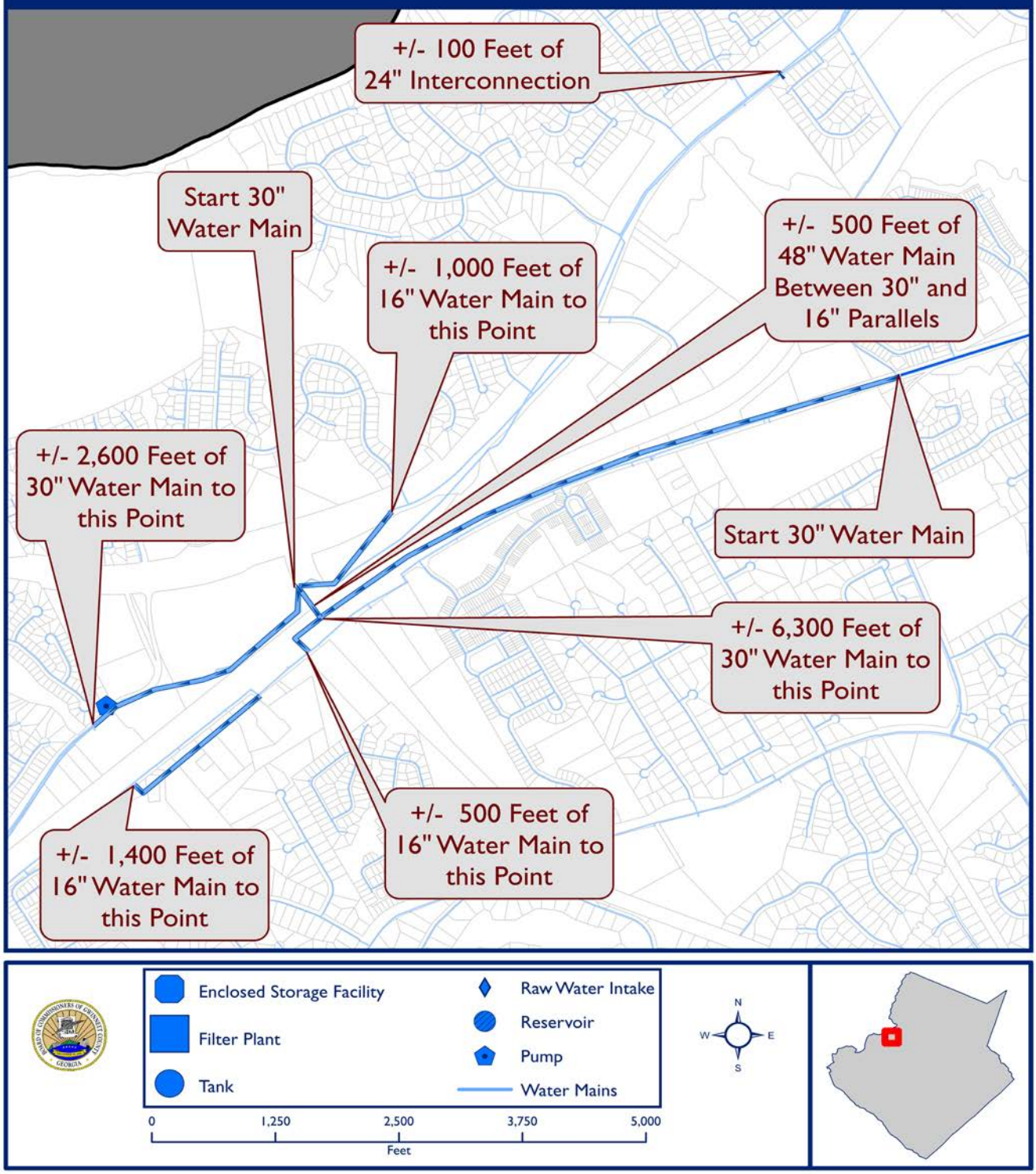
TM7.9 - WD13


Start 60" Water Main
+/- 15,000 Feet of 60" Water Main to this Point
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
0
1,250
2,500
3,750
5,000
Feet
N
W
E
S

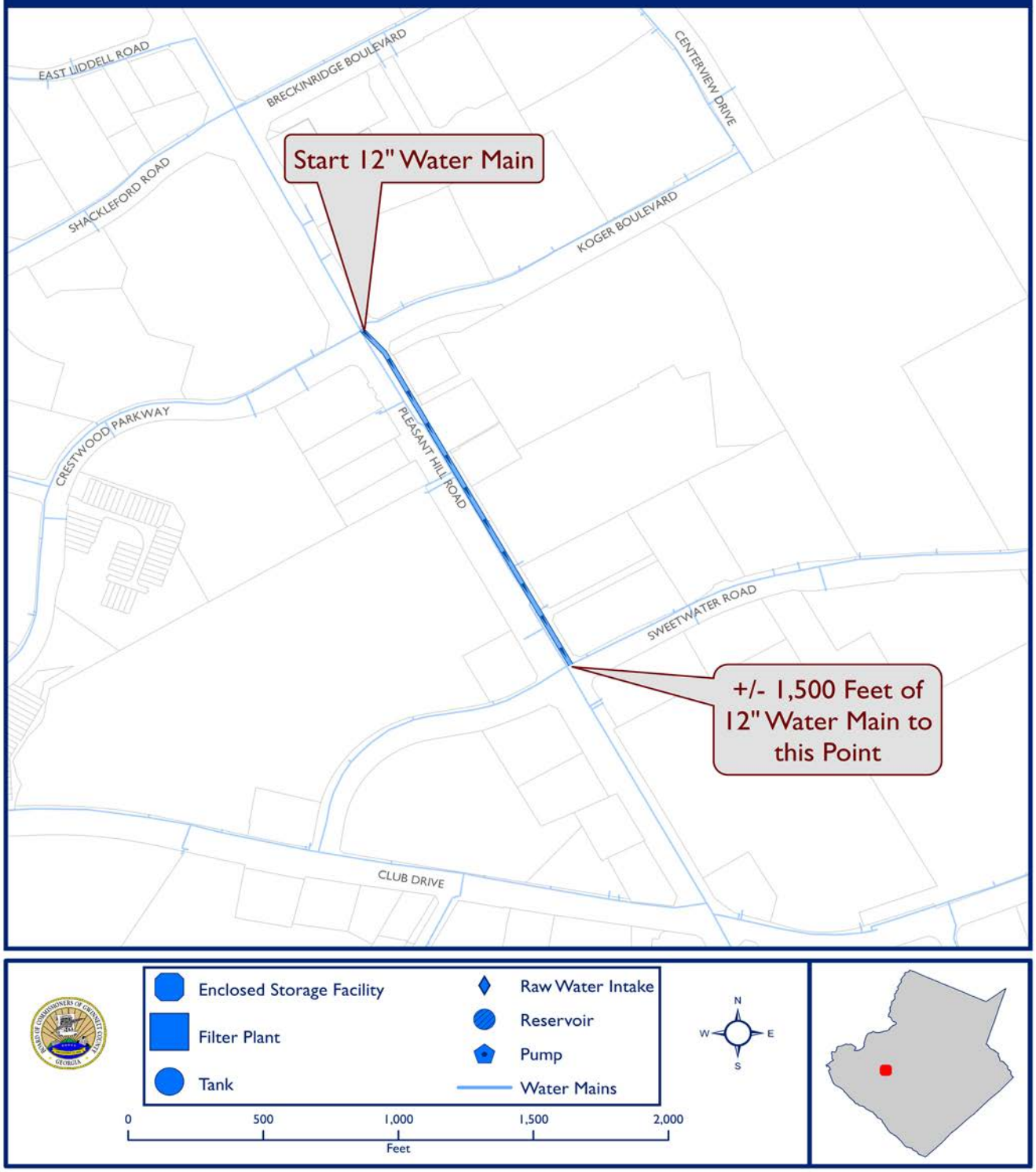
TM7.10 - WD14


Install One Additional HSPS to Match Existing HSPS to Expand Capacity from 75MGD to 100MGD at 300 Ft TDH
Shoal Creek
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
750
1,500
2,250
3,000
Feet

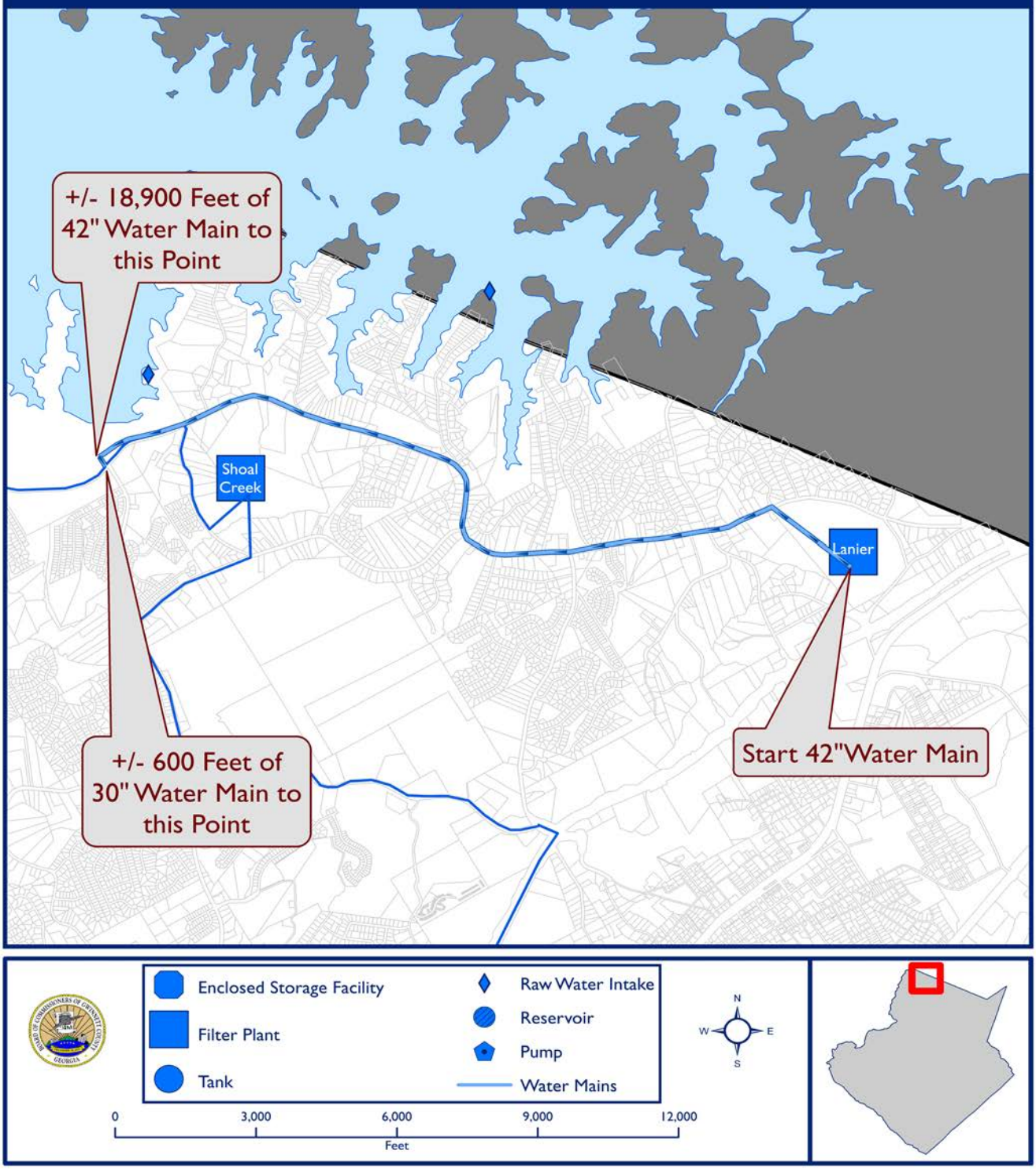
TM7.10 - WD15


+/- 100 Feet of 24" Interconnection
Start 30" Water Main
+/- 1,000 Feet of 16" Water Main to this Point
+/- 500 Feet of 48" Water Main Between 30" and 16" Parallels
+/- 2,600 Feet of 30" Water Main to this Point
Start 30" Water Main
+/- 6,300 Feet of 30" Water Main to this Point
+/- 500 Feet of 16" Water Main to this Point
+/- 1,400 Feet of 16" Water Main to this Point
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
0
1,250
2,500
3,750
5,000
Feet
N
W
E
S

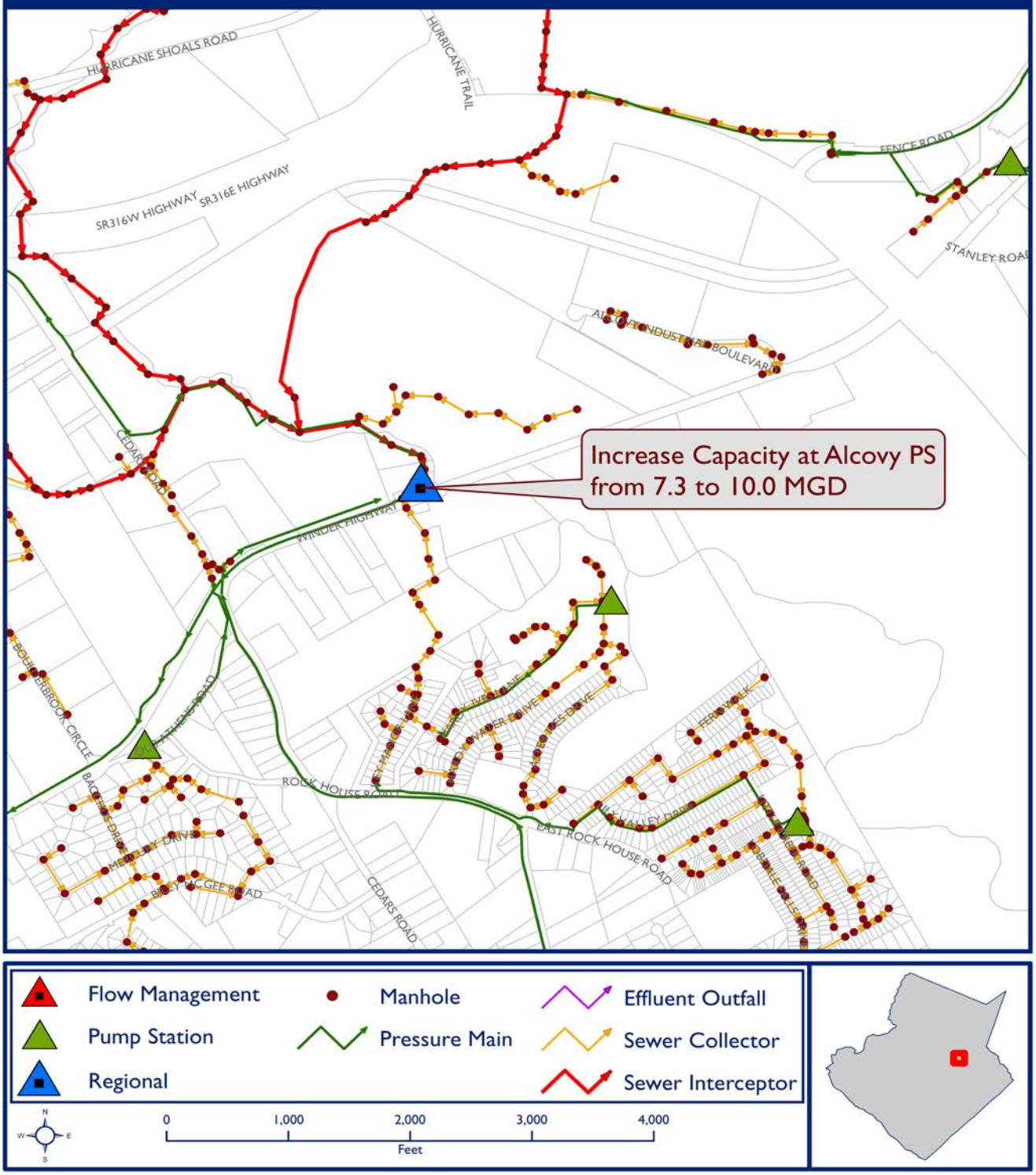
TM7.10 - WD16


EAST LIDDELL ROAD
BRECKINRIDGE BOULEVARD
CENTERVIEW DRIVE
SHACKLEFORD ROAD
Start 12" Water Main
KOGER BOULEVARD
CRESTWOOD PARKWAY
PLEASANT HILL ROAD
SWEETWATER ROAD
+/- 1,500 Feet of 12" Water Main to this Point
CLUB DRIVE
Enclosed Storage Facility
Filter Plant
Tank
Raw Water Intake
Reservoir
Pump
Water Mains
N
W
E
S
0
500
1,000
1,500
2,000
Feet

TM7.11 - WDAlt1



TM8.2 Table - WC1



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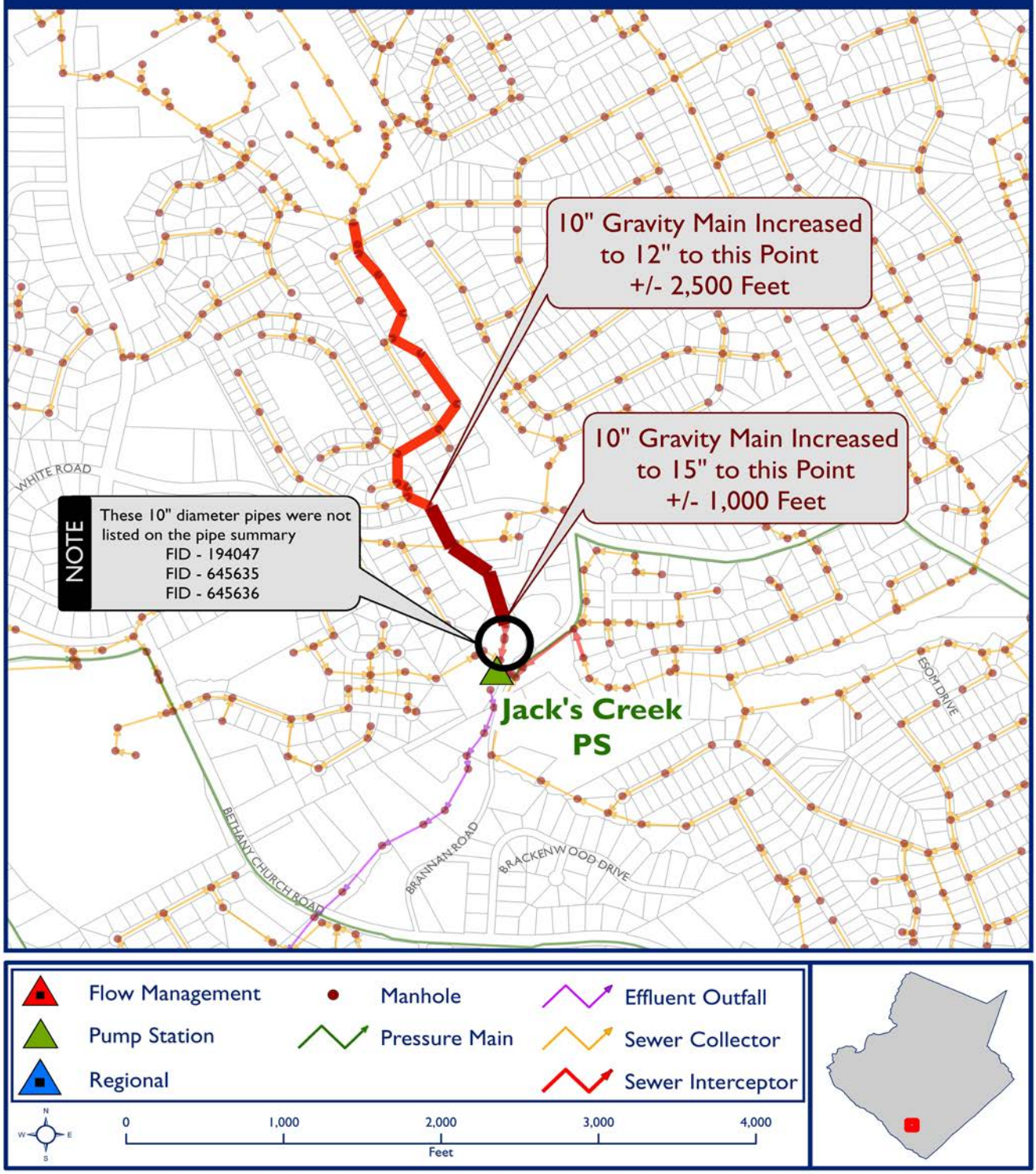

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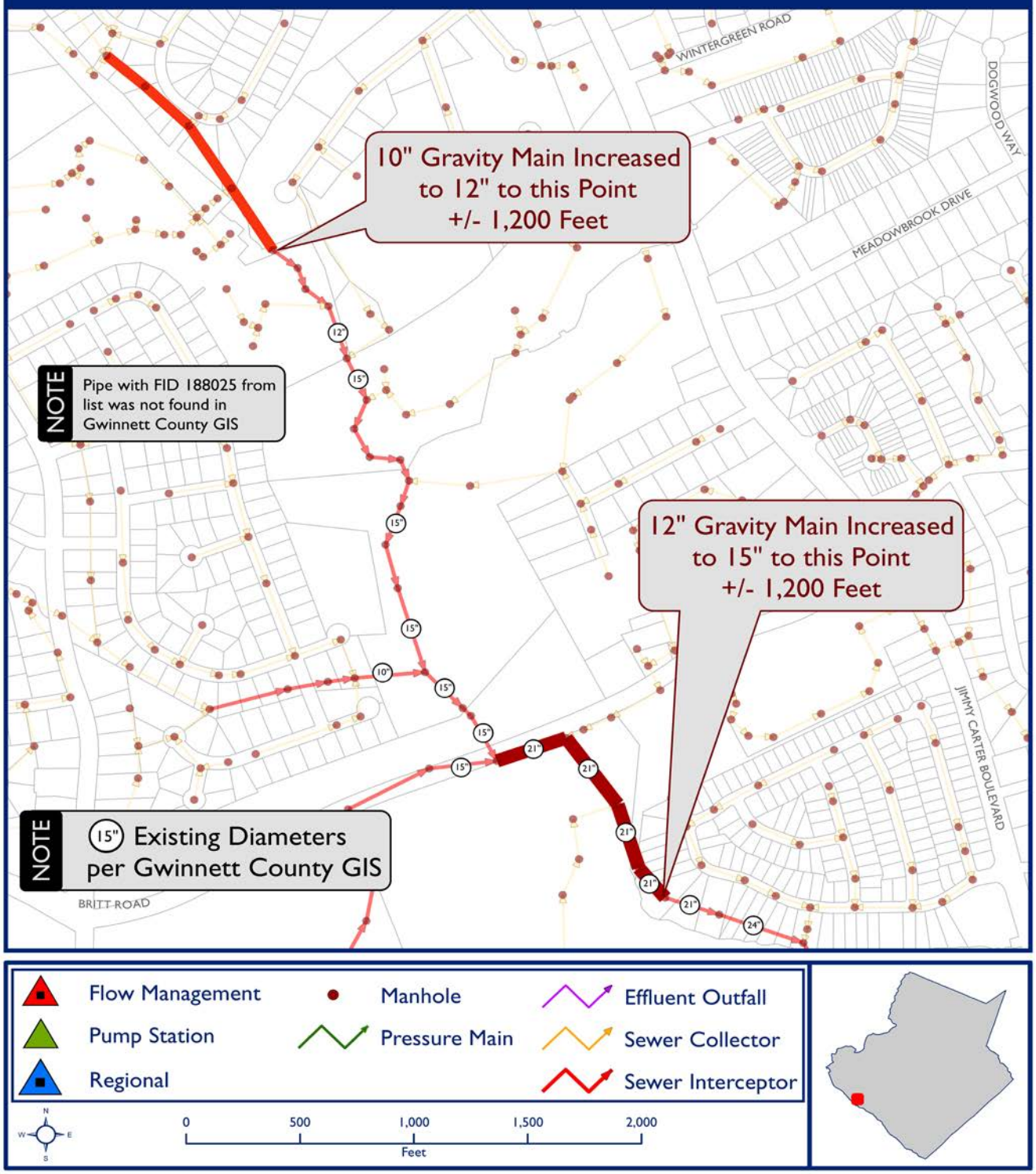

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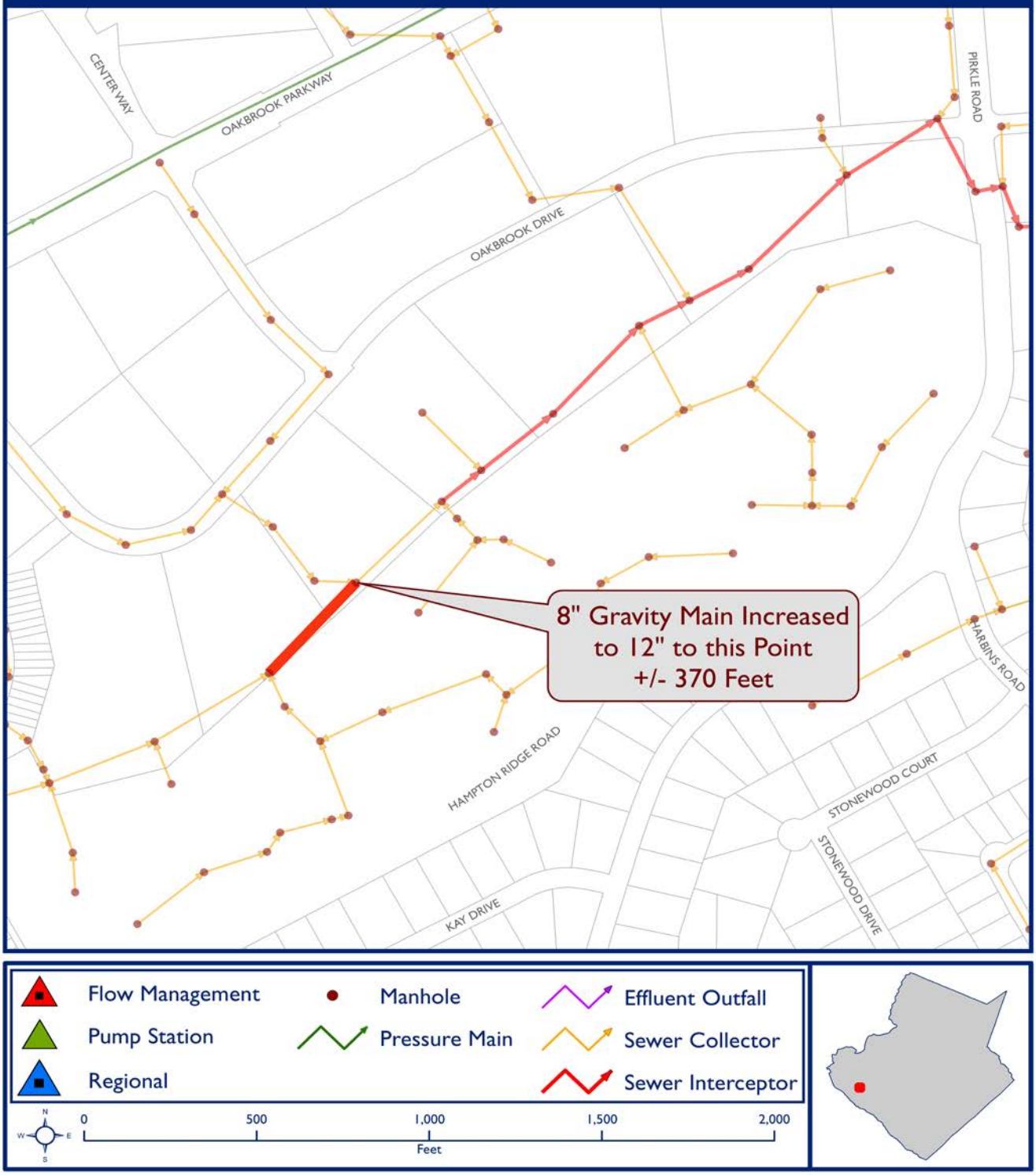

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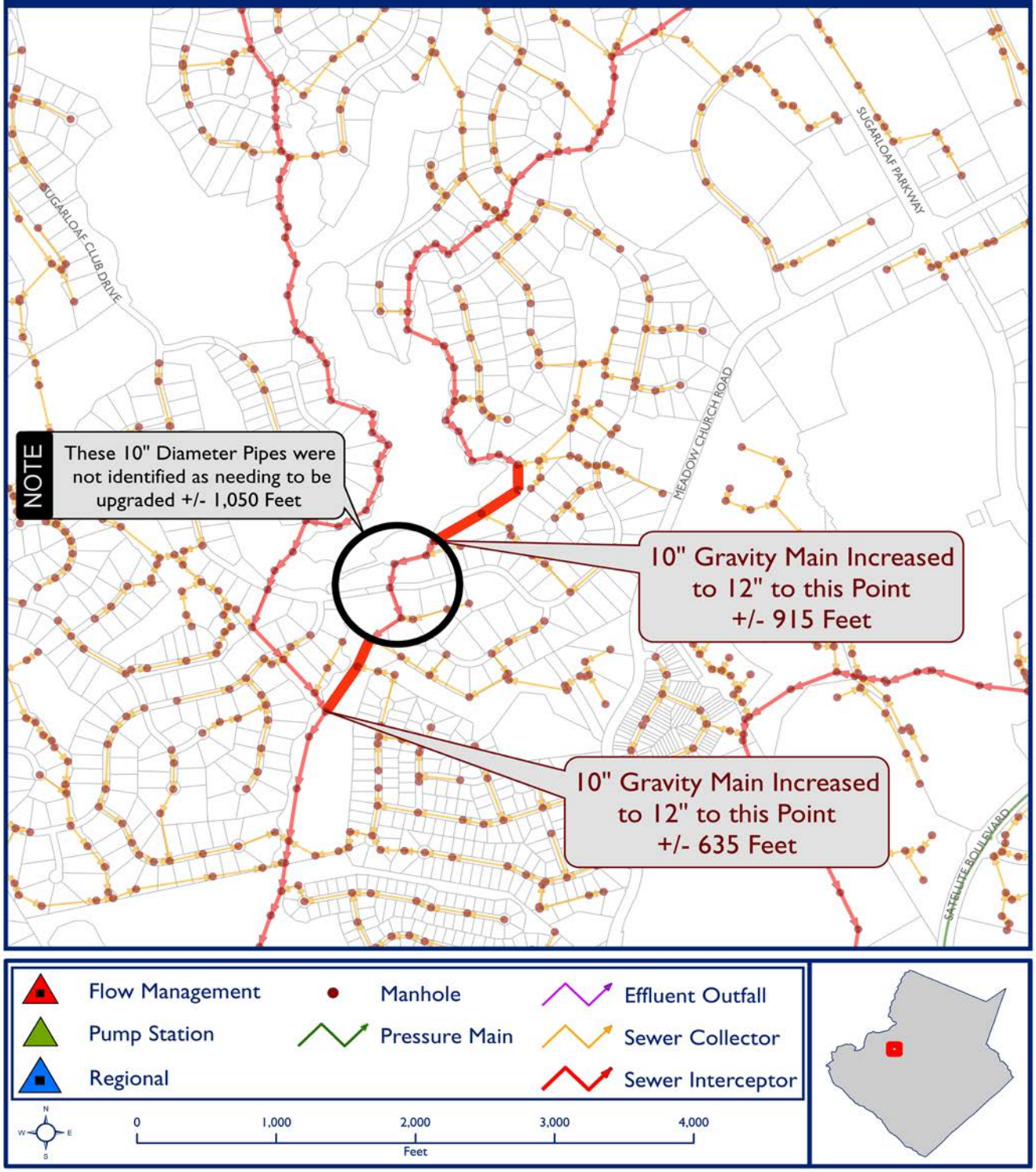
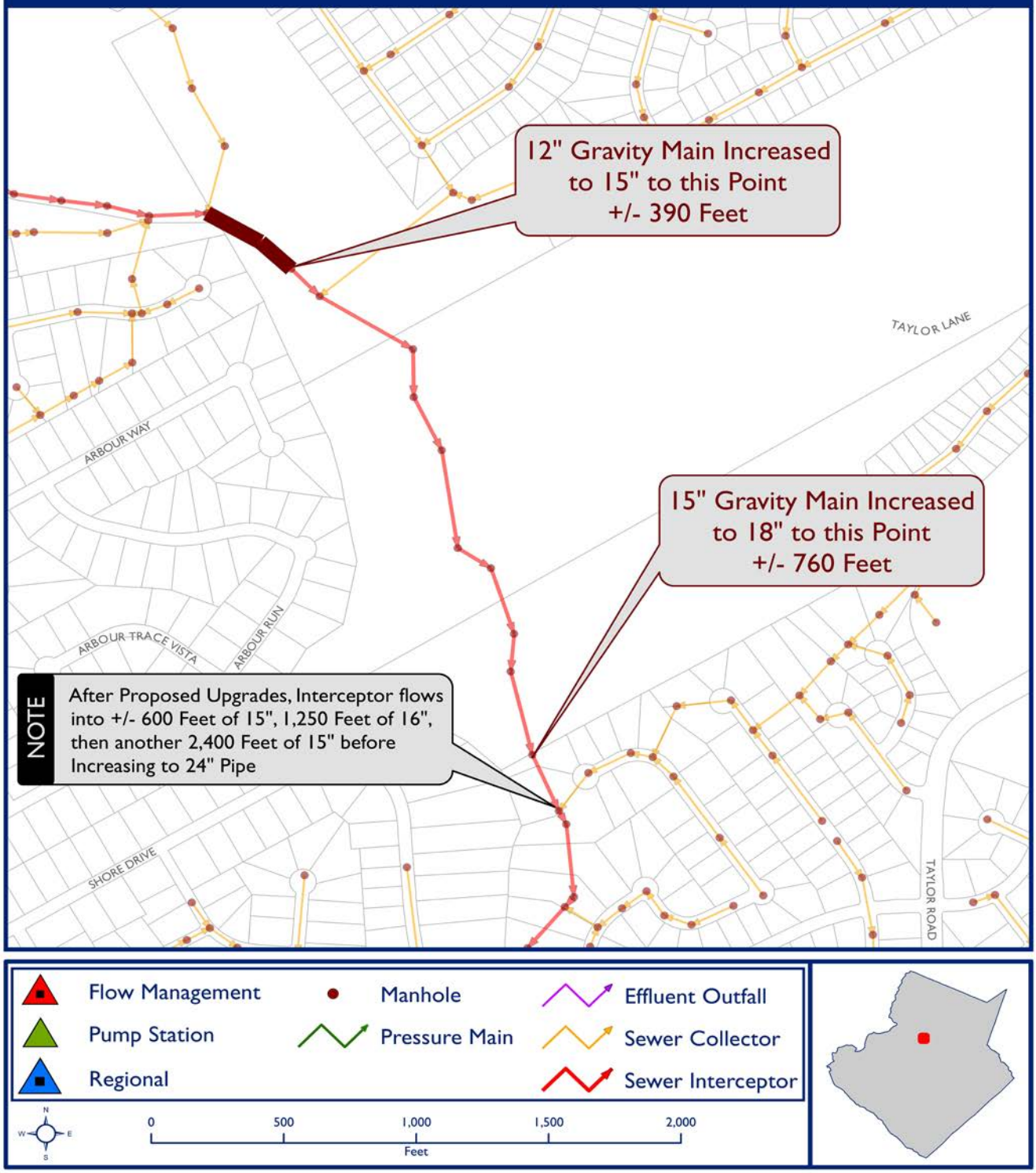


TM8.2 Table - WC6



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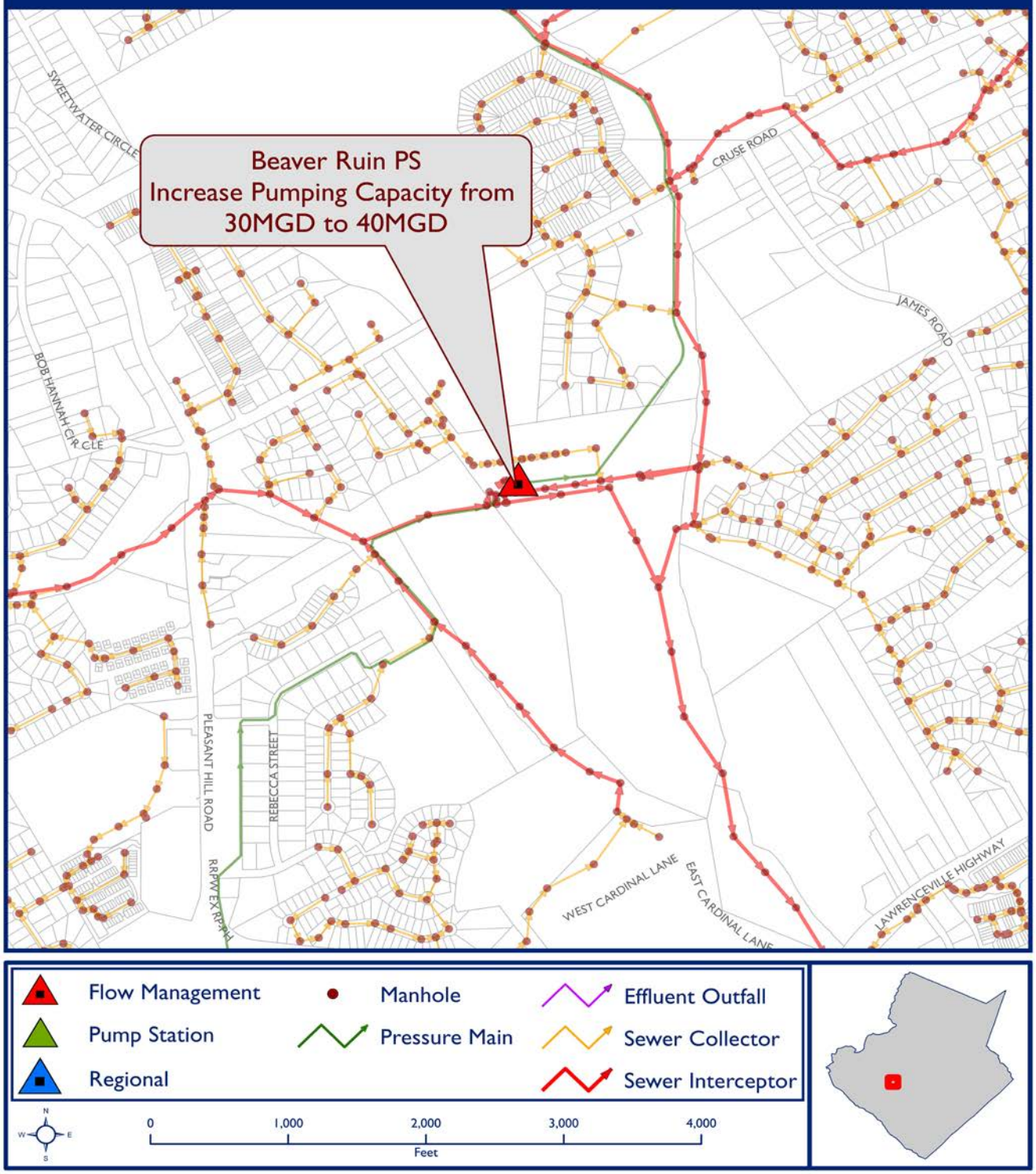

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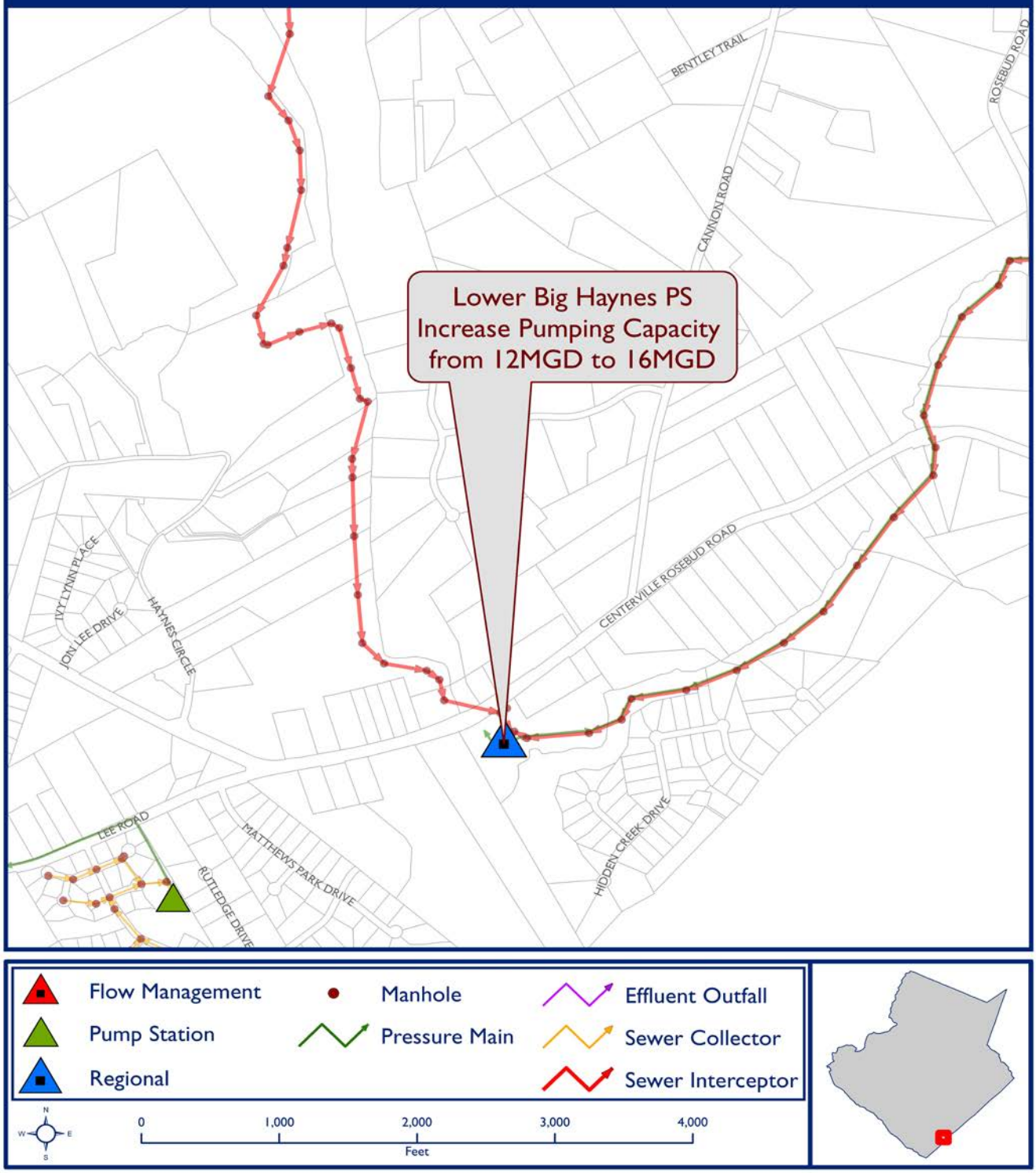

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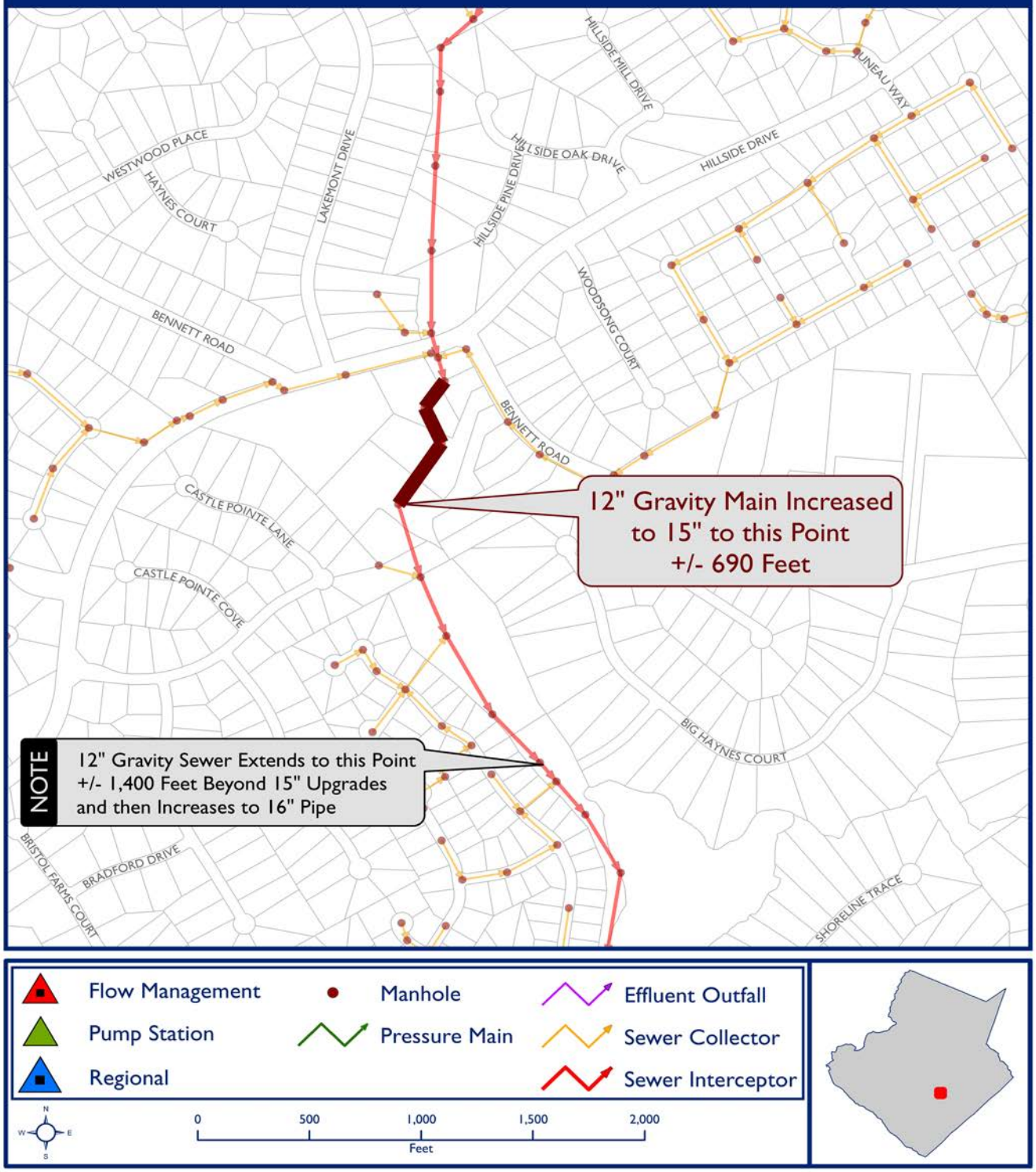

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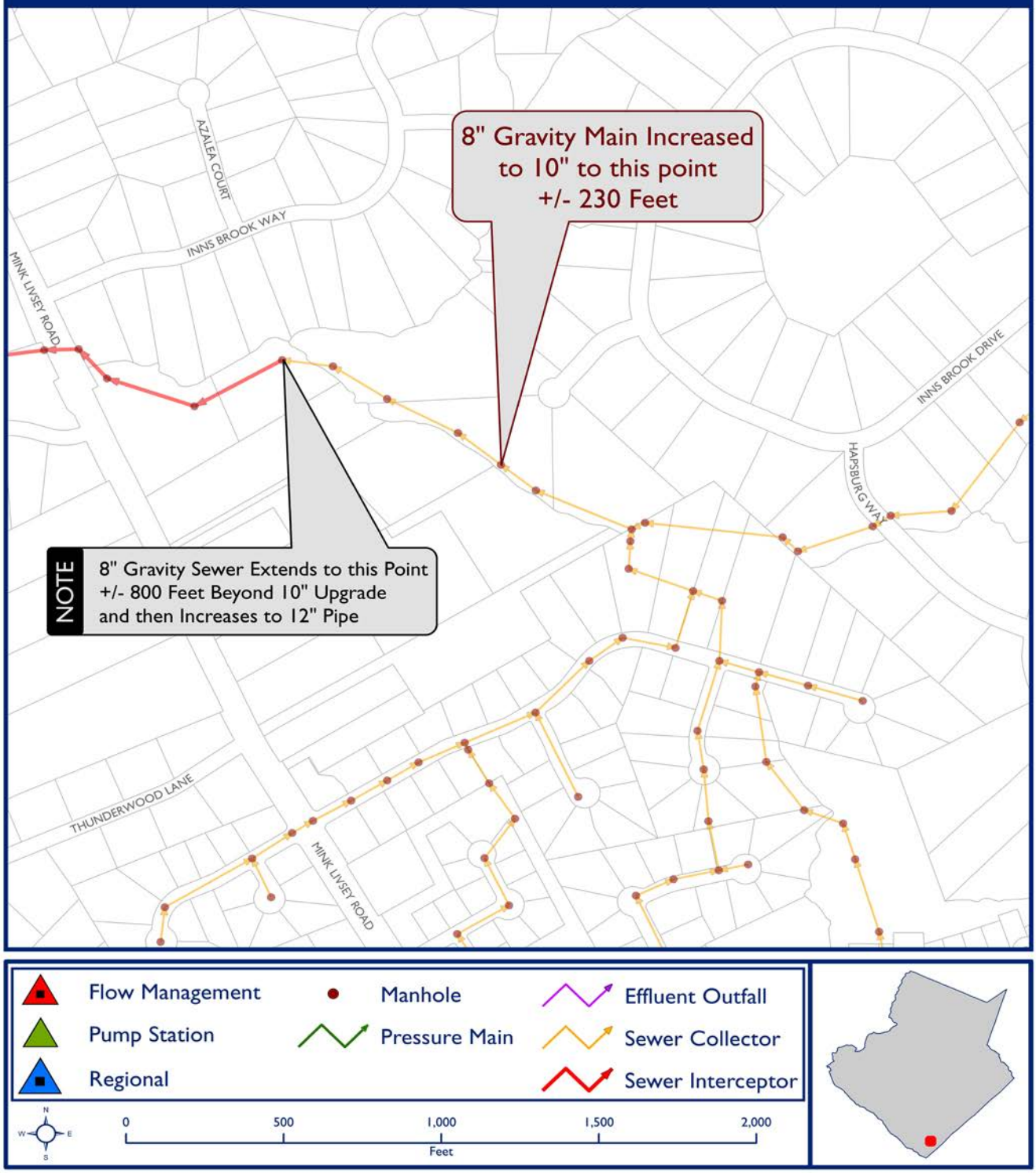

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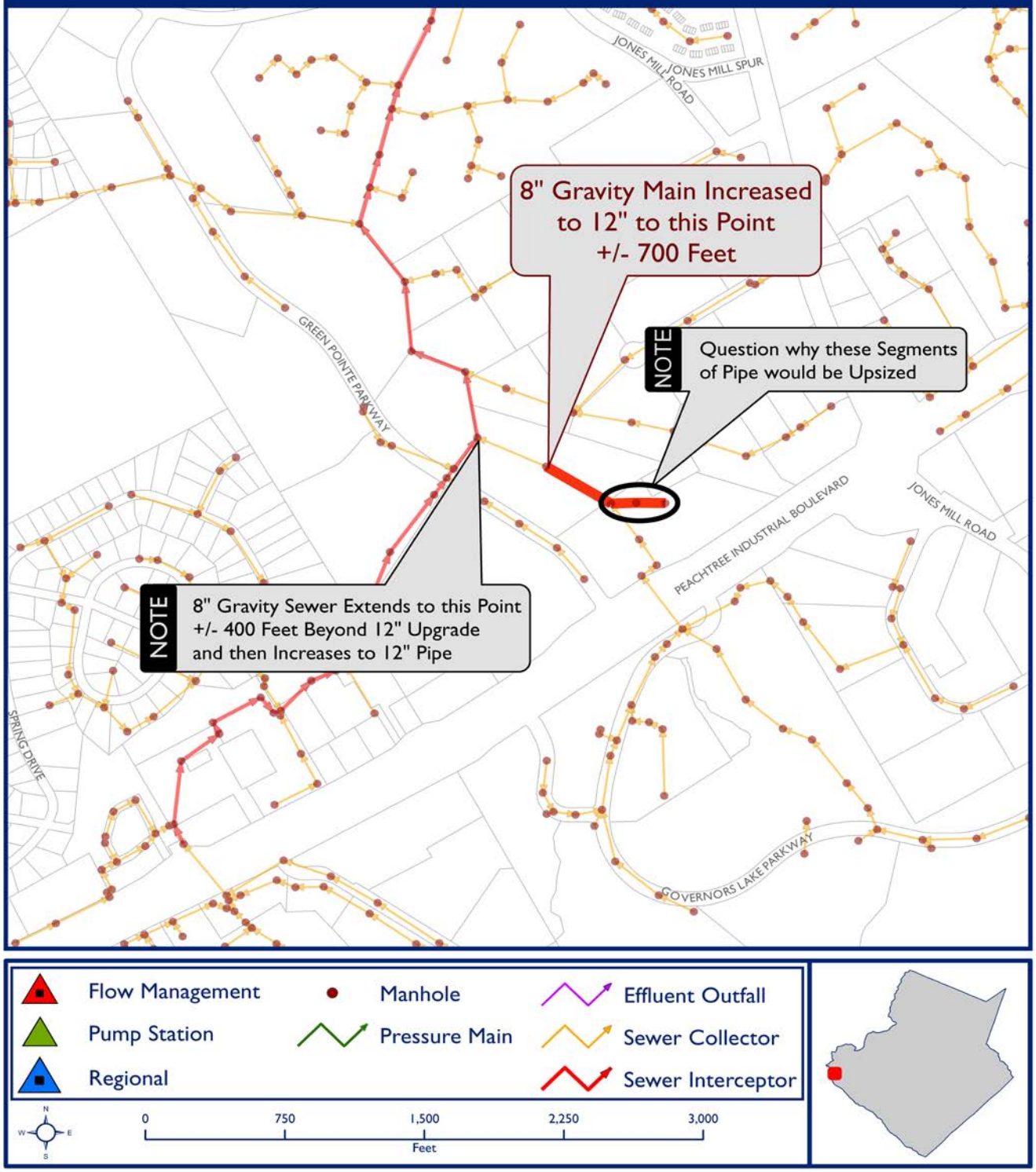

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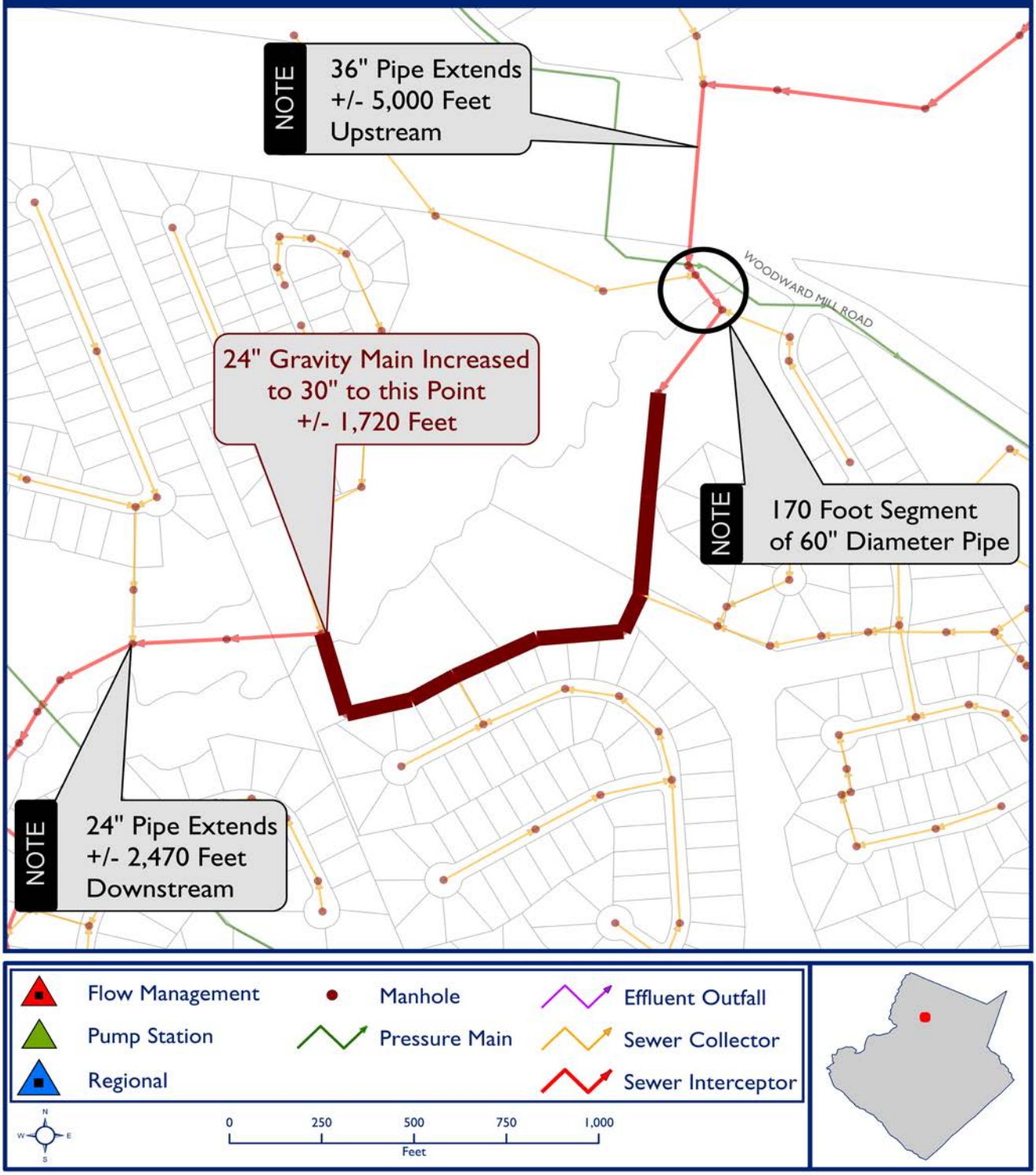

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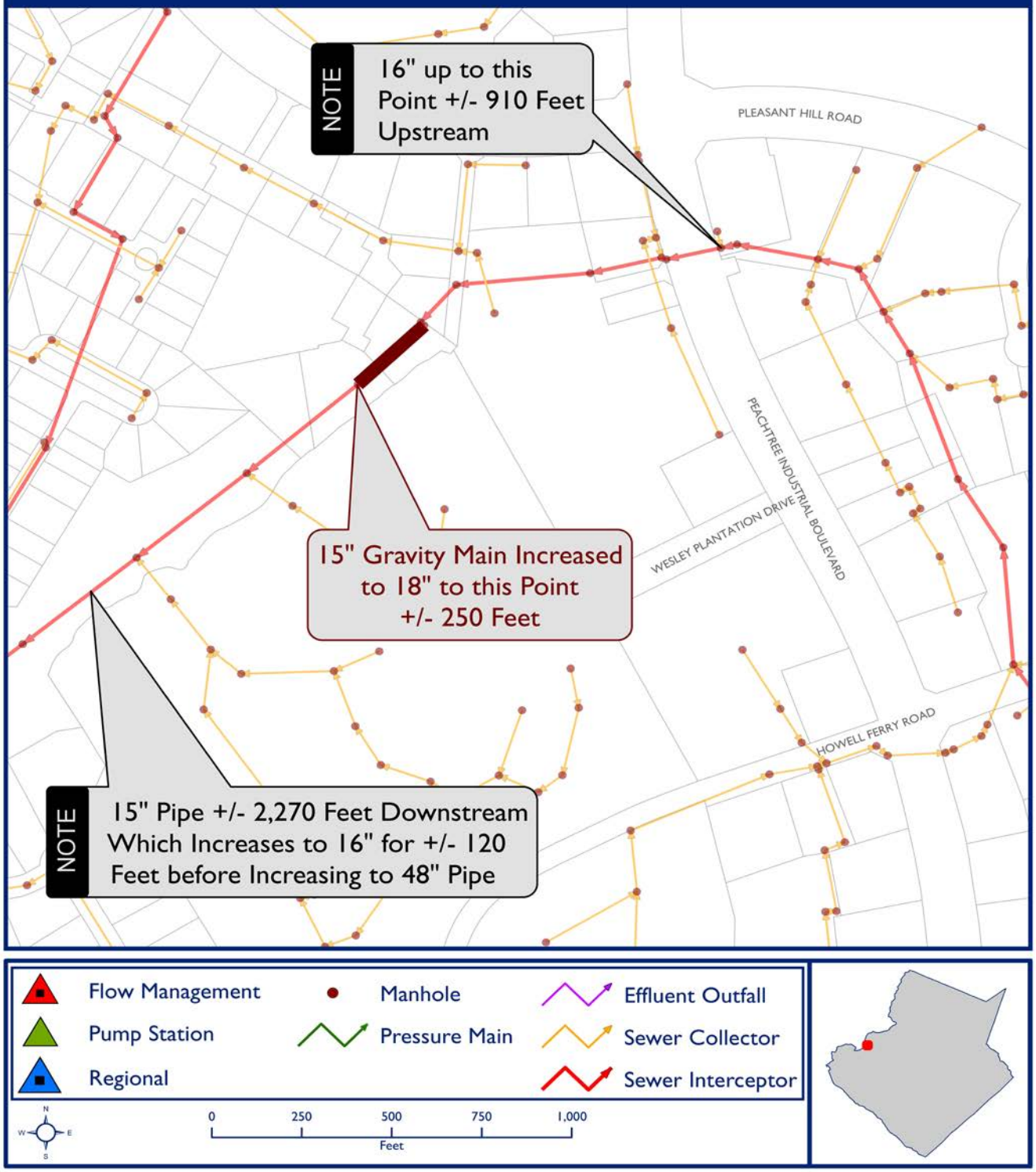

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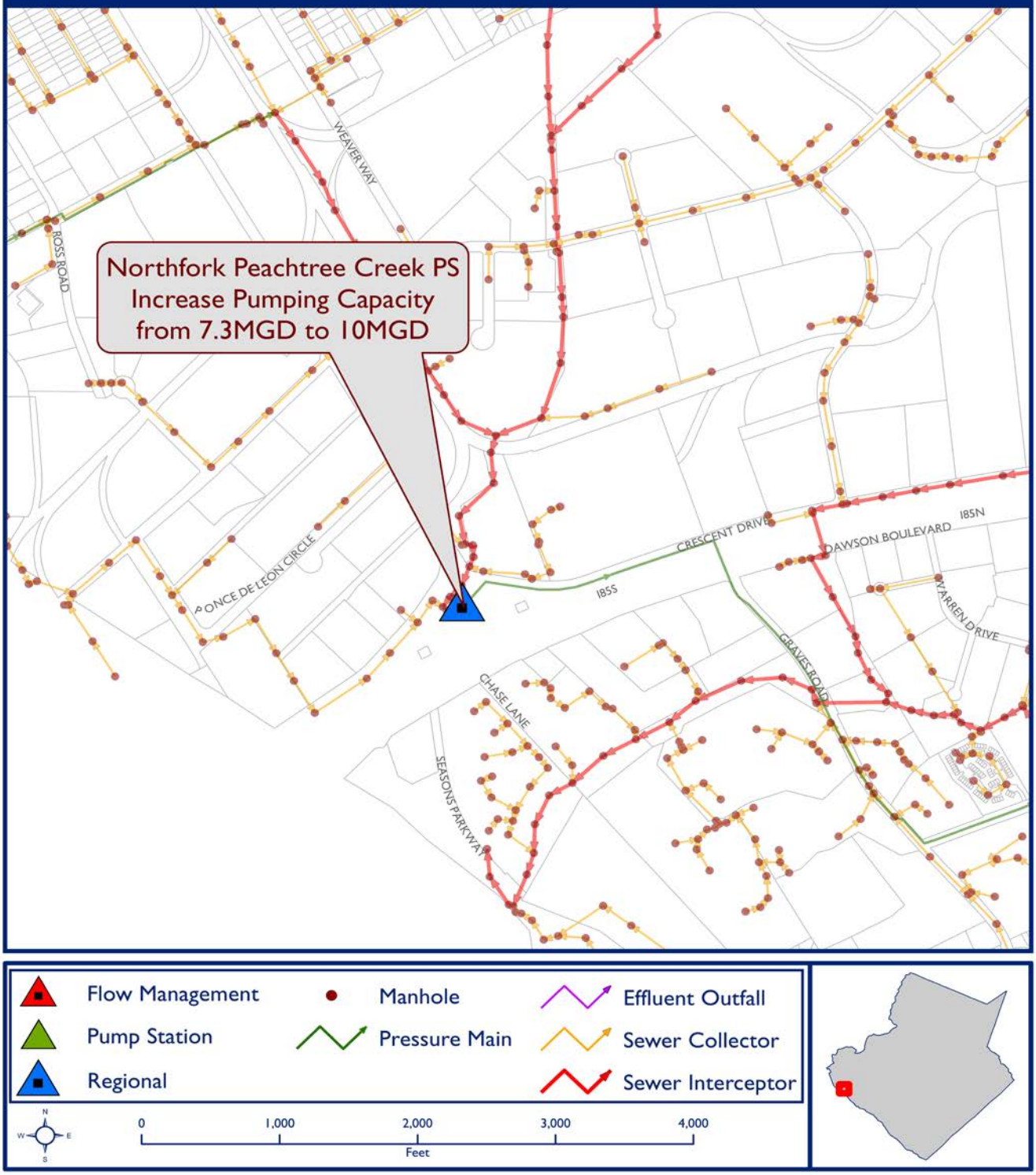
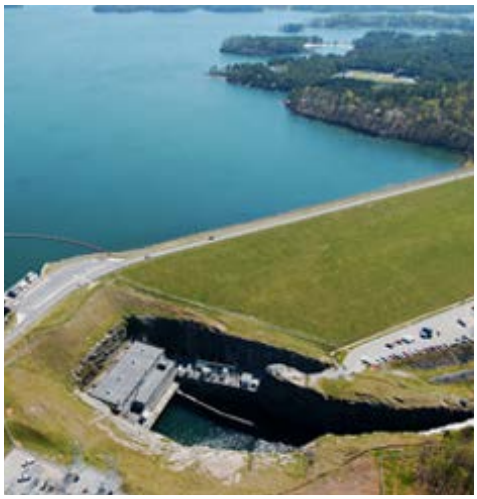


Appendix B
Technical Memoranda

2030 Water and Wastewater
Master Plan



AECOM

AECOM Water
In association with: **JJG & PPI**

Gwinnett County 2030 Water and Wastewater Master Plan

Technical Memorandum 1

Population and Employment Forecasts

TO:	Todd Cleaver - Gwinnett County Planning and Development	PAGES:	12
SUBJECT:	Gwinnett County 2030 Water and Watewater Master Plan Technical Memorandum 1 – Population and Employment Forecasts		
FROM:	Nancy Gonce, AECOM		
BY:	David King, PE and Tai-Yi Su, PE; Jordan, Jones & Goulding		
DATE:	September 22, 2010		

SUMMARY

The Gwinnett County 2030 Unified Plan (Unified Plan) is the guiding document for development within the County. After reviewing recent population estimates and various existing projections with Gwinnett County staff, it was concluded that the International Gateway Scenario in the Unified Plan will be used for long-term planning of water and wastewater infrastructure with flow triggers that will be determined later in this planning process. The planning team will jointly develop these flow triggers with Gwinnett County staff to indicate when capital improvement projects are expected in order to meet short- and long-term needs of the County. In this scenario, the population in Gwinnett County is projected to reach 1.15 million, a 45-percent increase over a 20-year planning horizon. The employment is projected to reach approximately 595,000 in year 2030, or a 60-percent increase in total number of jobs from 2010. A review of projected population and employment distribution among Gwinnett County's eight major watersheds and 60 water and wastewater subbasins showed that the Upper Yellow River and the Chattahoochee River watersheds will continue to have the highest concentration of future population and employment, and therefore the highest future water demand and wastewater treatment needs. These projections along with the future land use trends identified in the Unified Plan will be used to develop water demand and wastewater flow projections for the planning horizon. Gwinnett's 2030 water and wastewater infrastructure needs will be identified based on these projections.

INTRODUCTION

Gwinnett County enlisted AECOM in partnership with Jordan, Jones and Goulding, Inc. (JJG) and Precision Planning, Inc. (PPI) to develop the Gwinnett County 2030 Water and Wastewater Master Plan (Master Plan) that incorporates the most-recent growth projections and updated demand factors including current water conservation measures. The Master Plan will be used to guide capital investments and utility planning proactively for the next 20 years. This technical memorandum establishes a foundation for the utility master planning by defining the population and employment projections as well as their disaggregation throughout Gwinnett County from year 2010 to the 2030 planning horizon.

TRENDS

Gwinnett County and the Atlanta region have experienced growth that has significantly outpaced the national average over the past half-century. This divergence can primarily be attributed to above-average regional job-growth and the growing regional significance of the Atlanta area. Additionally, Gwinnett County has outpaced the growth rate of the collective Atlanta metropolitan counties over this same time period and has converted from rural agricultural land use to mainly suburban and commercial land use. However, since the recession began in December of 2007, Gwinnett County as well as the Atlanta Region's above-average growth rate has declined due to the national housing slump. The Unified Plan, completed in 2008, predicted slower but continued population and employment growth over the next 25 years. The Unified Plan integrates two traditionally separate plans: the Comprehensive Plan and the Consolidated Plan and will guide future land use and community development decisions in Gwinnett County through 2030. The Unified Plan will be used as the basis for the water and wastewater master planning effort.

REVIEW OF EXISTING POPULATION PROJECTIONS

The Unified Plan provides a detailed analysis of historic population trends for Gwinnett County by decade and two future growth scenarios for population projections: the "Middle of the Pack" scenario and the "International Gateway" scenario. These growth scenarios were compared to other existing population projections to determine the most appropriate forecasted growth rate for the Master Plan.

Since the Unified Plan was completed, the Atlanta Regional Commission (ARC) and the U.S. Census Bureau published their 2009 population estimates, while the Georgia Office of Planning and Budget (OPB) published population projections in March 2010. Population estimates are an evaluation of current or past year's population for a region, and the ARC and U.S. Census Bureau estimate Gwinnett County's 2009 population to be 757,300 and 808,167, respectively. Population projections, also known as population forecasts, are a judgment regarding a region's population in future planning horizons. Table TM1.1 provides a summary overview of various sources of Gwinnett County projections from 2010 to 2030.

Table TM1. 1: Comparison of Existing Population Projections and Estimates

Source	YEAR					
	2009[1]	2010	2015	2020	2025	2030
Unified Plan - Middle of the Pack Scenario (2008)		795,444	897,313	949,657	996,747	1,041,380
Unified Plan - International Gateway Scenario (2008)		795,444	884,083	972,722	1,061,361	1,150,000
Atlanta Regional Commission County Projections[2] (2006)	757,300	760,134	843,944	900,950	945,891	988,694
Metro North Georgia Water Planning District[3] (2009)			843,900		945,900	
Georgia Office of Planning and Budget (2010)		825,818	910,677	1,006,914	1,113,479	1,208,392
US Census Bureau (2009)	808,167					

1 – Population Estimates, ARC (April 2009) & US Census Bureau (July 2009)
2 – http://www.atlantaregional.com/info-center/arc-region
3 – Water Supply and Water Conservation Plan, Metro North Georgia Water Planning District, May 2009

Population Estimates		Population Projections				
✕	△	■	■	▲	●	◆
US Census Estimates (2009)	ARC Estimates (2009)	Unified Plan Middle of the Pack Scenario (2008)	Unified Plan International Gateway Scenario (2008)	Atlanta Regional Commission County Projections (2006)	Metro North Georgia Water Planning District (2009)	Georgia Governor's Office of Planning and Budget (2010)

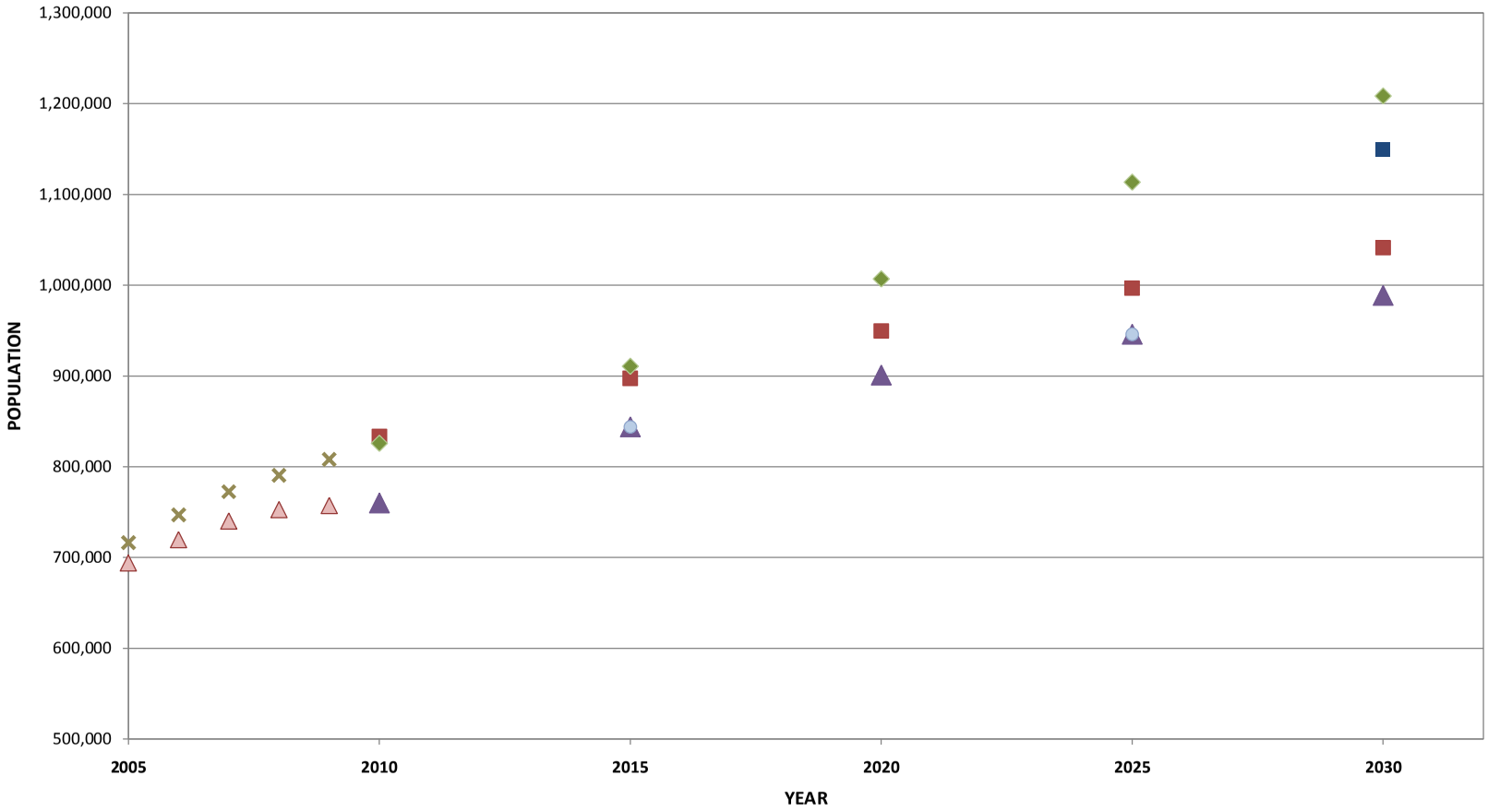


Figure TM1.1: Gwinnett County Population Projection Comparison

Among the five sets of projections, the OPB's projections provide the most aggressive rate of growth for Gwinnett County while the ARC projections are the most conservative. OPB's projections were based on recent census data, which was higher than estimates provided by ARC. The Metro North Georgia Water Planning District (MNGWPD) used the 2006 ARC projections in their Water Supply and Water Conservation Management Plan (May 2009). Figure TM1.1 charts recent population estimates from ARC and U.S. Census Bureau over the past four years and various population projection sources for Gwinnett County. After experiencing the historical growth in the past decade (an average annual increase of 18,761 from 2000 to 2009), the County experienced dramatic slowdown in population growth in 2008 to 2009 (an increase of 4,500) based on ARC's recent publication. However, similar slowdown is experienced nationwide and in all counties in the metro Atlanta region; Gwinnett's 2008-2009 increase still ranked second in the region behind Fulton County.

REVIEW OF EMPLOYMENT PROJECTIONS

In addition to population trends, employment data provides a greater level of detail for water and wastewater planning. The Unified Plan indicates that job growth will remain strong in general with some sectors such as light industry, warehousing/distribution, construction, and retail, slowing compared to historical trends. The employment trends will be compared to the future land use plan to detect implications to employment centers and to determine areas of high water demand and/or wastewater discharge. The Unified Plan outlines the employment projections for Gwinnett County using the 2005 Gwinnett County employment estimate for a base as summarized in Table TM1.2. The range of the Unified Plan's job growth projections between the scenarios is 31 and 60 percent from 2010 to 2030, and the primary sectors of growth are professional services, advanced technical, and government related services.

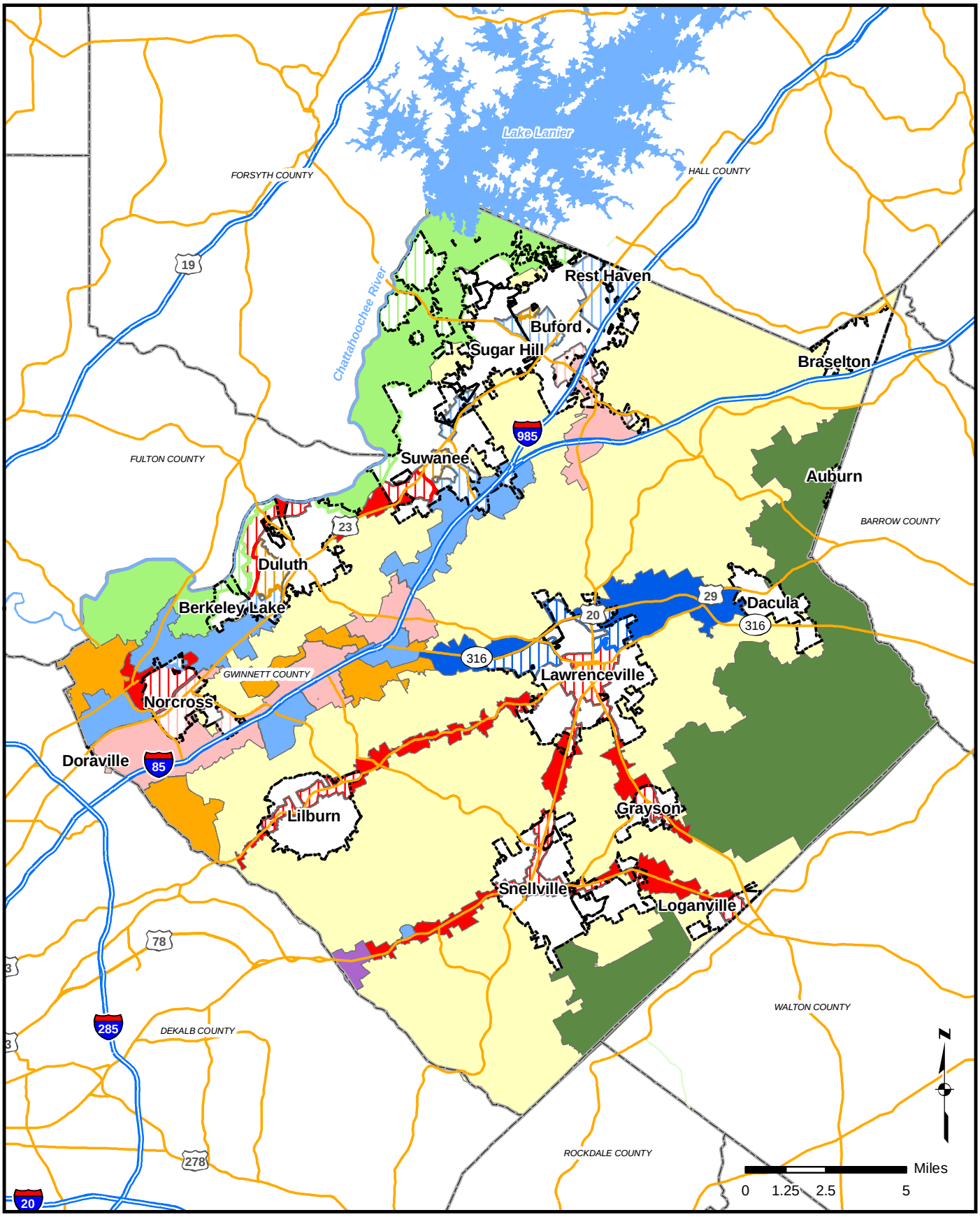
Table TM1. 2: Comparison of Existing Employment Projections (# of jobs)

Source	YEAR				
	2010	2015	2020	2025	2030
Unified Plan - Middle of the Pack Scenario (2008) [1]	371,660				487,719
Unified Plan - International Gateway Scenario (2008) [1]	371,660	427,483	483,305	539,128	594,950
Atlanta Regional Commission County Projections (2006)		396,110	438,052	477,215	516,001

Note 1: Unified Plan employment forecasts were interpolated based on employment for 2005 and 2030

REVIEW OF FUTURE LAND USE

The future land use development map in the Unified Plan, as shown in Figure TM1.2, reflects the County's vision for development over the next 20 years. The Unified Plan shows future employment hubs, high density residential centers and mixed use areas along the major transportation corridors with suburban areas surrounding. Future business and mixed-use areas are planned along I-85 and an advanced research and development center is planned along University Parkway (SR 316) near Lawrenceville. The land use plan encourages opportunities for residents to live near work. In addition to preserving the rural nature of eastern Gwinnett County, the Unified Plan designated approximately 20% of the County with potential for redevelopment. These land use trends will be considered when planning the County's future water and wastewater needs.



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM1.2
Gwinnett County
2030 Unified Plan
Future Development Map

April 2010

Legend
Character Areas

- Regional Mixed-Use
- Preferred Office
- Corridor Mixed-Use
- Community Mixed-Use
- R & D Corridors
- Mixed Housing Types
- Existing/Emerging Suburban
- Chattahoochee River Area
- Rural/Estate Areas

*hatched areas indicate land within corporate limits

RECOMMENDED SCENARIO

After discussions with the Gwinnett County staff, the International Gateway Scenario for population and employment growth from the Unified Plan was selected as the most appropriate basis for long-term planning of water and wastewater infrastructure in Gwinnett County. Under this scenario, Gwinnett County's total population is projected to grow from 795,444 to 1,150,000 in 2030 (an increase of approximately 45%) with a 60% increase in employment opportunities from 2010.

Population and employment are the basis for water and wastewater forecasts. Underestimating growth can lead to reactive construction of infrastructure and can delay growth in occurring. Overestimating growth can lead to earlier-than-necessary capital investments and can result in system maintenance problems (such as water quality issues in oversized water distribution mains). To prevent these situations from happening, the plan will establish "capacity or production level" based triggers that will guide the development of infrastructure. The Strategic Infrastructure Planning Division of Planning and Development will adjust population and employment forecasts based on best available data on an ongoing basis.

REVIEW OF POPULATION AND EMPLOYMENT DISTRIBUTION

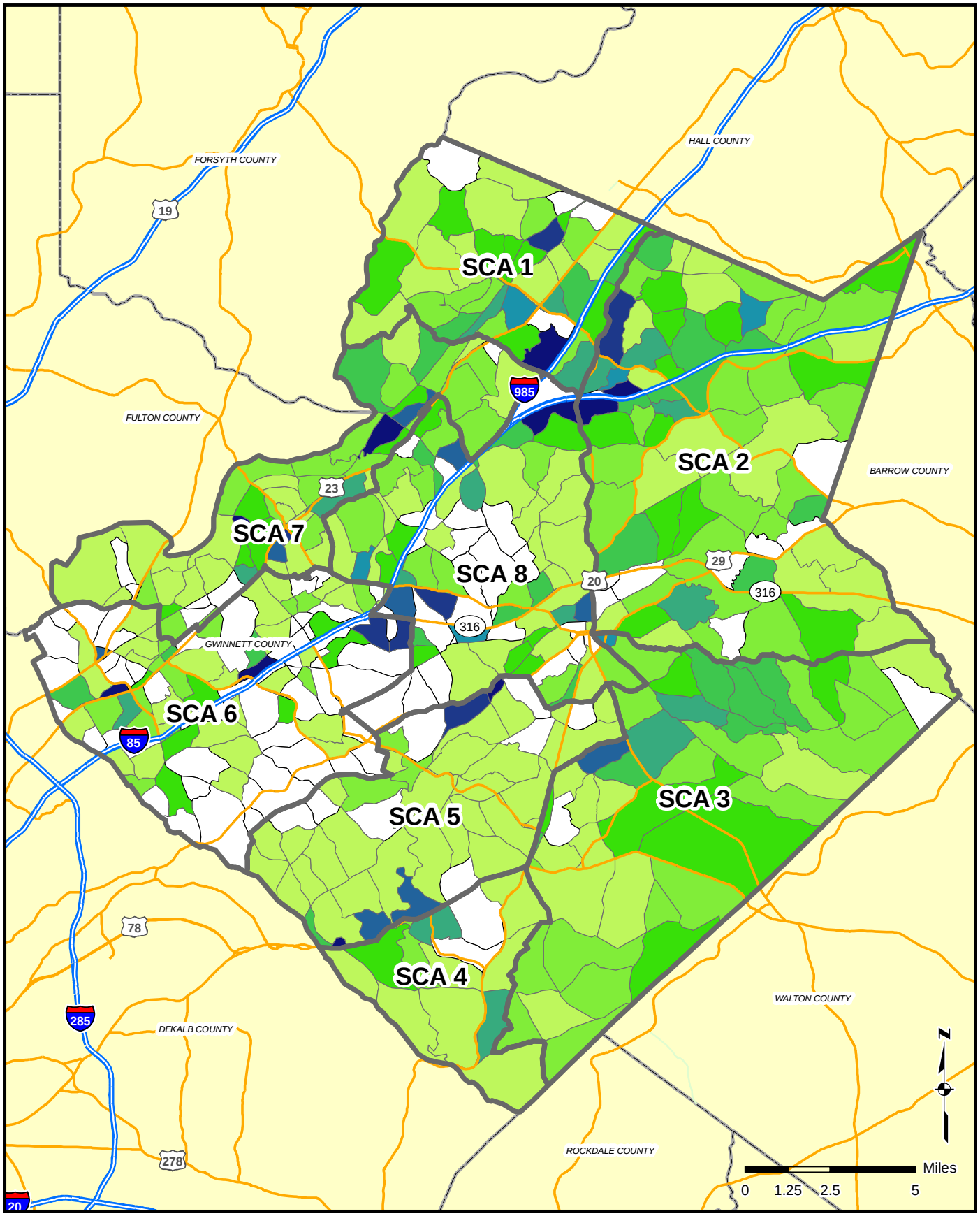
POPULATION DISTRIBUTION

The International Gateway population projections were disaggregated throughout Gwinnett County as part of the Unified Plan. Gwinnett County is divided into 8 Sub-County Areas (SCA) and these are further subdivided into 482 Traffic Analysis Zones (TAZ). Table TM1.3 summarizes the Unified Plan's International Gateway population projections by SCA. Figure TM1.3 illustrates the population projection growth from 2010 to 2030 by TAZ with the color scheme representing various ranges of change in population density.

Table TM1. 3: Gwinnett County International Gateway Scenario Population Projections by SCA

SCA	YEAR					Percent Change (2010 – 2030)
	2010	2015	2020	2025	2030	
1	43,092	58,130	73,168	88,206	103,244	140%
2	108,957	118,649	128,341	138,033	147,725	36%
3	97,908	104,592	111,275	117,958	124,641	27%
4	45,482	48,393	51,305	54,216	57,128	26%
5	100,192	103,594	106,996	110,398	113,800	14%
6	202,418	227,626	252,834	278,042	303,250	50%
7	76,240	88,957	101,674	114,390	127,107	67%
8	121,156	134,143	147,130	160,118	173,105	43%
TOTAL	**795,444**	**884,083**	**972,722**	**1,061,361**	**1,150,000**	**45%**

Figure TM1.3 suggests that growth trends relate to the type of land use. Lower density suburban areas will likely remain low density. The areas of concentrated growth occur around the designated mixed-use areas especially near major highways and interstates. The SCA of the highest percentage change in population is SCA 1 which is along a major interstate spur (I-985) and close to Lake Lanier and the Chattahoochee River, which are both desirable attractions.



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM1.3
2030 Population Density Change
Unified Plan Middle of the Pack Scenario

April 2010

Legend

Sub-County Area (SCA) Boundaries

2010 - 2030 Change in Population Density (People/Acre)

- < 0
- 0.0 - 0.5
- 0.6 - 1.0
- 1.1 - 1.5
- 1.6 - 2.0
- 2.1 - 2.5
- 2.6 - 3.0
- 3.1 - 4.0
- 4.1 - 5.0
- > 5

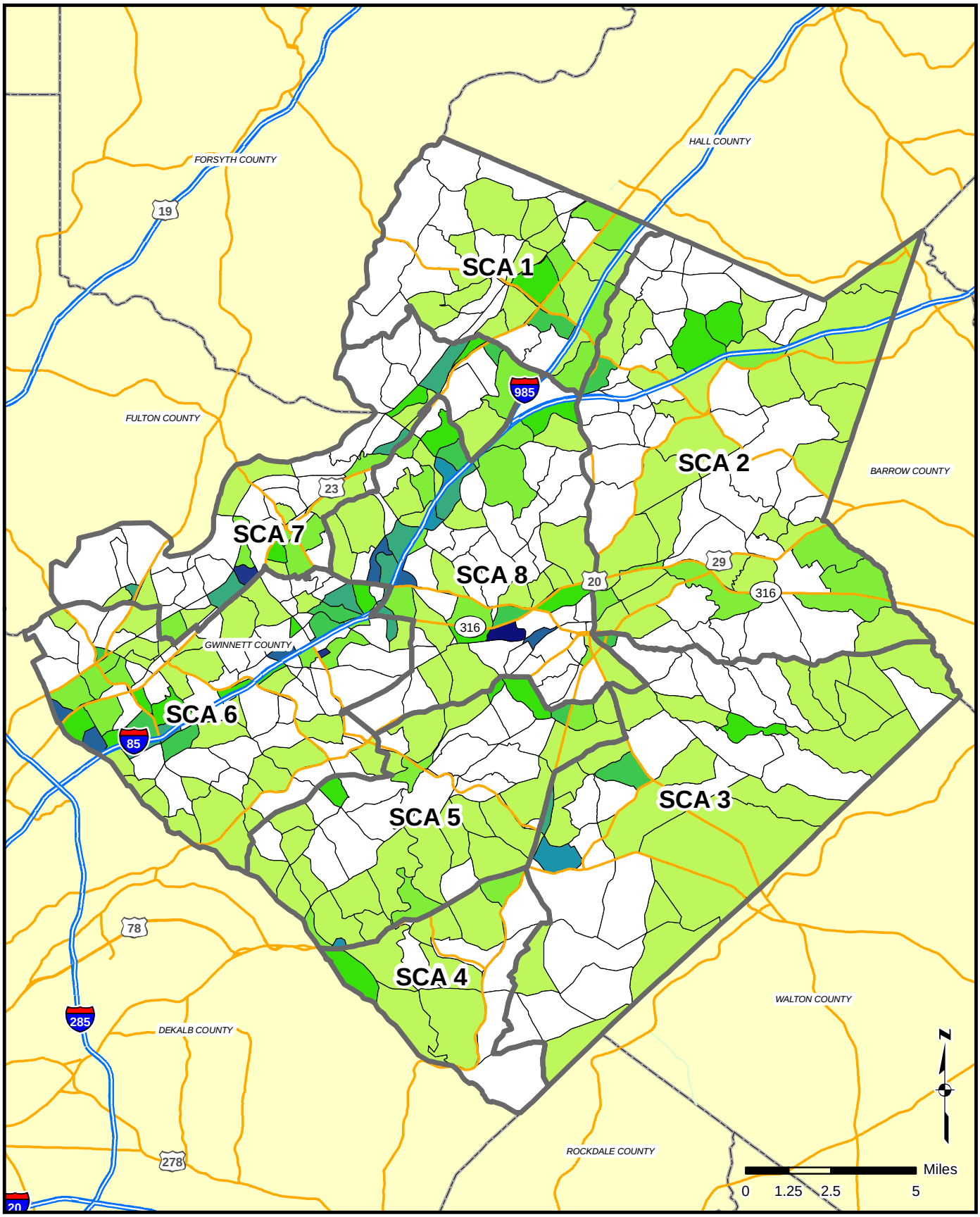
EMPLOYMENT DISTRIBUTION

The Unified Plan's International Gateway employment projections are summarized by SCA in Table TM1.4.

Table TM1. 4: Gwinnett County International Gateway Scenario Employment Projections by SCA

SCA	YEAR 2010	YEAR 2030	Percent Change (2010 – 2030)
1	25,631	61,402	140%
2	31,256	54,833	75%
3	14,165	21,179	50%
4	6,802	11,301	66%
5	22,560	25,906	15%
6	139,972	217,069	55%
7	46,116	74,864	62%
8	85,157	128,395	51%
TOTAL	**371,660**	**594,950**	**60%**

Figure TM1.4 illustrates the Unified Plan's International Gateway projected employment growth transition on a TAZ level with the color scheme representing the change in employment density. The Unified Plan identifies future business growth corridors along major transportation thoroughfares, producing more concentrated linear areas of employment. SCA 6 remains the highest subarea of employment due to proximity to Atlanta and being bisected by a major interstate (I-85).



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM1.4
2030 Employment Density Change
Unified Plan Middle of the Pack Scenario

April 2010

Legend

Sub-County Area (SCA) Boundaries

2005 - 2030 Change in Employment Density (Employees/Acre)

- < 0
- 0.0 - 2.0
- 2.1 - 4.0
- 4.1 - 6.0
- 6.1 - 8.0
- 8.1 - 10.0
- 10.1 - 12.0
- 12.1 - 14.0
- 14.1 - 16.0
- > 16

POPULATION AND EMPLOYMENT PROJECTIONS WITHIN SUBBASINS

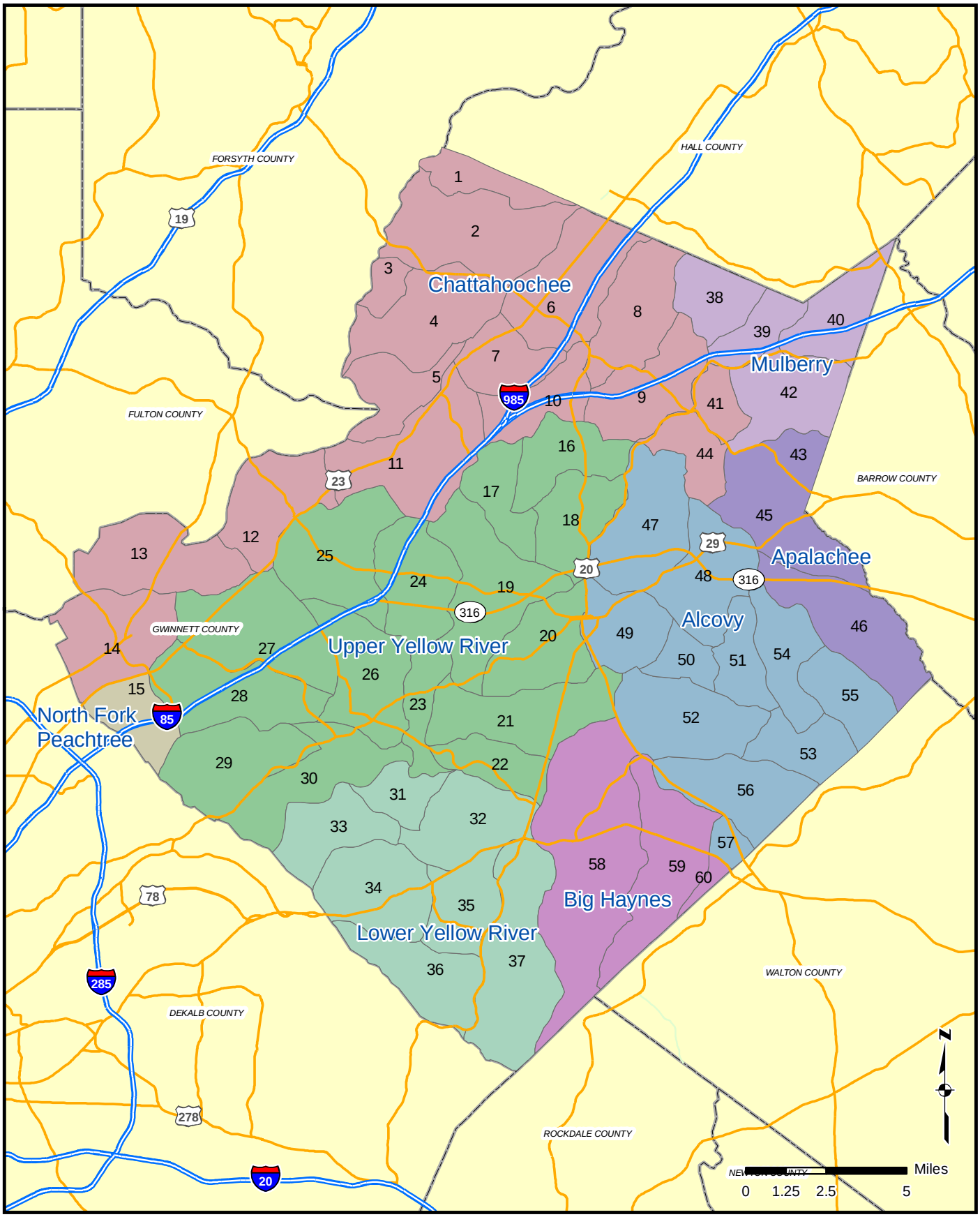
Gwinnett County has been divided into 60 water and wastewater subbasins. These subbasins average approximately 5,000 acres in size and are divided by minor receiving water bodies (e.g. Beaver Ruin Creek, Jacks Creek, etc.). As shown in Figure TM1.5, the subbasins can also be grouped into eight major watersheds that are 40,000 to 250,000 acres in size (e.g. Chattahoochee River, Alcovy River, etc.).

The TAZ boundaries afforded more detail for examining micro-scale population and employment projection distributions within Gwinnett County, but the water and wastewater subbasins will be utilized in the subsequent master planning phases when water demands and wastewater flows are estimated. Similar trends to the TAZ level comparison are apparent on a subbasin scale: higher densities of population and employment are projected in subbasins that contain the business hubs and mixed-use centers along major transportation corridors, the subbasins experiencing the largest change in population density are located in the northwest region of the county along I-985 near Lake Lanier, and the projected change in employment density is comparatively more dramatic than population density trends.

Table TM1.5 provides an overview of the projections summarized by major watersheds categorized by the 60 water and wastewater subbasins, shown in Figure TM1.5. The Chattahoochee and Upper Yellow River Watersheds will continue to have the highest concentration of population and employment through 2030.

Table TM1. 5: Population and Employment Projections by Major Watershed

WATERSHED	POPULATION		EMPLOYMENT	
	2010	2030	2010	2030
Alcovy	71,046	94,844	18,959	28,892
Apalachee	20,855	24,856	1,986	1,370
Big Haynes	49,140	59,960	7,040	11,844
Chattahoochee	168,378	324,994	122,911	231,821
Lower Yellow River	102,240	120,611	21,573	29,927
Mulberry	28,894	29,585	3,622	4,719
North Fork Peachtree	20,118	28,158	11,765	26,573
Upper Yellow River	334,773	466,992	183,803	259,805
TOTAL	**795,444**	**1,150,000**	**371,660**	**594,950**



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM1.5
Water & Wastewater Subbasin Overview
Gwinnett County, Georgia

April 2010

Legend

Subbasins
Major Watershed
- Alcovy
- Apalachee
- Big Haynes
- Chattahoochee
- Lower Yellow River
- Mulberry
- North Fork Peachtree
- Upper Yellow River

CONCLUSIONS

After reviewing recent population estimates and various existing projections with Gwinnett County staff, it was concluded that the International Gateway Scenario in the Unified Plan is most appropriate for long-term planning of water and wastewater infrastructure. In this scenario, the population in Gwinnett County is projected to reach 1.15 million, a 45-percent increase over a 20-year planning horizon. The employment is projected to reach approximately 595,000 in year 2030, or a 60-percent increase in total number of jobs from 2010. A review of projected population and employment distribution among Gwinnett County's eight major watersheds and 60 water and wastewater subbasins showed that the Upper Yellow River and the Chattahoochee River watersheds will continue to have the highest concentration of future population and employment, and therefore the highest future water demand and wastewater treatment needs. These projections, along with the future land use trends identified in the Unified Plan, will be used to develop water demand and wastewater flow projections for the 2030 planning horizon. Subsequently, the water and wastewater infrastructure needs will be identified based on these projections. The planning team and Gwinnett County staff will jointly develop flow triggers for timing the needs of water and wastewater infrastructure improvement projects later in the planning process.

AECOM

AECOM Water
In association with: **JJG & PPI**

Gwinnett County 2030 Water and Wastewater Master Plan

Technical Memorandum 2

Summary of Water and Wastewater Forecasts

TO:	Todd Cleaver – Gwinnett County Planning and Development	PAGES:	20
SUBJECT:	Gwinnett County 2030 Water and Wastewater Master Plan Technical Memorandum 2 – Summary of Water and Wastewater Forecasts		
FROM:	Kim Shorter, AECOM		
cc:	David King, PE and Tai-Yi Su, PE; Jacobs		
DATE:	September 22, 2010		

SUMMARY

This Technical Memorandum presents the forecasted Gwinnett County water supply demands and wastewater flows for the planning period ending in 2030. The forecasted water and wastewater demands are associated with the anticipated future increases in population and employment presented in Gwinnett County's 2030 Unified Plan. The population and employment forecasts, presented in Technical Memorandum 1, are based on the International Gateway scenario in the Unified Plan. Under this scenario, the population is expected to increase by 45 percent during the next 20 years, from almost 800,000 in 2010 to 1.15 million people by 2030.

The water and wastewater demands will increase during the planning period in conjunction with the County's expected growth and development. The estimated water demand with the existing conservation program is projected to increase to 154 million gallons per day (MGD) by 2030 on an annual average day basis. Similarly, the wastewater flows are projected to increase to an average daily flow of 104 MGD by 2030. These forecasts include the demand reductions expected from the existing water conservation program. The reductions will be achieved through implementation of the requirements of the Metro Water District 2009 Water Supply and Water Conservation Management Plan, as well as the requirements of the recently adopted statewide Water Stewardship Act (SB 370).

Table TM2.1 and Table TM2.2 present the water and wastewater forecasts from 2015 to 2030 in 5-year increments.

Table TM2.1: Water Demand Forecast Summary (MGD)				
Year	**2015**	**2020**	**2025**	**2030**
Annual Average Day Demand	121	131	142	154
Peak Day Demand	182	197	213	231

Note these demands include the existing conservation programs.

Table TM2.2: Wastewater Flow Forecast Summary (MGD)				
Year	**2015**	**2020**	**2025**	**2030**
Annual Average Day Flow	77	85	94	104
Maximum Month Flow	85	94	104	114
Peak Day Flow	116	128	142	156

The current permitted water withdrawal (from Lake Lanier) is 150 MGD on a monthly average basis, which equates to 125 MGD on an annual average basis. The permitted wastewater treatment capacity is 98 MGD on a maximum monthly basis. Based on the projected demands, additional water withdrawal and wastewater discharge permitted capacity will be needed within the planning horizon. Further analysis of future water and wastewater needs will be included as part of the alternatives analysis.

INTRODUCTION

Technical Memorandum 2, as part of the Gwinnett County 2030 Water and Wastewater Master Plan, summarizes the water and wastewater flow forecasts for the 20-year planning horizon. The water and wastewater forecasts were developed using the population and employment projections presented in Technical Memorandum 1.

This Technical Memorandum is organized in the following sections:

- Population and Employment Projection Overview – This section summarizes the population and employment projections developed in Technical Memorandum 1 for each of the 60 water and wastewater sub-basins.
- Water Demand Forecast – This section provides an overview of the existing water system use characteristics and the methodology used to forecast future water demands.
- Wastewater Flow Forecast – This section presents the existing wastewater system characteristics and the methodology used to estimate future wastewater flows.
- Conclusions – This section presents a brief summary of the forecasted water and wastewater demands that will serve as the basis for capital improvements that will be identified during the alternatives analysis.

The forecasts presented in this Technical Memorandum were developed in collaboration with the Gwinnett County Department of Planning and Development (P&D), and the Department of Water Resources (DWR). A workshop with key staff from both departments was held on June 10, 2010 to review the forecast methodologies and preliminary results. This Technical Memorandum summarizes the assumptions and parameters selected by the planning team and Gwinnett County staff at the workshop and the resulting forecasts.

POPULATION AND EMPLOYMENT PROJECTION OVERVIEW

The Unified Plan is the guiding document for development within Gwinnett County. As outlined in Technical Memorandum 1, the International Gateway scenario from the Unified Plan is the basis for the water and wastewater projections. The International Gateway scenario emphasizes rezoning along transportation corridors with specific areas (primarily in the eastern portion of the County) designated to maintain their rural character. Table TM2.3 summarizes the population and employment projections from the International Gateway scenario.

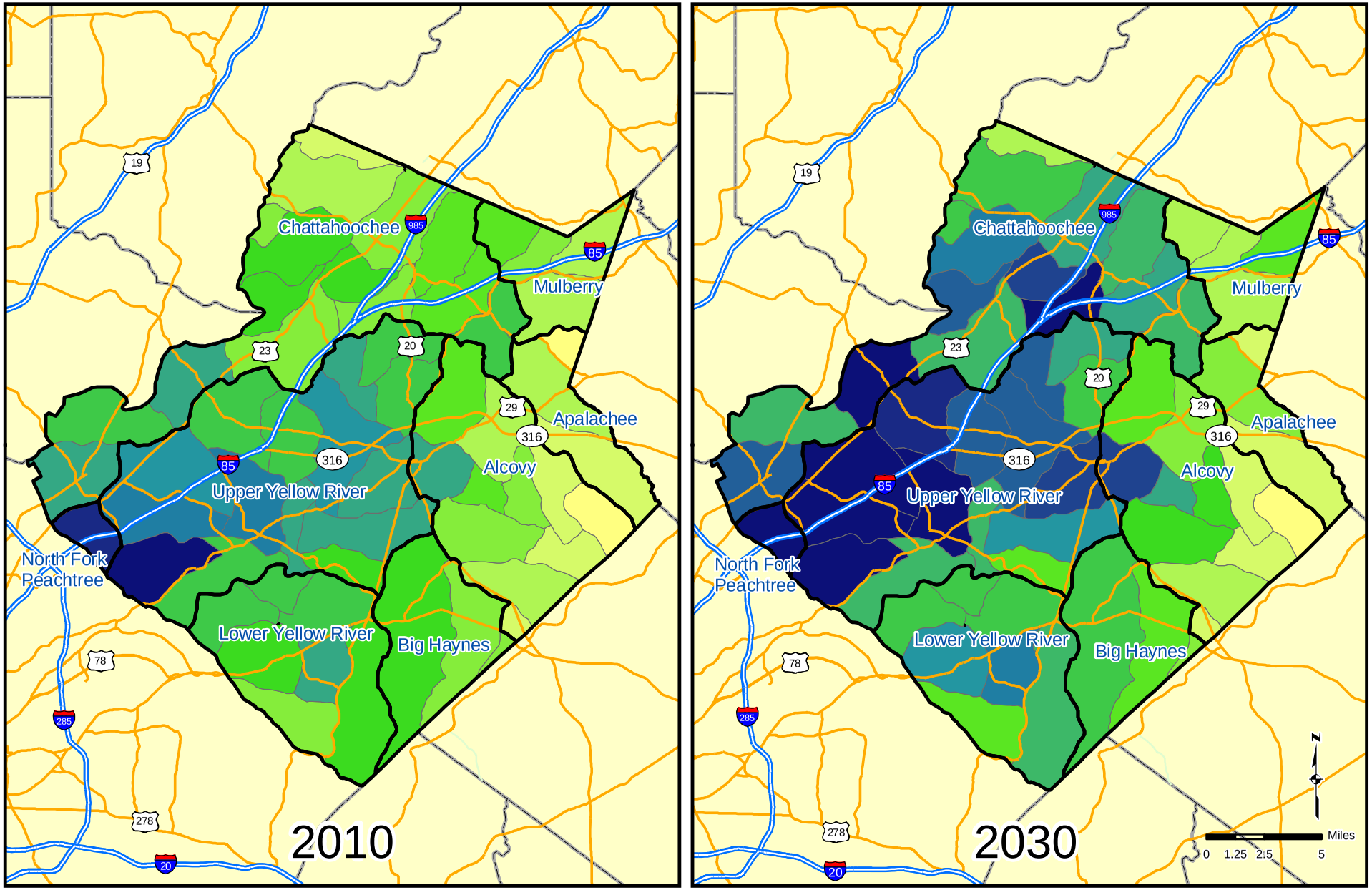
Table TM2.3: Population and Employment Projections from the Unified Plan's International Gateway Scenario

Year	2015	2020	2025	2030
Population	884,083	972,722	1,061,361	1,150,000
Employment[1]	427,483	483,305	539,128	594,950

Note 1 – Employment projections were based on the 2005 base employment of 315,838 and the projected 2030 employment as developed for the Unified Plan.

The DWR divides the County into the eight major watersheds and then further subdivides these watersheds into a total of 60 sub-basins (shown in Figure TM2.A in Appendix A). These sub-basins are the basis for DWR's planning and system evaluation activities, including the water and wastewater computer models used for planning and operations. The population and employment for each time period was distributed across the 60 sub-basins based on anticipated growth patterns. Figure TM2.1 illustrates the resulting change in population density, and Figure TM2.2 illustrates the change in employment density for each of the 60 sub-basins in the County from 2015 to 2030.

Based on the changes in population and employment density shown in Figures TM2.1 and TM2.2, the majority of the future water and wastewater needs will occur in sub-basins within the Upper Yellow River and the Chattahoochee River watersheds that follow the I-85 and GA-316 roadway corridors. This trend is consistent with the International Gateway scenario in the Unified Plan.

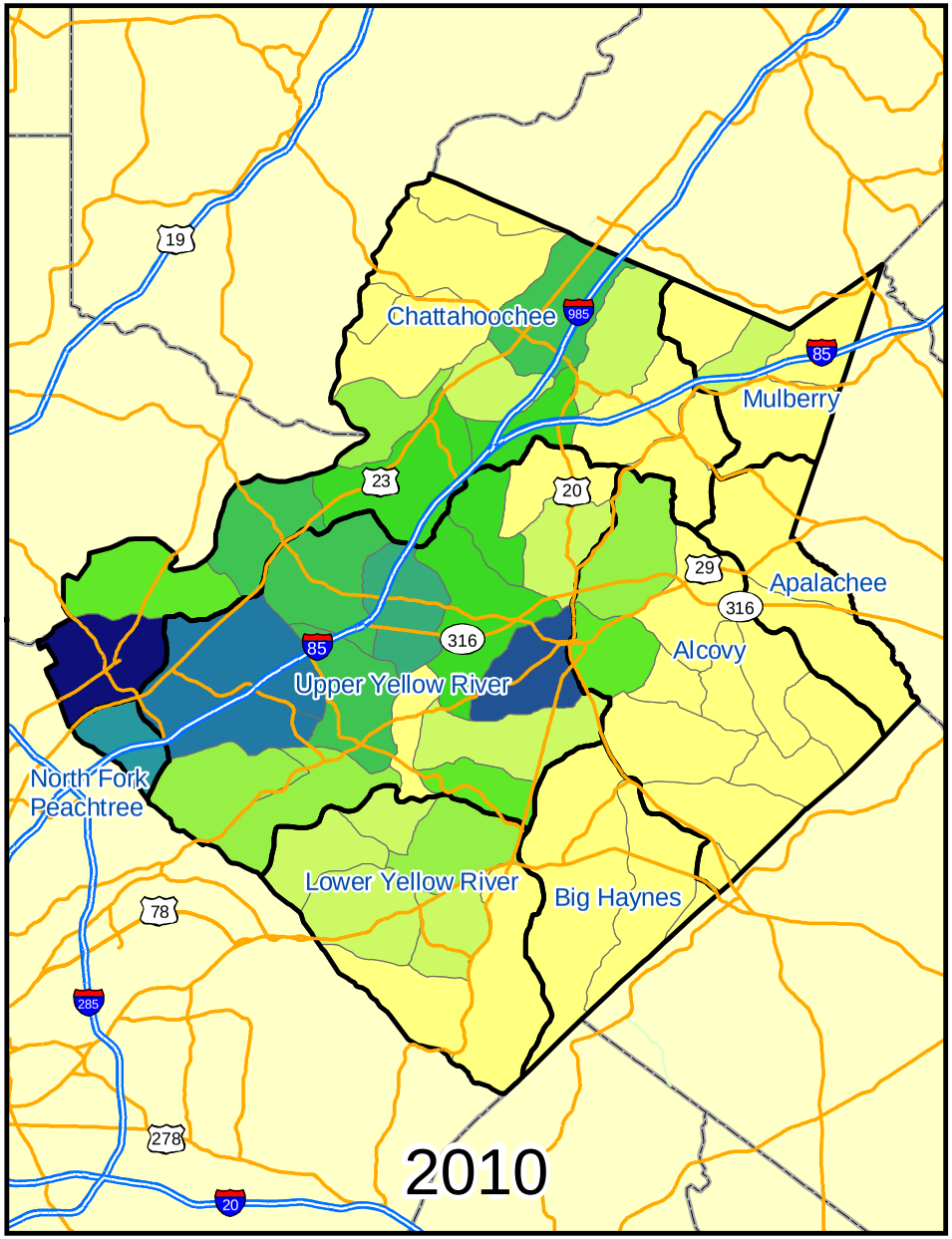


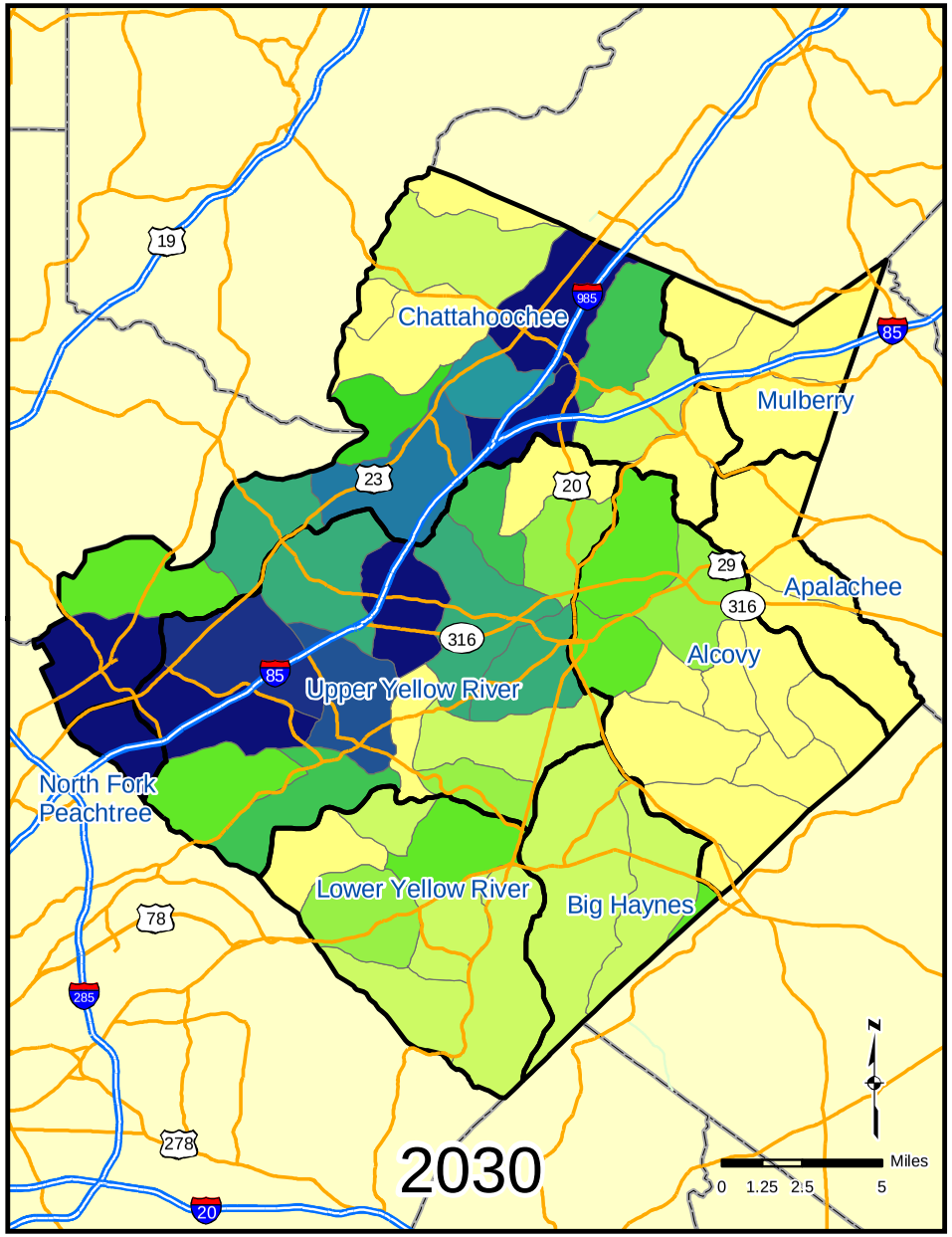
Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM2.1
Population Projection Overview by Subbasin
Unified Plan International Gateway Scenario

2010

Legend
Major Watersheds
Population Density
(People/Acre)
<0.50
0.51 - 1.00
1.01 - 1.50
1.51 - 2.00
2.01 - 2.50
2.51 - 3.00
3.01 - 3.50
3.51 - 4.00
4.01 - 4.50
4.51 - 5.00
5.01 - 5.50
5.51 - 6.00
6.01 - 6.50
6.51 - 7.00
>7.00





Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM2.2
Employment Projection Overview by Subbasin
Unified Plan International Gateway Scenario

2010

Legend
Major Watersheds
Employment Density
(Employees/Acre)
< 0.50
0.51 - 1.00
1.01 - 1.50
1.51 - 2.00
2.01 - 2.50
2.51 - 3.00
3.01 - 3.50
3.51 - 4.00
4.01 - 4.50
4.51 - 5.00
5.01 - 5.50
> 5.51

WATER DEMAND FORECAST

This section summarizes the existing water system data and methodology used to develop the water demand forecast for 5-year intervals from 2015 through 2030.

REVIEW OF EXISTING WATER SYSTEM DATA

The existing water production data, billing, and consumption reports from 2005 through 2009 were used to evaluate the current water service area characteristics. This existing data provided the foundation for estimating future water service needs.

Water System and Wholesale Customers

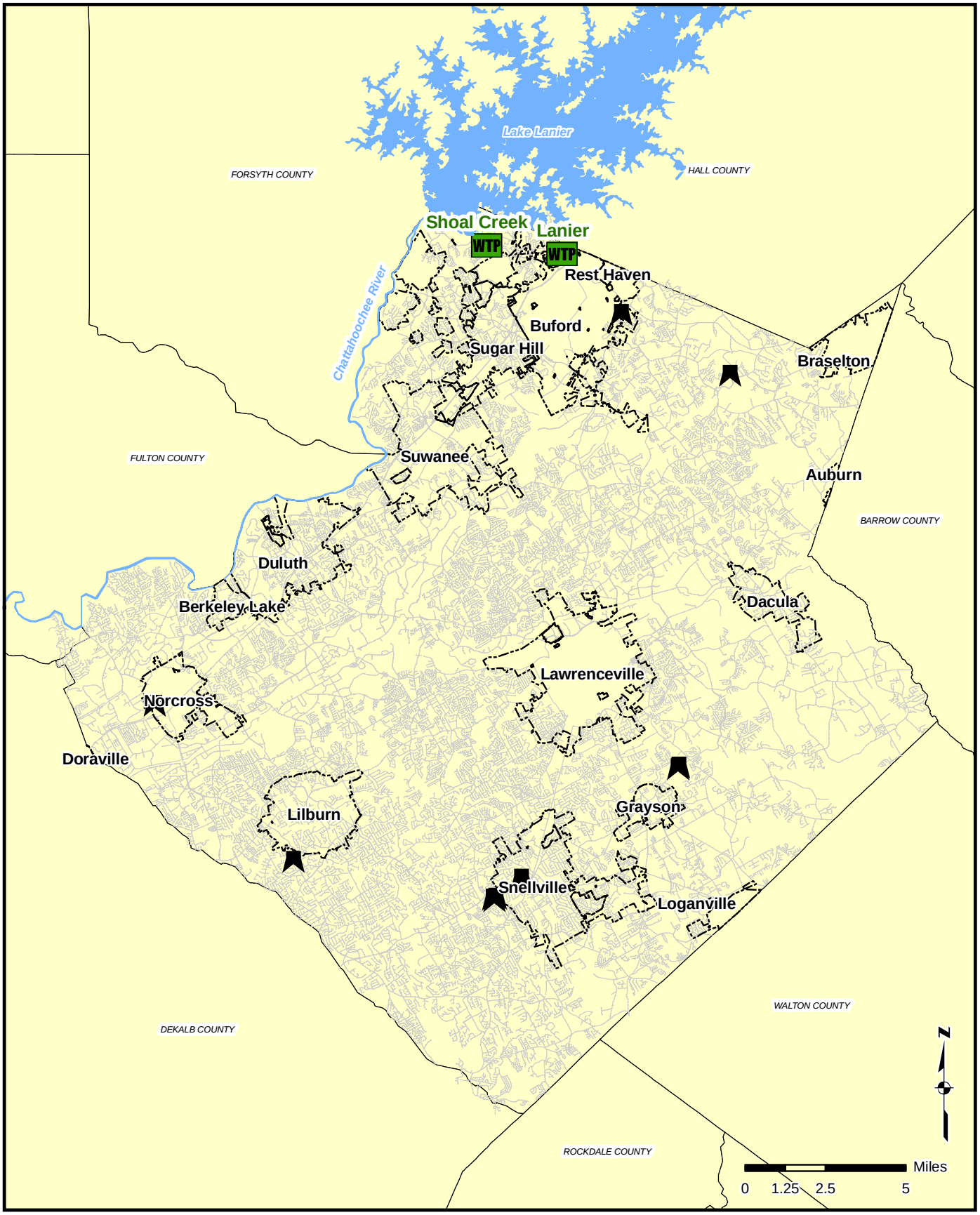
The Gwinnett County water service area serves the majority of the unincorporated county as shown in Figure TM2.3. The system consists of two primary water treatment plants (WTPs), Shoal Creek WTP and Lanier WTP, with a combined peak day treatment capacity of 225 MGD. The water distribution network includes 10 storage tanks and over 3,600 miles of water mains.

Gwinnett County currently serves over 230,000 residential, commercial, light industrial and institutional customers. In addition, 11 wholesale customers purchase water from the county. The wholesale customers include the following:

- Cities within the county with separate distribution systems: Auburn, Braselton, Buford, Lawrenceville, Loganville, Norcross, and Suwanee; and
- Customers outside of the county limits: City of Gainesville, Barrow County, Rockdale County, and Walton County.

Water Production Data

The raw water withdrawal and plant production data from both the Shoal Creek and Lanier WTPs were analyzed for a 5-year period from 2005 through 2009. The typical withdrawal for this 5-year period was 82.5 MGD on an annual average basis. This average withdrawal, however, reflects depressed water use associated with a long-term drought and mandated use restrictions. It is important to note that this period included the worst drought (2007 through 2008) in recorded history. The raw water withdrawals from the last 2 years (2008 through 2009) are approximately 20 percent lower than the first 3 years (2005 through 2007) of this period due to the stringent outdoor watering restrictions. The average volume of treated or “finished” water pumped to the distribution system for the 5-year period was 79.6 MGD on an annual average day basis. The average in-plant water use represents 3.6 percent of the total water withdrawn. This quantity is used for plant processes, including mixing chemicals, sample lines, filter backwash, and basin maintenance.



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM2.3
Gwinnett County
Water System Overview

2010

Legend

WTP — WTP

Storage Tank

Water Main

City Boundary

Peaking Factors

The peak day factor is the ratio between the volume of water produced on the peak day versus an average day for a given year and is useful for distribution system planning. Table TM2.4 presents the water production data used to calculate the peak day factor and the resulting peak day factor for each year in the 5-year period. The average peak day factor for the 5-year period is 1.4 with a range from 1.2 to 1.5. The peak day factor for 2008 is not considered representative of the system for planning purposes due to the emergency drought restrictions in effect in 2008. A peak day factor of 1.5 will be used for this Master Plan.

Table TM2.4: Water Production Summary

Year	2005	2006	2007	2008	2009
Annual Average Day Demand (MGD)	80.7	87.4	86.8	71.9	71.3
Peak Day Demand (MGD)	113.3	129.8	126.3	87.9	103.1
Peak Day Factor	1.4	1.5	1.5	1.2	1.4

Note: Peak Day Factor = Peak Day Demand divided by Annual Average Day Demand

Water Sales and Customer Classification

The volume of finished water pumped to the distribution system is comprised of two components: water use that is billed to customers and non-revenue water (NRW). Non-revenue water is the water that is distributed but not billed to customers. Non-revenue water in this Technical Memorandum follows the American Water Works Association (AWWA) definition and includes water loss from leaks, apparent losses (billing errors, metering errors, illegal use), and unbilled authorized consumption (such as water used to fight fires). Non-revenue water is essentially water that enters the distribution system that does not generate revenues for the DWR.

On average, Gwinnett County's 230,000 plus customers used and paid for 70.1 MGD of the 79.6 MGD of water pumped to the distribution system over the 5-year period from 2005 through 2009. The average NRW for the 5-year period is 12 percent. The NRW is the difference between the water pumped to the distribution system and the water billed to customers divided by the total amount of water pumped into the system.

For this Master Plan, the metered customers from the DWR billing data were divided into three primary categories: residential, commercial, and wholesale. The commercial category includes the small number (<100) of light industrial customers identified in the billing data. Table TM2.5 illustrates the average consumption for each of these customer categories over the 5-year period from 2005 to 2009.

Table TM2.5: Water System Customer Composition[1]

Customer Category	Water Sold (MGD)	Percent of Total Water Sold (%)
Residential	54.6	77.9
Commercial[2]	11.7	16.7
Wholesale	3.8	5.4
TOTAL	**70.1**	**100**

1 – Based on 2005 through 2009 billing data and GIS water meter designations.
2 – Commercial demand includes light industrial customers.

On average, residential customers account for the majority (77.9 percent) of the county's total water sales, while wholesale and commercial demands comprise the remaining water sales (22.1 percent) for the 5-year period from 2005 to 2009.

Overall Per Capita Water Demand

Overall per capita water demand represents the total amount of water entering the distribution system divided by the population served. (Note that the total withdrawal includes NRW.) This Master Plan will use an overall baseline per capita water demand of 145 gallons per capita/day (gpcd) for Gwinnett County. The 2009 Metro Water District Water Supply Plan used a baseline per capita value for Gwinnett County of 142 gpcd for 2006 with an increase to 154 gpcd by 2030. The 145 gpcd recommended for this Master Plan is an interpolated value for the 2010 base planning year.

The Metro Water District Water Plan overall per capita water demand of 142 gpcd is higher than the DWR calculated per capita for 2005 to 2009. Although the Metro Water District Plan is also based on DWR water use records, it includes an adjustment factor to normalize depressed usage during the 2006 drought to reflect expected use during a normal weather year. This overall per capita also includes 5 MGD added for future industrial demand.

The per capita demand for each customer type was then calculated based on the overall per capita of 145 gpcd and the percentage of total water use associated with that customer category (shown in Table TM2.5). The computed per capita demand for residential users is 96 gpcd and 44 gpcd for commercial users with the existing conservation programs.

Summary of Water Demand Factors

Table TM2.6 summarizes the factors used to calculate future water demands.

Table TM2.6: Water Demand Factors (2010)

Factor	Value
Overall Per Capita Water Demand (gpcd)[1]	145
Residential Per Capita Water Demand (gpcd)	96
Commercial Per Capita Water Demand (gped)	44
Peak Day Factor	1.5
Percentage of Total System Demand (%):	
• Residential	77.9
• Commercial	16.7
• Wholesale	5.4

Note 1 – Interpolated from the 2006 per capita demand (2009 Metro Water District Water Plan).

FUTURE WATER DEMAND SCENARIOS

The future water demands are presented for three different future scenarios. The first scenario of future water demands reflects the baseline (existing) per capita numbers extending the trend line into the future. The second scenario of future water demands reflects the reduction in demand associated with the regional water conservation program. The third scenario of future water demands shows the reduction in demand if the enhanced water conservation programs are implemented. This section outlines the water conservation program options and how they impact the future water demands.

Water Conservation

Gwinnett County prides itself on being a leader in water conservation and water efficiency. The County was one of the first in the State to be recognized through the Department of Community Affairs' *Water First* program for water stewardship beyond permit requirements.

As a part of the Metro Water District, Gwinnett County is actively implementing the regional water conservation program as outlined in the *2009 Water Supply and Water Conservation Management Plan*. This water conservation program, initiated in 2003 and updated in 2009, includes 12 water conservation measures. These measures include:

- Conservation Pricing
- Replace Older, Inefficient Plumbing Fixtures
- Pre-Rinse Spray Valve Retrofit Education
- Rain Sensor Shut-Off Switches on New Irrigation Systems
- Require Sub-Meters in New Multi-Family Buildings
- Assess and Reduce Water System Leakage
- Conduct Residential Water Audits
- Distribute Low-Flow Retrofit Kits to Residential Users
- Conduct Commercial Water Audits
- Implement an Education and Public Awareness Plan
- Install High Efficiency Toilets and Urinals in Government Buildings
- Require New Car Washes to Recycle Water

In addition to the measures above, the Georgia General Assembly passed the Water Stewardship Bill (SB 370) in 2010. The Water Stewardship Bill requires the installation of high efficiency water fixtures in new construction, including 1.28 gallon per flush toilets, after July 1, 2012, among other requirements.

These water demands, which account for the planned reduction in demand over the baseline based on implementation of the 2009 Metro Water District Water Plan and key elements of the Water Stewardship Bill, are shown in Table TM2.7. Combined, these programs identify a reduction in 2030 demand of over 22 MGD, as shown in Figure TM2.4 (Regional Water Conservation Programs).

Table TM2.7: Total System Water Demand Forecasts: Baseline and Conservation Scenarios (MGD)

Scenario	YEAR			
	2015	2020	2025	2030
Baseline (Existing Conservation)	129.4	144.8	160.7	176.9
Regional Water Conservation Program	120.7	131.0	142.5	154.3
Enhanced Water Conservation Program	116.5	123.2	131.9	141.2

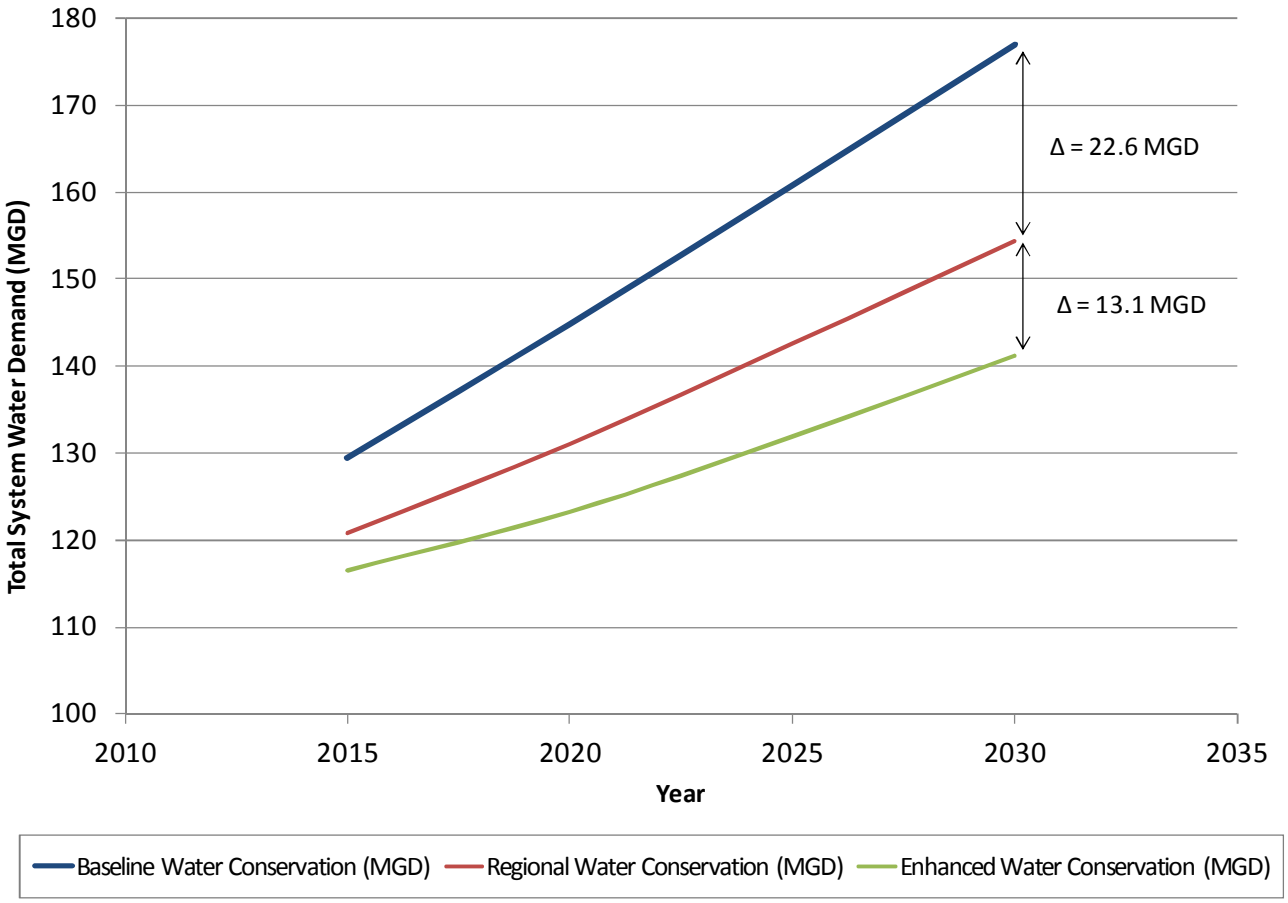


Figure TM2.4: Water Demand Forecasts Comparison (International Gateway Population Projection)

Due to concerns over future water supply and legal challenges to the use of Lake Lanier, the Metro Water District providers who rely on Lake Lanier and the Chattahoochee River are proactively considering adoption of the enhanced water conservation measures. These additional measures could reduce demand an additional 13 MGD, as shown in Figure TM2.4 (Enhanced Conservation Program). These measures have not been adopted. While the reduction in demand as a result of these additional water conservation measures is shown, the reduced demands are not the basis for this Master Plan. The results are presented as they may guide future analysis to determine the impacts to the system if these water conservation measures are adopted.

This Master Plan will use the demand reduction of almost 23 MGD associated with the regional water conservation program, shown in Figure TM2.4. This results in a 2030 demand of approximately 154 MGD on an annual average day basis. The actual reduction in demands will depend on the additional conservation measures Gwinnett County chooses to adopt beyond the existing requirements.

Summary of the Water Demand Forecast Results

The water demand forecasts are presented by customer category in Table TM2.8 for 5-year intervals from 2015 through 2030. The total water demand forecast is also summarized for the 60 sub-basins in Appendix A, Table A1. These future water demands will be input into the distribution system computer model to evaluate the distribution system response to higher demands. The distribution system model results will guide the identification of future infrastructure improvements. The water demands include the demand reductions associated with the existing water conservation program.

Table TM2.8: Water Demand Forecast Summary

Year	2015	2020	2025	2030
Total System Annual Average Day Demand (MGD)[1]	120.7	131.0	142.5	154.3
Residential Demand (MGD)[2]	82.7	89.8	97.6	105.7
Commercial Demand (MGD)[2]	17.8	19.3	21.0	22.7
Wholesale Demand (MGD)[2]	5.7	6.2	6.8	7.3

Note 1 – Existing water conservation program forecast.
Note 2 – The residential, commercial, and wholesale demands were calculated based on actual billing consumption and does not include non-revenue water; therefore the sum of these demands does not equal the total system demand which includes non-revenue water

Summary of the Water Supply and Water Treatment Needs

The water demand forecasts presented in Table TM2.8 reflect the water that will be needed to meet the demands of Gwinnett County customers. The water withdrawn from Lake Lanier and treated at the two Water Filter Plants will need to account for the in-plant water use of 3.6 percent. Therefore the permitted water withdrawal and treatment capacity in 2030 will need to be 160 MGD on an annual average basis.

WASTEWATER FLOW FORECAST

This section summarizes the existing wastewater data and methodology used to develop the wastewater demand forecasts for 5-year intervals from 2015 to 2030.

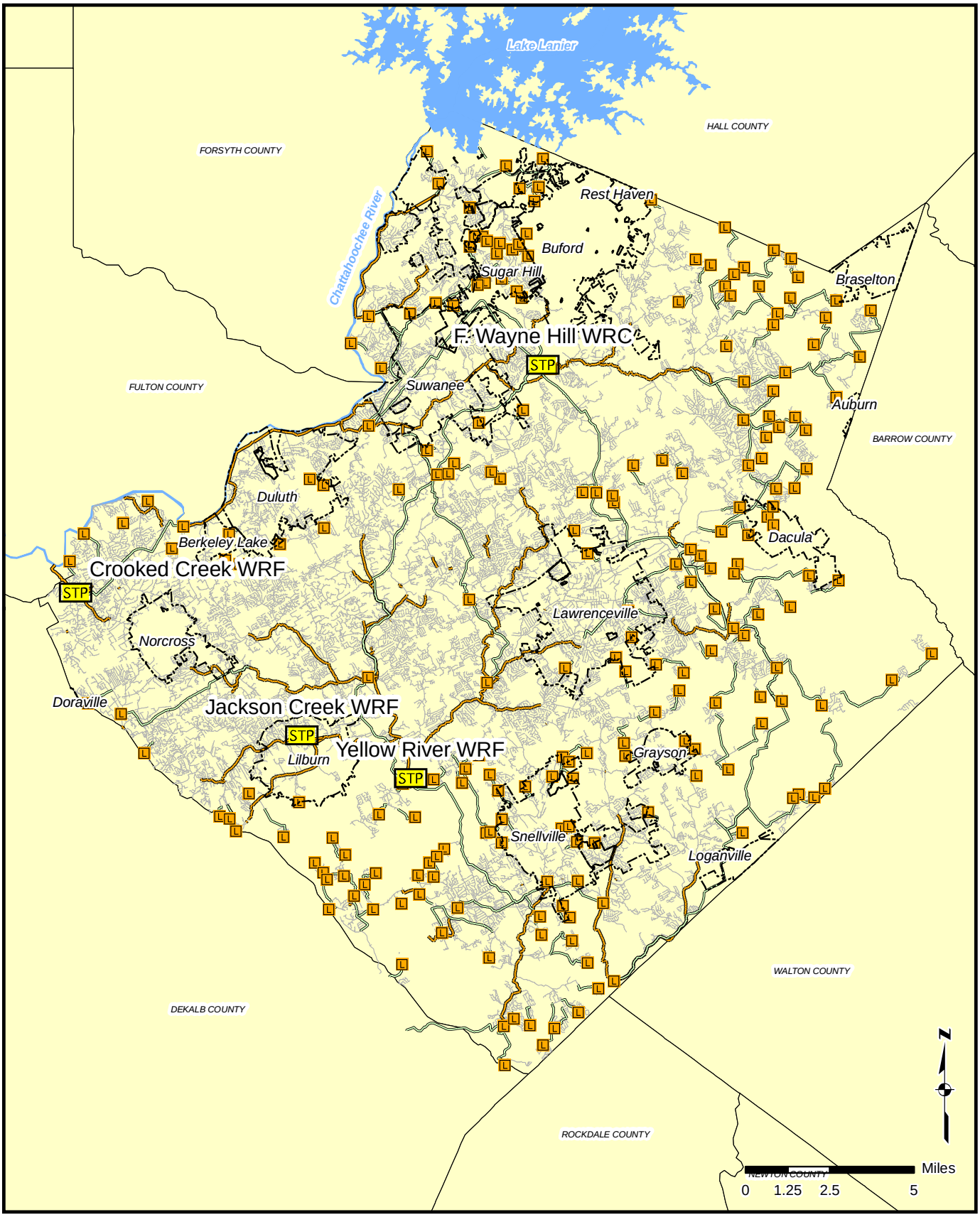
REVIEW OF EXISTING WASTEWATER SYSTEM DATA

The wastewater data presented in this section is based on wastewater treatment records from 2007 through 2009, the time period that best reflects the existing system characteristics. The timeframe evaluated for wastewater data is shorter than that for water system data due to the operational changes and plant closures described below.

Wastewater System

Over the past decade, Gwinnett County has consolidated wastewater facilities from ten facilities to only four facilities operating in 2010. The facility consolidation was accomplished to improve the level of treatment and to reduce operating costs. Gwinnett County plans to decommission one more facility, reducing the total number to three wastewater treatment plants by 2012. The four wastewater treatment plants currently in operation in Gwinnett County include Crooked Creek Water Reclamation Facility (WRF), Jackson Creek WRF, Yellow River WRF, and F. Wayne Hill Water Resources Center (WRC), with a total annual average existing permitted treatment capacity of 75 MGD, or 92.5 MGD based on maximum monthly flow. The County also has an agreement with DeKalb County to divert up to 5 MGD of wastewater to the DeKalb County Pole Bridge

Water Pollution Control Plant (WPCP). Gwinnett County is planning to decommission the Jackson Creek WRF and divert flows to one of the other County treatment plants. Flows currently sent to the DeKalb Pole Bridge WPCP will be discontinued by 2012, and treated within the Gwinnett County system. Gwinnett County also is in the process of expanding the Yellow River WRF, increasing the total permitted discharge to 98 MGD by 2012. The wastewater collection system currently includes over 220 operating pump stations, 275 miles of force mains, and approximately 2,600 miles of gravity mains. Figure TM2.5 provides an overview of the Gwinnett County wastewater system.



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM2.5
Gwinnett County
Wastewater System Overview

2010

Legend

STP WWTP
City Boundary
Pump Station
Force Main

Gravity Main
DIAMETER
< 24 inch
24+ inch

Plant Treatment Data

The data from the four existing WRFs were evaluated from the 3-year period from 2007 through 2009 to determine the annual average day flow (AADF), maximum month flow (MMF), and peak day flow (PDF). The data records included both the influent (wastewater entering the treatment plant) and effluent (treated water discharged from the plant) flows. Due to the configuration of the equalization storage at the F. Wayne Hill WRC, the influent flows were used for this analysis to assess peak flows. The annual average day flow for the DWR wastewater system between 2007 and 2009 is approximately 50 MGD. It is important to note that wastewater flows are sensitive to weather conditions similar to water flows. In 2007 and 2008, the severe drought resulted in reduced water consumption and reduced water table levels, which reduced wastewater flows; conversely, the severe floods in 2009 increased the wastewater inflow into the wastewater system.

Peaking Factors

Table TM2.9 summarizes the wastewater system flows and calculated peaking factors based on daily flow records for the 3-year period of 2007 through 2009.

Table TM2.9: Wastewater Flow Factors

Factor	Value
Annual Average Day Flow (MGD)	49.9
Maximum Month Flow (MGD)	54.4
Peak Day Flow (MGD)	74.4
MMF/AADF Ratio	1.1
PDF/AADF Ratio	1.5

Indoor Water Use

Indoor water use is assumed to return to the wastewater system, whereas outdoor water use is assumed to be lost to groundwater and/or the natural drainage system. The indoor water use percentages in the Metro Water District's 2009 Water Plan for Gwinnett County were reviewed and considered appropriate for this Master Plan. The indoor water use for residential water customers is 78 percent of total water use and 66 percent of total water use for commercial customers. The overall County average indoor water use of 77 percent was used for the wholesale water customers. The percentages for indoor water use by customer category were used to translate the forecasted water demands into forecasted wastewater demands.

Future Sewer Service Area

The wastewater flows are based on the projected population and employment growth over the planning period; however, not all of the new residents and employees will be served by centralized sewer. The population served by centralized sewer was projected by subtracting the estimated population served by septic system from the total County population. The Gwinnett County Stormwater Management Division developed a database of existing septic systems in 2006, and the DWR updated this database to reflect conditions in 2010. The septic system database provides the number of parcels served by septic systems. Multiplying the number of parcels by the average household size of 2.9 people per household from the Unified Plan provides the population served by septic systems. For 2010, approximately 27 percent of the County population is served by septic system, while the remaining 73 percent are served by centralized sewer. Figure TM2.6 shows the relative percent sewered for each sub-basin as of 2010.

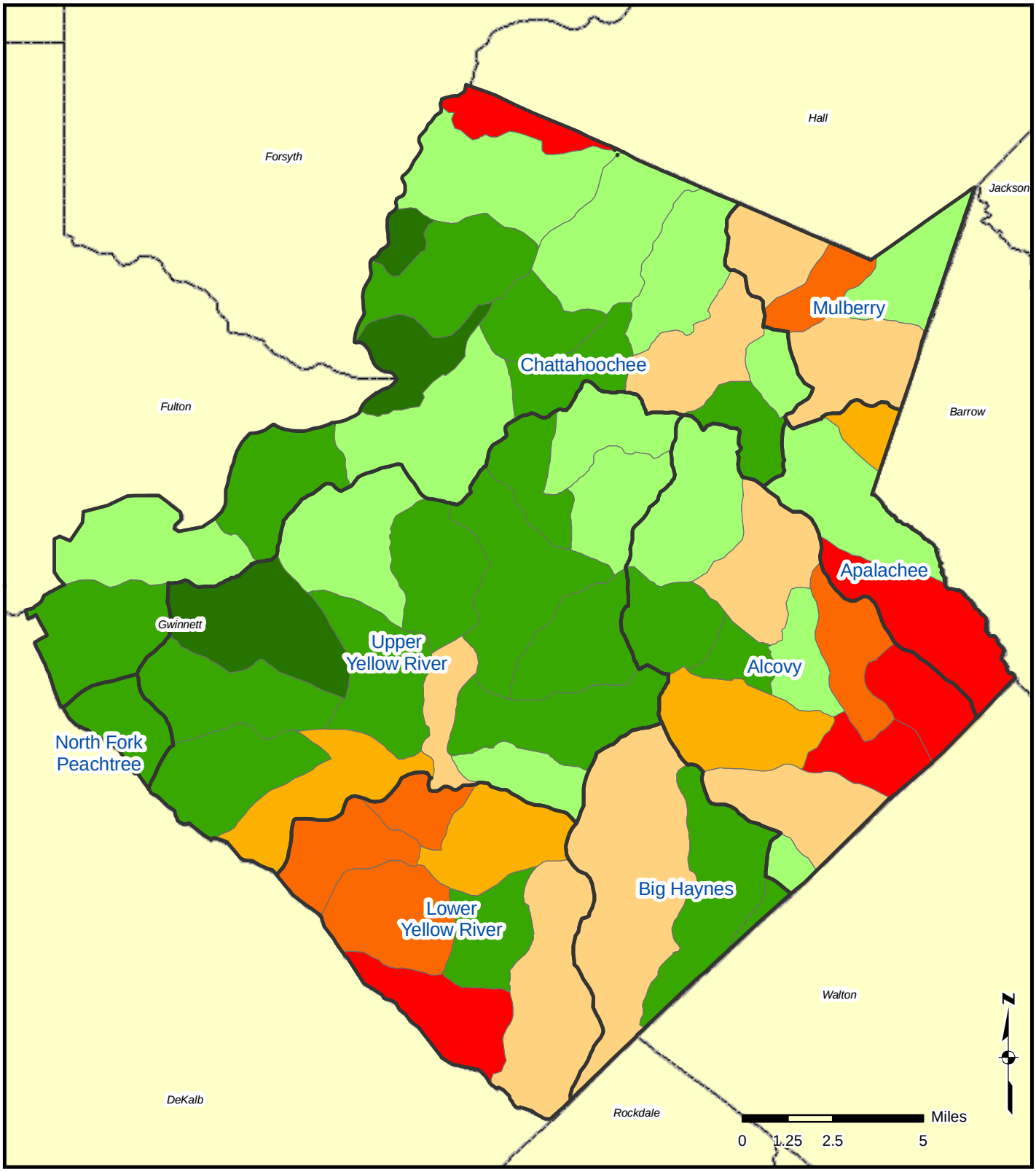
The following assumptions were used to estimate the change in sewer service area over the 2030 planning horizon:

- All of the incentivized development areas (e.g., Community Improvement District, Livable Community Initiative Area, etc.) within the County were assumed to be converted to 100 percent sewered by 2030.

- The Rural Estate Characteristic Areas (RECAs) are assumed to remain unsewered. However, for planning purposes, if a traffic analysis zone (TAZ) has more than 25 percent of its total area within 1,000 feet of an existing gravity sewer, an allowance for flows from the development was included.

- Commercial customers are assumed to be 100 percent sewered.

Based on these assumptions, the percent population served by the county system is projected to increase to 80 percent in 2030 for residential customers. The percentage of sewered area is projected to increase in most sub-basins except for along the eastern boundary of the county in the RECA sub-basins.



Gwinnett County 2030 Water & Wastewater Master Plan

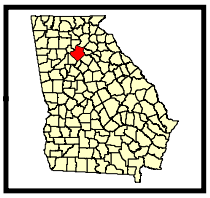


Figure TM2.6
Subbasin Overview:
Percent of Population on County Wastewater System

2010

Legend

Major Watersheds

Percent Sewered (%)

- < 15
- 15 - 30
- 30 - 45
- 45 - 60
- 60 - 75
- 75 - 90
- > 90

Inflow and Infiltration

Inflow and Infiltration (I/I) are unintended stormwater and groundwater that enter the wastewater collection system through manhole covers (inflow), illegally connected downspouts (inflow), or leaks in aging pipes (infiltration). Previously conducted I/I analyses for the Gwinnett County system were reviewed along with recent flow records from wet and dry years, both of which suggest that the average 20 percent I/I used in the 2009 Metro Water District Wastewater Plan is an appropriate assumption for the Gwinnett County wastewater collection system. The 20 percent assumed I/I is added to the estimated wastewater flow developed from the population and employment projections.

Summary of Wastewater Flow Factors

Table TM2.10 summarizes the factors that are used to forecast the future wastewater flows.

Table TM2.10: Wastewater Flow Forecast Factors

Factor	Value
Inflow & Infiltration (%)	20
Indoor Water Use – Residential (%)	78
Indoor Water Use – Commercial (%)	66
Indoor Water Use – Wholesale (%)	77
Percent Sewered – Residential (%)	73-80
Percent Sewered – Commercial (%)	99-100

1 – For planning purposes

Summary of Wastewater Flow Forecasts

The forecasted average annual wastewater flows were calculated by taking the average annual water demands with the regional water conservation program multiplied by the percentage of indoor water use for the customer category and then multiplied by the percentage of the area sewered. The I/I factor of 20 percent was added to these flows to develop the wastewater flow forecasts presented in Table TM2.11. The peaking factors were then applied to the annual average flows to calculate the maximum month flows and the peak day flows, which will be important for sizing infrastructure. The total wastewater system flow forecasts are presented in Figure TM2.7 and then by sub-basin scale in Appendix A (Table A2).

Table TM2.11: Wastewater Flow Forecasts

	YEAR			
	2015	**2020**	**2025**	**2030**
Annual Average Day Flow (MGD)	77.2	85.2	94.3	103.9
Maximum Month Flow (MGD)	84.9	93.7	103.8	114.3
Peak Day Flow (MGD)	115.7	127.8	141.5	155.9

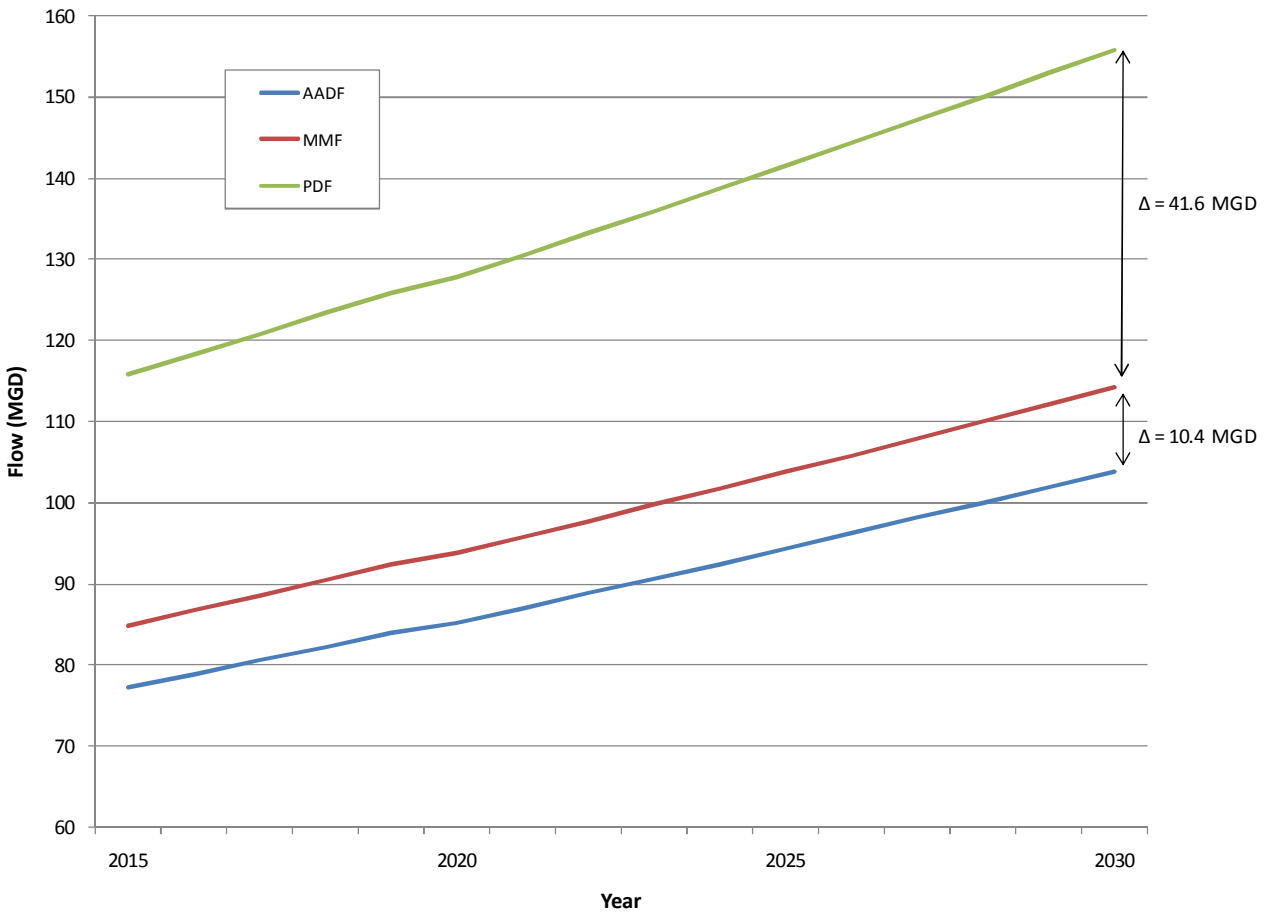


Figure TM2.7: Total Wastewater System Flow Forecast

CONCLUSIONS

With the regional water conservation program, the water demands are projected to increase to 154 MGD on an annual average basis. If the enhanced water conservation measures are implemented, this water demand may only increase to 141 MGD on an annual average basis. Factoring for in-plant water use, the water withdrawal and treatment capacity needs will be 160 MGD on an annual average basis. The current permitted withdrawal is 150 MGD on an average monthly basis or 125 MGD on an annual average basis. Therefore, additional water supply may be needed in the 2030 planning horizon. The peak day water demand in 2030 is forecasted to be 231 MGD. Currently, the permitted water treatment plant capacity is 225 MGD for the peak day; therefore additional water treatment capacity may also be needed in the 2030 planning horizon. These needs will be outlined in greater detail during the alternatives analysis.

Likewise, the wastewater demands are anticipated to grow to 114 MGD on a maximum month basis. The 2012 permitted treatment capacity is 98 MGD on a maximum monthly basis; therefore additional wastewater treatment capacity may be needed in the 2030 planning horizon.

The projected water and wastewater demands will be entered into the computer models for the water distribution and wastewater collection systems to identify potential system constraints. Alternatives will be

identified and evaluated to address future needs for water supply, water treatment and distribution, wastewater collection, treatment and disposal, and biosolids handling.

References:

AECOM, Maddaus Water Management, and R2T, Inc. *Water Supply and Water Conservation Management Plan.* Metropolitan North Georgia Water Planning District. May 2009.

CDM. *Water and Wastewater – Master Plan Update*. Gwinnett County Department of Public Works. November 2003.

APPENDIX A

Water and Wastewater Forecasts by Subbasin

Table A1: Water Demand Forecast by Subbasin

SUBBASIN	WATERSHED	SUBBASIN NAME	AREA (ACRES)	2010 POPULATION	2030 POPULATION	2010 EMPLOYMENT	2030 EMPLOYMENT	2010 WATER ANNUAL AVERAGE DAY DEMAND (MGD)	2030 WATER ANNUAL AVERAGE DAY DEMAND (MGD)
1	Chattahoochee	Lake Lanier	2,339	2,031	2,395	148	143	0.24	0.27
2	Chattahoochee	Richland Creek	7,981	11,198	25,260	2,680	6,180	1.44	3.07
3	Chattahoochee	Suwanee Buford Dam Road	1,158	1,739	3,701	13	48	0.20	0.41
4	Chattahoochee	Level Creek	6,217	16,753	32,574	1,946	1,948	2.04	3.69
5	Chattahoochee	Brushy Creek	3,392	8,544	19,150	4,556	7,536	1.23	2.46
6	Chattahoochee	Upper Suwanee Creek	6,825	11,295	27,514	17,976	38,750	2.26	4.82
7	Chattahoochee	Middle Suwanee Creek	3,312	8,652	21,155	2,290	13,083	1.12	2.94
8	Chattahoochee	Upper Ivy Creek	5,237	12,181	20,389	4,213	13,794	1.63	2.88
9	Chattahoochee	Little Ivy Creek	5,110	10,355	22,281	2,237	4,977	1.32	2.69
10	Chattahoochee	Lower Ivy Creek	3,466	6,322	25,821	8,424	27,486	1.18	4.11
11	Chattahoochee	Lower Suwanee Creek	7,734	14,054	29,361	17,337	33,721	2.55	4.79
12	Chattahoochee	Duluth - Chattahoochee	5,114	20,925	38,618	12,920	16,244	3.11	5.01
13	Chattahoochee	Berkeley Lake	6,263	20,110	22,530	10,107	9,790	2.86	2.94
14	Chattahoochee	Crooked Creek	5,955	24,219	34,245	38,065	58,120	4.82	6.45
15	North Fork Peachtree	North Fork Peachtree Creek	3,037	20,118	28,158	11,765	26,573	2.95	4.33
16	Upper Yellow River	Little Suwanee Creek	3,871	13,158	16,870	1,465	1,869	1.60	1.95
17	Upper Yellow River	Old Peachtree Road	3,101	13,270	17,065	6,280	7,958	1.87	2.25
18	Upper Yellow River	Upper Yellow River	4,081	13,560	13,617	3,815	4,143	1.77	1.69
19	Upper Yellow River	Wolf Creek	7,522	35,068	41,988	15,808	24,023	4.89	5.74
20	Upper Yellow River	Patterson/Marathon PS (Pew Creek)	4,899	19,776	31,152	24,176	16,053	3.57	4.18
21	Upper Yellow River	County Fairground	6,229	26,067	30,038	4,408	4,387	3.25	3.52
22	Upper Yellow River	Lake Matthews	2,784	8,237	6,766	4,556	3,822	1.19	0.92
23	Upper Yellow River	Winn Drive	2,404	9,721	9,140	991	477	1.18	1.03
24	Upper Yellow River	Lee Daniel Creek	5,139	15,877	29,506	16,833	44,201	2.73	5.29
25	Upper Yellow River	Singleton Creek/Upper Sweetwater Creek	6,684	20,668	44,125	18,815	22,944	3.39	5.92
26	Upper Yellow River	Sweetwater Creek	5,705	29,971	44,575	16,236	25,762	4.33	6.10
27	Upper Yellow River	Bromolow Creek	7,379	36,288	58,988	29,641	37,245	5.77	8.22
28	Upper Yellow River	Beaver Ruin Creek	6,069	32,598	47,826	26,045	42,397	5.15	7.23
29	Upper Yellow River	Upper Jackson Creek	5,752	42,568	54,097	7,274	10,327	5.31	6.45
30	Upper Yellow River	Lower Jackson Creek	5,527	17,946	21,240	7,458	14,195	2.47	3.00
31	Lower Yellow River	Yellow River WRF	2,105	6,333	6,406	1,576	1,498	0.82	0.78
32	Lower Yellow River	Turkey and Watson Creeks	5,063	15,694	16,454	6,915	9,682	2.18	2.26
33	Lower Yellow River	Garner Creek	4,022	13,783	12,563	2,063	1,472	1.70	1.45
34	Lower Yellow River	Pounds Creek	5,570	16,523	26,386	3,501	6,483	2.10	3.21
35	Lower Yellow River	Jacks Creek	3,709	16,341	18,671	2,841	3,122	2.04	2.20
36	Lower Yellow River	Lower Yellow River	4,684	9,308	10,312	934	2,783	1.13	1.27
37	Lower Yellow River	No Business Creek	8,509	24,258	29,819	3,743	4,888	3.00	3.52
38	Mulberry	Sherwood Creek	3,141	6,535	4,005	799	518	0.80	0.47
39	Mulberry	Duncan Creek	2,302	3,635	2,926	1,249	834	0.49	0.36
40	Mulberry	Wheeler Creek	3,940	4,344	8,045	284	777	0.52	0.92
41	Mulberry	Jim Moore Road Pump Station	1,748	6,086	6,302	816	504	0.75	0.72
42	Mulberry	Little Mulberry River	5,272	7,580	7,463	471	2,069	0.90	0.92
43	Mulberry	Rock Creek	1,427	713	844	3	16	0.08	0.09
44	Apalachee	Dacula Road Pump Station	2,580	8,858	9,585	340	513	1.04	1.08
45	Apalachee	Apalachee River	6,183	7,331	10,350	1,479	690	0.93	1.17
46	Apalachee	Drowning Creek	6,409	4,666	4,922	167	168	0.55	0.55
47	Alcovy	Alcovy Pump Station	6,364	13,403	14,917	8,591	12,483	2.01	2.22
48	Alcovy	Hopkins Creek	5,427	6,387	9,782	2,396	5,975	0.87	1.35
49	Alcovy	Ezzard Pump Station	3,763	16,525	24,039	5,927	6,864	2.22	2.97
50	Alcovy	Shoal Creek	1,676	4,101	7,501	60	11	0.48	0.83
51	Alcovy	Middle Alcovy River	2,632	4,759	6,924	146	10	0.56	0.76
52	Alcovy	Tribble Mill County Park	6,019	10,766	16,045	413	556	1.27	1.80
53	Alcovy	Lower Alcovy River	3,007	2,479	2,246	3	7	0.29	0.25
54	Alcovy	Palm Creek	3,760	2,941	2,815	551	575	0.37	0.34
55	Alcovy	Cedar Creek	3,306	992	1,356	166	31	0.12	0.15
56	Alcovy	Bay Creek	5,087	6,887	7,496	448	1,198	0.82	0.88
57	Alcovy	Big Flat Creek	892	822	779	135	414	0.10	0.11
58	Big Haynes	Big Haynes Creek	13,879	35,642	44,545	5,695	8,191	4.42	5.29
59	Big Haynes	Brushy Fork Creek	6,824	13,498	15,415	1,345	3,653	1.63	1.87
60	Alcovy	Loganville	504	984	945	125	767	0.12	0.14
			TOTAL	**795,444**	**1,150,000**	**371,660**	**594,950**	**111.7**	**154.3**

Table A2: Wastewater Flow Forecast by Subbasin

SUBBASIN	WATERSHED	SUBBASIN NAME	AREA (ACRES)	2010 POPULATION	2030 POPULATION	2010 EMPLOYMENT	2030 EMPLOYMENT	2010 % SEWERED	2010 WASTEWATER ANNUAL AVERAGE DAY FLOW (MGD)	2030 WASTEWATER ANNUAL AVERAGE DAY FLOW (MGD)
1	Chattahoochee	Lake Lanier	2,339	2,031	2,395	148	143	13%	0.03	0.04
2	Chattahoochee	Richland Creek	7,981	11,198	25,260	2,680	6,180	75%	0.96	2.01
3	Chattahoochee	Suwanee Buford Dam Road	1,158	1,739	3,701	13	48	93%	0.17	0.33
4	Chattahoochee	Level Creek	6,217	16,753	32,574	1,946	1,948	80%	1.46	2.68
5	Chattahoochee	Brushy Creek	3,392	8,544	19,150	4,556	7,536	93%	0.99	1.90
6	Chattahoochee	Upper Suwanee Creek	6,825	11,295	27,514	17,976	38,750	62%	1.43	3.25
7	Chattahoochee	Middle Suwanee Creek	3,312	8,652	21,155	2,290	13,083	85%	0.85	1.96
8	Chattahoochee	Upper Ivy Creek	5,237	12,181	20,389	4,213	13,794	63%	0.96	1.99
9	Chattahoochee	Little Ivy Creek	5,110	10,355	22,281	2,237	4,977	48%	0.59	1.82
10	Chattahoochee	Lower Ivy Creek	3,466	6,322	25,821	8,424	27,486	77%	0.83	3.19
11	Chattahoochee	Lower Suwanee Creek	7,734	14,054	29,361	17,337	33,721	70%	1.69	3.24
12	Chattahoochee	Duluth - Chattahoochee	5,114	20,925	38,618	12,920	16,244	78%	2.18	3.43
13	Chattahoochee	Berkeley Lake	6,263	20,110	22,530	10,107	9,790	71%	1.86	1.81
14	Chattahoochee	Crooked Creek	5,955	24,219	34,245	38,065	58,120	84%	3.58	4.97
15	North Fork Peachtree	North Fork Peachtree Creek	3,037	20,118	28,158	11,765	26,573	85%	2.21	3.45
16	Upper Yellow River	Little Suwanee Creek	3,871	13,158	16,870	1,465	1,869	61%	0.88	1.21
17	Upper Yellow River	Old Peachtree Road	3,101	13,270	17,065	6,280	7,958	77%	1.29	1.53
18	Upper Yellow River	Upper Yellow River	4,081	13,560	13,617	3,815	4,143	66%	1.06	1.18
19	Upper Yellow River	Wolf Creek	7,522	35,068	41,988	15,808	24,023	80%	3.49	4.23
20	Upper Yellow River	Patterson/Marathon PS (Pew Creek)	4,899	19,776	31,152	24,176	16,053	76%	2.50	3.19
21	Upper Yellow River	County Fairground	6,229	26,067	30,038	4,408	4,387	76%	2.19	2.44
22	Upper Yellow River	Lake Matthews	2,784	8,237	6,766	4,556	3,822	61%	0.69	0.58
23	Upper Yellow River	Winn Drive	2,404	9,721	9,140	991	477	59%	0.63	0.59
24	Upper Yellow River	Lee Daniel Creek	5,139	15,877	29,506	16,833	44,201	87%	2.08	4.07
25	Upper Yellow River	Singleton Creek/Upper Sweetwater Creek	6,684	20,668	44,125	18,815	22,944	68%	2.17	3.83
26	Upper Yellow River	Sweetwater Creek	5,705	29,971	44,575	16,236	25,762	87%	3.31	4.36
27	Upper Yellow River	Bromolow Creek	7,379	36,288	58,988	29,641	37,245	93%	4.62	6.24
28	Upper Yellow River	Beaver Ruin Creek	6,069	32,598	47,826	26,045	42,397	85%	3.88	5.73
29	Upper Yellow River	Upper Jackson Creek	5,752	42,568	54,097	7,274	10,327	82%	3.85	4.95
30	Upper Yellow River	Lower Jackson Creek	5,527	17,946	21,240	7,458	14,195	40%	1.02	1.35
31	Lower Yellow River	Yellow River WRF	2,105	6,333	6,406	1,576	1,498	29%	0.25	0.20
32	Lower Yellow River	Turkey and Watson Creeks	5,063	15,694	16,454	6,915	9,682	32%	0.78	1.37
33	Lower Yellow River	Garner Creek	4,022	13,783	12,563	2,063	1,472	19%	0.34	0.32
34	Lower Yellow River	Pounds Creek	5,570	16,523	26,386	3,501	6,483	18%	0.44	1.52
35	Lower Yellow River	Jacks Creek	3,709	16,341	18,671	2,841	3,122	77%	1.40	1.61
36	Lower Yellow River	Lower Yellow River	4,684	9,308	10,312	934	2,783	3%	0.07	0.64
37	Lower Yellow River	No Business Creek	8,509	24,258	29,819	3,743	4,888	54%	1.49	2.06
38	Mulberry	Sherwood Creek	3,141	6,535	4,005	799	518	57%	0.41	0.28
39	Mulberry	Duncan Creek	2,302	3,635	2,926	1,249	834	20%	0.13	0.21
40	Mulberry	Wheeler Creek	3,940	4,344	8,045	284	777	62%	0.29	0.59
41	Mulberry	Jim Moore Road Pump Station	1,748	6,086	6,302	816	504	73%	0.49	0.49
42	Mulberry	Little Mulberry River	5,272	7,580	7,463	471	2,069	48%	0.39	0.56
43	Mulberry	Rock Creek	1,427	713	844	3	16	39%	0.03	0.00
44	Apalachee	Dacula Road Pump Station	2,580	8,858	9,585	340	513	86%	0.79	0.83
45	Apalachee	Apalachee River	6,183	7,331	10,350	1,479	690	68%	0.57	0.45
46	Apalachee	Drowning Creek	6,409	4,666	4,922	167	168	1%	0.01	0.01
47	Alcovy	Alcovy Pump Station	6,364	13,403	14,917	8,591	12,483	66%	1.25	1.30
48	Alcovy	Hopkins Creek	5,427	6,387	9,782	2,396	5,975	54%	0.45	0.70
49	Alcovy	Ezzard Pump Station	3,763	16,525	24,039	5,927	6,864	89%	1.73	2.10
50	Alcovy	Shoal Creek	1,676	4,101	7,501	60	11	83%	0.35	0.63
51	Alcovy	Middle Alcovy River	2,632	4,759	6,924	146	10	74%	0.37	0.57
52	Alcovy	Tribble Mill County Park	6,019	10,766	16,045	413	556	40%	0.45	0.94
53	Alcovy	Lower Alcovy River	3,007	2,479	2,246	3	7	2%	0.01	0.08
54	Alcovy	Palm Creek	3,760	2,941	2,815	551	575	20%	0.08	0.12
55	Alcovy	Cedar Creek	3,306	992	1,356	166	31	2%	0.01	0.02
56	Alcovy	Bay Creek	5,087	6,887	7,496	448	1,198	47%	0.35	0.20
57	Alcovy	Big Flat Creek	892	822	779	135	414	71%	0.06	0.09
58	Big Haynes	Big Haynes Creek	13,879	35,642	44,545	5,695	8,191	60%	2.43	3.00
59	Big Haynes	Brushy Fork Creek	6,824	13,498	15,415	1,345	3,653	76%	1.10	1.35
60	Alcovy	Loganville	504	984	945	125	767	82%	0.09	0.11
			TOTAL	**795,444**	**1,150,000**	**371,660**	**594,950**		**70.1**	**103.9**

AECOM

AECOM Water
In association with: **JJG & PPI**

Gwinnett County 2030 Water & Wastewater Master Plan

Technical Memorandum 5

Distribution and Collection System Modeling

TO:	Todd Cleaver - Gwinnett County Planning & Development	PAGES:	27
SUBJECT:	Gwinnett County 2030 Water & Wastewater Master Plan Technical Memorandum 5 – Distribution and Collection System Modeling		
FROM:	Kim Shorter, AECOM		
BY:	Stephanie Gardner		
DATE:	May 10, 2011		

SUMMARY

This Technical Memorandum (TM) provides a summary of the hydraulic computer models used to evaluate the water distribution and wastewater collection systems. Gwinnett County Department of Water Resources existing water distribution and wastewater collection system models were used as a foundation for this analysis. Gwinnett County uses the Bentley WaterGEMS and SewerGEMS software products. The existing models are primarily used by Gwinnett County to optimize and manage systemwide flows as well as gage the ability of the system to serve new developments on a localized level. Some adjustments were made as part of the 2030 Water and Wastewater Master Plan to improve the usability of these models for long-range master planning. This TM provides an overview of the adjustments to the water distribution and wastewater collection system models and how they were used to evaluate future capacity improvements that may be needed by the 2030 planning horizon.

INTRODUCTION

Technical Memorandum 5, as part of the Gwinnett County 2030 Water and Wastewater Master Plan, summarizes the tools and evaluation methodology used to identify future capacity improvements that may be needed within the 20-year planning horizon. This TM outlines the methodology that was used to develop the results presented in TM 7 – Water Transmission and Storage Evaluation and Recommendations and TM 8 – Wastewater Collection and Pumping Evaluation and Recommendations.

This TM is organized in the following sections:

- Water distribution model summary – provides a description of the model used to evaluate the water distribution system and outlines the modifications performed as part of the Master Plan.
- Water distribution system evaluation - provides details on the parameters that were used to evaluate the water distribution system.

- Wastewater collection model summary – provides a description of the model used to evaluate the wastewater collection system and outlines the modifications performed as part of the Master Plan.
- Wastewater collection system evaluation – provides details on the parameters that were used to evaluate the wastewater collection system.
- Conclusion – summary of how the results were used for the evaluation of future capacity improvements.

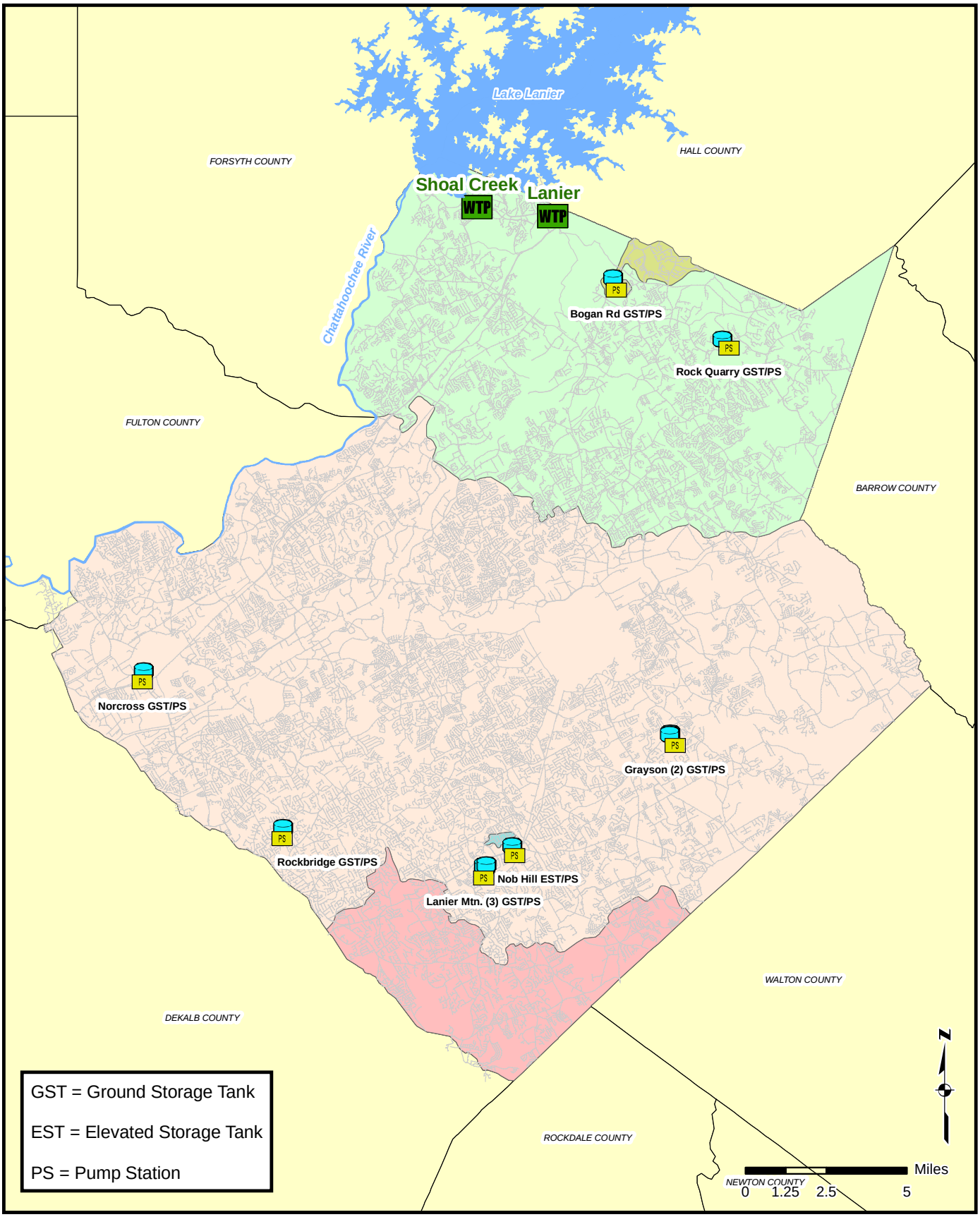
WATER DISTRIBUTION MODEL SUMMARY

A hydraulic model was used to evaluate the performance of the water distribution system, shown in Figure TM5.1, under current and future water demand conditions. The hydraulic modeling analysis used the most recent Gwinnett County Department of Water Resources (DWR) water distribution system model. The existing water system model was developed in Bentley's WaterGEMS distribution system modeling software, and the most recent calibration changes were made by DWR personnel in October 2009.

Additional updates to the model provided by DWR were made to reflect current Gwinnett County SCADA (Supervisory Control and Data Acquisition) data. The following subsections (pipe modifications, valve modifications, controls, and diurnal pattern modifications) and referenced appendices provide an overview of the model adjustments that were made for the water distribution hydraulic system analysis.

PIPE MODIFICATIONS

The existing Gwinnett County water model includes over 3,600 miles of pipe (120,000 pipe segments in the model) ranging from 2 to 78-inches in diameter. Three segments of piping were added to complete disconnected transmission routes in the model, which probably occurred when the pipes were originally imported into the model. This is a common importing error that is almost undetectable by visual inspection. Short (less than 10 ft) segments of 6-inch, 10-inch, and 48-inch diameter pipe were added to the model where these disconnections existed. Figure TM5.2 provides an overview of the areas where the pipe segments were added to the existing system model.



Gwinnett County 2030 Water & Wastewater Master Plan

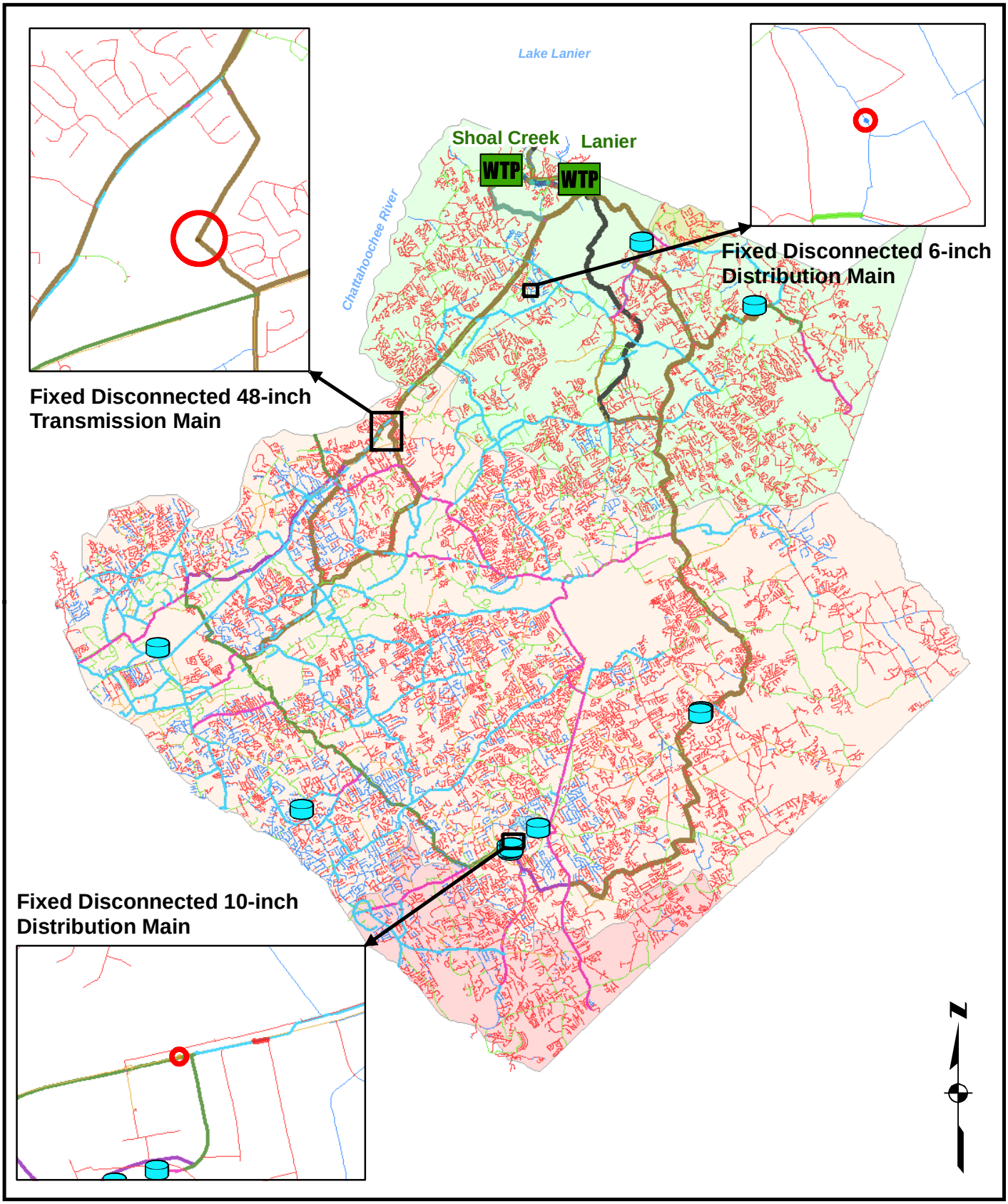
Figure TM5.1

Water Distribution System Overview

Legend

PS Pump Station
WTP WTP
Storage Tank
Water Main

PRESSURE ZONE
Central
Knob Hill
North
South
Upper North (Bogan Rd)



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM5.2

Pipe Modifications to Existing DWR Model

Legend

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78

VALVE MODIFICATIONS

There are five pressure zones in the Gwinnett County water model as shown in Figure TM5.1: the North Pressure Zone, the Bogan Road (a.k.a. Upper North) Pressure Zone, the Central Pressure Zone, the Nob Hill (a.k.a. Knollwood) Pressure Zone, and the South Pressure Zone. In the version of the water model that was provided by DWR, some pressure zones were not completely isolated from the others as evidenced by the "open pipes" connecting pressure zones with no apparent pressure control valves present. Per DWR's instructions early in the process, nine additional isolation valves were closed in order to completely separate the pressure zones. The model includes a total of 62 closed valves. Appendix A includes figures that depict the eight areas where valves were closed in the system model to separate the pressure zones.

SYSTEM CONTROLS

Gwinnett County currently uses an energy management software package produced by Derceto called Aquadapt to assist in operating the distribution system in a more efficient manner. The Aquadapt software works with the SCADA system to optimize energy use based on plant flow rates, system pressures, tank levels, pump efficiency and availability, and power costs while maintaining defined system parameters. Aquadapt has a skeletonized (5,000 pipe) model that projects water demand and performs a water balance 48 hours in advance.

During daily operations, the Aquadapt software performs a system simulation with the model every 30 minutes based on system conditions, changes in demand, pressure, or in response to manual inputs made by the system operators such as tagging pumps "out of service" for routine preventative maintenance. Each morning the Aquadapt software gives the system operators a schedule of when certain pumps will be activated, when tanks will fill, and other operational considerations. The Aquadapt software controls the system and sends commands to start/stop pumps, open/close fill valves, and changes filter plant pumping rates to meet demand while being monitored by the system operators. Because of the Aquadapt software, fill times for tanks vary now, depending on overall system conditions, energy costs, and other parameters; therefore, tanks may not necessarily be filled between 11 PM – 5 AM as in the past. Additionally, the Aquadapt software has a "deep draw" cycle for tank turnover. This assures that each tank is drawn down to its minimum level once every three days. Because of the variable nature of the Aquadapt software, the distribution modeling done for the Master Plan may not necessarily reflect the exact operation of the system. However, the recommended projects are derived from operational solutions using the model that will provide a level of service consistent with what is currently experienced by Gwinnett County customers.

The Gwinnett County water model, as provided by DWR, included controls set to match actual SCADA data that depicted tank levels and pump controls in the system for a particular day (October 1, 2009), which was the date of the last calibration. For purposes of this hydraulic analysis, the tank and pump controls needed to be independent of changes in demand or dates to analyze the future hypothetical demand scenarios. The controls were adjusted to achieve a consistent pumping rate from the water treatment plants and to allow the distribution storage tanks and re-pump stations to supply additional water during periods of higher demand throughout the day. In effect, the tanks are filled when the hourly demand is less than the daily average and the tanks drain when the hourly demand is higher than the daily average. Operating storage in this manner allows the transmission mains to meet future demands even when they are sized for less than peak hour flow, thus avoiding expensive capital projects. Because general diurnal patterns are applied to the demands in the model, the tank fill and draw times are based on whether the hourly system demands are either below or exceed the average daily demand.

The fill rate for each tank was also controlled in the model. The fill rates for the tanks within Gwinnett's system were controlled to maintain certain minimum pressures on the upstream side of the inflow valve. The minimum pressure for each tank was determined using the SCADA information and the specific pressure criteria for the system in the vicinity of each tank. The general tank-fill and draw schedules used in the model and the minimum system pressures while filling the tanks are summarized in Table TM5.1.

Table TM5.1: Tank and Pump Control Summary

System Tank	Time of Fill (hr – hr)	Pressure Maintained During Fill (psi)	Time Water Supplied from Tank (hr – hr)
Rock Quarry Tank	10 PM – 4:30 AM	75	5 AM – 9 AM; 5 PM – 9:30 PM
Bogan Road Tank	Level controlled	N/A	N/A
Grayson Tank 1	11 PM – 4 AM	75	4:30 AM – 10 AM; 4 PM – 10 PM
Grayson Tank 2	11 AM – 3 PM; 12 AM – 3 AM	75	4:30 AM – 10 AM; 4 PM – 10 PM
Norcross Tank	10 PM – 4:30 AM	60	6 AM – 7 AM; 1 PM – 9 PM
Lanier Mountain Tank 1	8 PM – 2 AM	15	5 AM – 9 AM
Lanier Mountain Tank 2	10 PM – 3 AM	15	5 AM – 9 AM
Lanier Mountain Tank 3	11 PM – 4 AM	15	5 AM – 9 AM
Rockbridge Tank	11 PM – 4 AM	45	6 AM – 9 AM; 6 PM – 8 PM
Nob Hill Tank	Level controlled	N/A	N/A

DIURNAL PATTERN MODIFICATIONS

Diurnal patterns that depicted hourly variations in daily demand were applied to the modeled demands in the system. Different demand patterns were designated for residential and commercial nodes in the model provided by DWR. The residential diurnal pattern that was included in the existing model was used for the Master Plan modeling effort. However, the commercial diurnal pattern in the model provided by DWR had hours with a zero multiplier and averaged to only a 0.65 multiplier for the 24-hour period. In effect, this multiplier would reduce the total commercial demand by 35 percent. The existing diurnal pattern was based on flow monitoring data and is appropriate for current DWR uses; however, this pattern is not appropriate for master planning and the planned increases in demand. The multiplier for each time step was increased by a set amount to eliminate the times of of the day with zero commercial demands and to bring the daily average to 1.0 and maintain the base commercial demand as forecasted.

DEMAND ALLOCATION

The future water demands are outlined in TM 2 - Summary of Water and Wastewater Forecasts and are based on the International Gateway scenario in the Unified Plan. The water demands associated with each traffic analysis zone (TAZ) were allocated to specific points, or nodes, within the distribution model to analyze how the distribution system will react. In general, the demands were applied to the same nodes used for previous Gwinnett County water modeling efforts. The demands were allocated using the following methodology:

- The water system nodes were assigned to a traffic analysis zone (TAZ) in GIS. The 482 TAZs within Gwinnett County were the basis for the demand projections presented in TM 2 – Summary of Water and Wastewater Forecasts.
- There were 10 TAZ's with associated water demands that did not overlay any nodes in the distribution system. These demands were assigned to representative nodes in the model that were located near the border of the TAZ areas in question.
- The Gwinnett County distribution model does not contain information on the pipe network for wholesale areas, because DWR does not maintain this pipe network. Wholesale demand nodes were

designated based on the location of the wholesale master meters. The future demands for each wholesale customer were estimated as a proportion of the total wholesale demand based on the average demand over the last five years for each customer. If there were multiple wholesale demand nodes for the same customer, then the demands were divided equally among those nodes.

DEMAND SCENARIOS

The peak day demands presented in TM 2 – Summary of Water and Wastewater Forecasts range from 182 MGD in 2015 to 231 MGD in 2030, based on the planned development identified in the Unified Plan International Gateway scenario. The first four demand scenarios were evaluated in case the demands did not increase as rapidly as anticipated in the Unified Plan and/or water conservation efforts exceed the expected values. The hydraulic model evaluated a wider range of future demands, including demands lower than the forecasted demands. If the growth anticipated in the Unified Plan is not realized or if water conservation efforts are more successful than anticipated, there will be information on the projects needed at these lower flow rates. The water distribution model evaluated the system under 8 demand scenarios, presented in TM 7 – Water Transmission and Storage Evaluation and Recommendations. The water demands evaluated include 131, 142, 154, 167, 182, 197, 215, and 231 MGD on a peak day basis.

These eight peak day demand scenarios were allocated throughout the system using the methodology described in the previous subsection. The distribution system was evaluated for its ability to adequately supply these demands while maintaining a defined set of operating guidelines, as described in TM 7 – Water Transmission and Storage Evaluation and Recommendations.

WATER DISTRIBUTION SYSTEM EVALUATION

The water system was evaluated for each of the demand scenarios outlined above against specific water system evaluation criteria or operating guidelines. The results of the evaluation are presented in TM7 – Water Transmission and Storage Evaluation and Recommendations. These operating guidelines include pipe system, system pressure, fire flow supply, and system storage capability.

The hydraulic model evaluated the system performance for each demand scenario and for each evaluation criteria. If evaluation criteria were not met, then a proposed system improvement was identified. The water system operating guidelines were developed from past experience along with project team meetings that included Gwinnett County personnel.

A water distribution system must meet state and federal regulations as well as some industry best practices. The operating guidelines are generally based on the peak day demand, ensuring that the system meets these guidelines on the single day with the highest water demand. The operating guidelines for this analysis were developed using information from the following sources:

- AWWA M31 *Distribution System Requirements for Fire Protection*
- AWWA M32 *Computer Modeling of Water Distribution Systems*
- *Water Distribution Systems Handbook* by Larry W. Mays
- *Modeling, Analysis, and Design of Water Distribution Systems* by Lee Cesario, published by AWWA
- *Water Distribution Modeling* by Thomas M. Walski, Donald V. Chase, and Dragan A. Savic

If the distribution model showed that the system could not meet the operating guidelines at a specified demand, then system improvements were identified so that the system met the operating guideline. The analysis started at the lowest demand, so that projects needed were carried forward to the evaluation at the next demand interval. The established operating guidelines are divided into four categories including piping system, system pressure, fire flow supply, and system storage. Each of these categories is discussed in detail in the following subsections as they relate specifically to the Gwinnett County Water Distribution System.

PIPE SYSTEM VELOCITY AND HEADLOSS

The velocity and headloss in the pipe system can be used to evaluate the potential for inadequate system pressure and/or water quality. Headloss represents the energy lost within a pipe. The higher the energy loss, the more pumping is required and therefore higher energy usage and energy costs. Headloss and pipe velocity are also directly proportional to the system pressure. Areas in the distribution system with high headloss or high velocity can result in unacceptable pressure in the distribution system.

As pipe velocities reach 5 feet per second (ft/s) or headlosses reach 6 ft/1,000 ft, pressures begin to decrease significantly within a given length of pipe. Consequently, the water system operating guidelines include a maximum velocity of 5 ft/s and a maximum headloss of 6 ft/1,000 ft for most pipes. For larger diameter transmission mains (i.e., pipes 16 inches in diameter and larger), the maximum allowable headloss is lower. The large diameter transmission mains convey water long distances, which can lead to large headloss accumulation, thus justifying the more constrained headloss recommendation. Specifically, transmission mains between 16 inches and 24 inches in diameter should maintain a headloss of less than 4 ft/1,000 ft, and transmission mains 30 inches in diameter and greater should not exceed a headloss of 2 ft/1,000 ft.

The recommended operating criteria are:

- Maximum instantaneous velocity: 5 ft/s at peak day demand conditions
- Maximum headloss for small diameter pipes (less than 16 inches in diameter): 6 ft/1,000 ft of pipe at peak day demand conditions
- Maximum headloss for 16 to 24-inch diameter transmission mains: 4 ft/1,000 ft of pipe at peak day demand conditions
- Maximum headloss for 30-inch and greater diameter transmission mains: 2 ft/1,000 ft of pipe at peak day demand conditions

SYSTEM PRESSURE

An acceptable pressure range is dependent on the specific features and conditions of each individual distribution system. If pressure in the distribution system is too low, then water quality and customer satisfaction can be jeopardized. If pressure in the distribution system is too high, there is an increased risk of damage to the distribution system and a higher level of water leakage. Currently, there are areas of the Gwinnett County Water Distribution System where the pressure exceeds 200 pounds per square inch (psi).

For distribution systems in general, low system pressures are observed in the vicinity of ground storage tanks or the suction side of booster pump stations. However, these low pressure regions that were indicated in the model were not flagged for improvement because customers are not located in the surrounding area. From general area guidelines and discussions with Gwinnett County personnel, a minimum pressure of 40 psi must be maintained at all customer service locations under normal conditions and 20 psi residual pressure (active flow pressure) during fire flows, which are discussed in the next subsection. The resulting operating criteria are summarized as follows:

- Minimum system pressure: 40 psi at customer connection points under peak day demand conditions
- Minimum residual pressure: 20 psi at customer connection points during fire flow conditions
- Maximum system pressure: 200 psi at average day demand conditions

FIRE FLOW SUPPLY

An adequate supply of water is needed to maintain minimum system pressures while meeting the intense demands associated with fire fighting conditions for a designated period of time. The fire flow supply criteria for this evaluation required the presence of fire hydrants on water mains 6 inches or larger in the existing

system model[1]. The fire hydrants must be able to provide 1,000 gallons per minute (gpm) of water for 2 hours in residential areas of the system and 3,000 gpm of water for 4 hours in commercial areas of the distribution system.

Typical guidelines for water system operation recommend evaluating the fire flow conditions during an average hour on the peak day. This recommendation exists because the likelihood of a large fire occurring during the peak hour on the peak day is negligible. As a result, planning for this unlikely event would result in the overdesign of system components.

SYSTEM STORAGE CAPACITY

System storage is required to balance supply and demand fluctuations, equalize pump station operation, and deliver water during emergencies such as fires, pipe breaks, pump station failure, or loss of the water supply source. While system storage serves many important functions, the water in storage tanks must drain and fill (i.e. tank turnover) frequently in order to minimize water age and maintain water quality in the system. Storage tanks should drain at least 10 percent (preferably up to 25 percent) of the storage volume during the average day demand conditions to minimize water age and maintain water quality. To meet emergency water needs, system storage should also maintain storage tank levels above 60 percent full during the peak day demand conditions.

WASTEWATER COLLECTION MODEL SUMMARY

A hydraulic model was used to evaluate the performance of the wastewater collection system under current and future wastewater flow conditions. There are three distinct types of hydraulic models used depending on the type of evaluation; skeletal, basin, or detailed model networks. A skeletal model network is intended to model main interceptors representing a large area within the wastewater system. A basin model can provide more detail within a particular sewer basin. Detailed model networks show a particular portion of a wastewater system in more detail and typically include nearly all pipes and manholes within the study area.

A skeletal system-wide model was identified as most appropriate for use in this Master Plan, based on discussions with DWR. For master planning purposes, a system-wide SewerGEMS model was completed by incorporating the data used in the individual area models (detailed models), identifying missing data and filling in the gaps. The existing SewerGEMS detailed models will continue to be used by Gwinnett DWR to evaluate flow management options, assess system capacity for future developments, and other daily analysis.

The skeletal system-wide model was used to (1) evaluate the available capacity in the existing wastewater collection system under future flow scenarios, (2) evaluate short-term and long-term system improvements, and (3) consider future flow management options (preferred over new infrastructure projects).

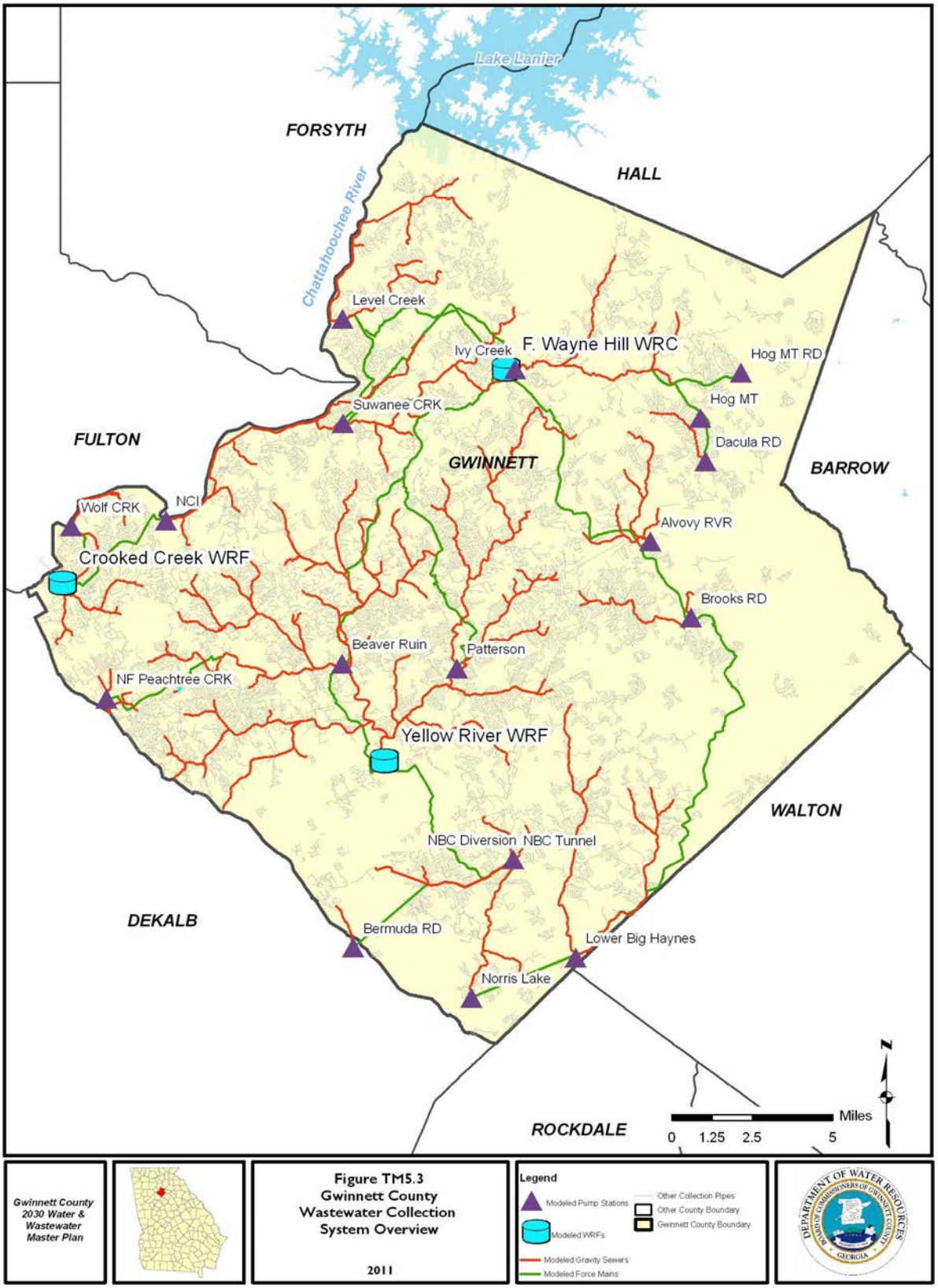
An overview of major system components is shown in Figure TM5.3. Figure TM5.4 shows the major sewer basins and modeled components. In general, the system-wide model includes the interceptor sewer network consisting of approximately 276 miles of gravity pipes 10 inches in diameter and greater, 131 miles of pressurized force mains 14 inches in diameter and greater, and 20 regional pump stations. The modeled regional pump stations, listed below, were modeled to simulate future flow management options.

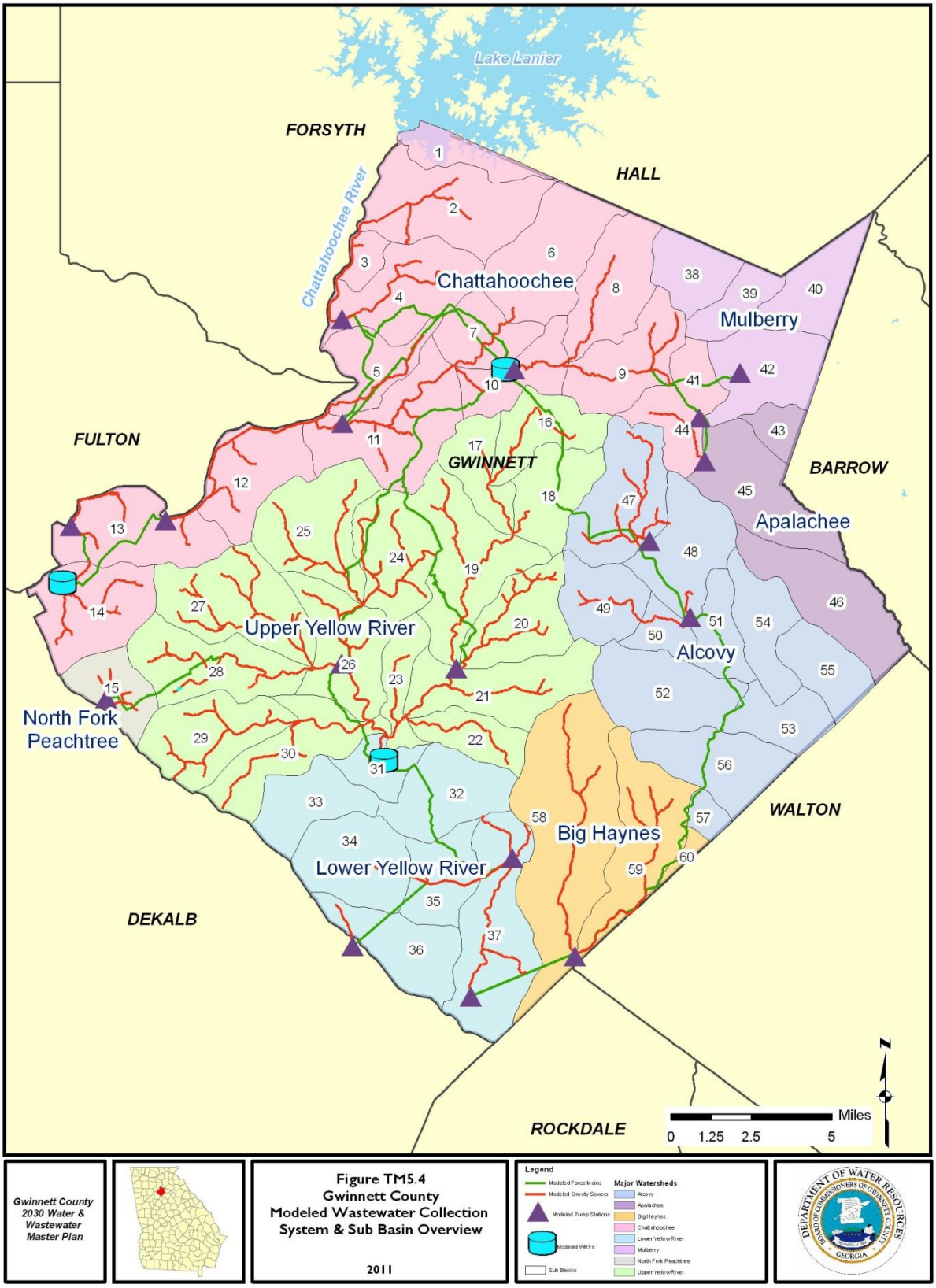
[1] The development guidelines require fire hydrants on water mains 8-inches or larger, therefore the system model is more conservative.

- Alcovy River
- Beaver Ruin
- Bermuda Road
- Brooks Road
- Dacula Road
- Ezzard Road (to Alcovy)
- Hog Mountain Road
- Hog Mountain 1 & 2
- Ivy Creek
- Jacks Creek
- Level Creek
- Lower Big Haynes
- No Business Creek (NBC) Diversion
- NBC Tunnel Pumps
- Norris Lake
- North Chattahoochee Interceptor (NCI)
- North Fork Peachtree Creek
- Patterson
- Suwannee Creek
- Wolf Creek

The Ezzard Road, Bermuda Road, and Jacks Creek regional pump stations were not included in the system-wide model as these pump stations will be out of service by 2012. As the model was evaluating long-term capacity needs as part of the Master Plan, the future operations were evaluated.

The following subsections (modifications and diurnal pattern modifications) provide an overview of the model adjustments that were made for the wastewater collection system analysis.


Lake Lanier
FORSYTH
HALL
Chattahoochee River
Level Creek
Ivy Creek
F. Wayne Hill WRC
Hog MT RD
Hog MT
Suwanee CRK
Dacula RD
FULTON
GWINNETT
BARROW
Wolf CRK
NCI
Alvovy RVR
Crooked Creek WRF
Brooks RD
Beaver Ruin
Patterson
NF Peachtree CRK
Yellow River WRF
WALTON
NBC Diversion
NBC Tunnel
DEKALB
Bermuda RD
Lower Big Haynes
Norris Lake
ROCKDALE
Miles
0 1.25 2.5 5
N
Gwinnett County 2030 Water & Wastewater Master Plan
Figure TM5.3
Gwinnett County
Wastewater Collection
System Overview
2011
Legend
Modeled Pump Stations
Modeled WRFs
Modeled Gravity Sewers
Modeled Force Mains
Other Collection Pipes
Other County Boundary
Gwinnett County Boundary
DEPARTMENT OF WATER RESOURCES
BOARD OF COMMISSIONERS OF GWINNETT COUNTY
GEORGIA


Lake Lanier
FORSYTH
HALL
Chattahoochee River
Chattahoochee
Mulberry
FULTON
GWINNETT
BARROW
Apalachee
Upper Yellow River
Alcovy
North Fork Peachtree
Big Haynes
Lower Yellow River
WALTON
DEKALB
ROCKDALE
Miles
0 1.25 2.5 5
Gwinnett County 2030 Water & Wastewater Master Plan
Figure TM5.4
Gwinnett County
Modeled Wastewater Collection System & Sub Basin Overview
2011
Legend
Modeled Force Mains
Modeled Gravity Sewers
Modeled Pump Stations
Modeled WRFs
Sub Basins
Major Watersheds
Alcovy
Apalachee
Big Haynes
Chattahoochee
Lower Yellow River
Mulberry
North Fork Peachtree
Upper Yellow River

MODIFICATIONS

The current SewerGEMS model provided by Gwinnett County is used by DWR staff for more detailed analysis on specific areas of the system. The existing model contains different scenarios that focus on specific areas of the County; however, the regional (skeletonized) model for the entire County required additional data for the Master Plan analysis. The interconnections within the collection system are important for master planning and evaluating future flow management alternatives. However, interconnecting the more detailed area-specific models would have been computationally too intensive for SewerGEMS to handle and the long model run times would make evaluating alternatives infeasible.

Therefore, several modifications to the skeletonized model were made so the model was suitable for master planning purposes. Modifications included the following:

- Missing major interceptor lines were manually entered based on the Gwinnett County GIS files, as-built drawings and detailed sub-models, as listed below.
    - Subbasin 29 interceptors were located in an individual model (labeled T09) which simulates every single pipe. The missing interceptors were imported into the skeletonized model.
    - Subbasin 30 interceptors were not included in any of the individual models provided by Gwinnett County. Therefore, these interceptors were manually added based on the County's GIS data. The pipeline GIS layer did not have upstream and downstream manhole information, so upstream and downstream manholes were manually identified and entered for each pipe. Missing elevation data for pipes and manholes was also completed based on the GIS system and/or (AECOM's) best professional judgment when Gwinnett County staff confirmed that data was not available.
    - Subbasin 24 and 25 interceptors were entered in the model by importing individual models provided by Gwinnett County.
    - Interceptors in subbasins 49 and 50 were added to the model. The details for these interceptors were extracted from the individual models provided by Gwinnett County and imported into the skeletonized model.
    - Flows in subbasin 24, 25, 29, 30, 49 and 50 were redistributed along the newly added interceptors.
    - The pipe sizes for the western gravity interceptors to Lower Big Haynes (in subbasin 58) were modified to match the GIS layer, based on discussions with Gwinnett County.
    - The gravity interceptor system around the Beaver Ruin pump station area was revised to add missing elevation data. The model previously included several pipes with negative slopes, and significant pipe drops due to inaccurate or missing invert elevations. These issues were likely due to data import from the Gwinnett County GIS. Gwinnett County provided as-built drawings and input to ensure the model correctly characterizes the complicated flow split and by-pass system.
- Duplicate infrastructure (i.e. manholes, pipes) were deleted, likely from the result of merging the individual models.
- Missing forcemain invert elevation information was entered where needed in the Lower Big Haynes and Level Creek areas. These files provided by Gwinnett County were not in the format (ESRI) needed for the SewerGEMS model and therefore were manually updated in the model.
- Flows in the collection system were validated based on 2010 measured maximum pump station flow and flow meter data provided by Gwinnett County.

DIURNAL PATTERN MODIFICATIONS

The diurnal pattern and the hourly multiplier in the skeletonized model were evaluated and modified for the Master Plan model analysis. This pattern was compared to multiple diurnal patterns developed for Gwinnett County as part of the flow metering in 2008 and 2009[2]. The pattern provided in the skeletonized model was plotted against average residential diurnal patterns developed for the 2009 study, and the skeletonized model diurnal pattern fell within the measured averages.

While the existing diurnal pattern falls within the range of diurnal patterns from the 2009 study, a diurnal pattern with a higher peaking factor is recommended for long-range planning. In part, the change in the diurnal pattern is needed because inflow and infiltration is accounted for in the model as a percentage of dry weather flow volume (20% of dry weather volume), spread evenly throughout the day regardless of the storm intensity or duration. As a separate dry and wet weather calibration was outside of the scope of the Master Plan modeling, the conservative approach is to intensify the peaking factor. Based on review of the flow meter data, the recommended diurnal pattern for the Master Plan model is based on the average pattern developed for weekdays from meter GM-192, as it produces the second highest peaking factor for all of the residential meters. The flow meter with the highest peaking factor was very small and had steep slopes that weren't seen as representative of the entire collection system. The drainage basin for meter GM-192 had representative slopes and land use patterns and therefore the peaking factors associated with meter GM-192 were applied to the remainder of the collection system.

Table TM5.2 presents a comparison of the diurnal pattern peaking factors in the existing Gwinnett County model as well as the model modified for the Master Plan.

Table TM5.2: Diurnal Pattern Peaking Factor Comparison

Time from Start (hours)	Existing Multiplier (peaking factor)	Modified Multiplier (peaking factor)
1	1.075	0.56
2	0.817	0.45
3	0.601	0.4
4	0.468	0.4
5	0.38	0.66
6	0.425	1.26
7	0.603	1.36
8	0.849	1.31
9	1.05	0.99
10	1.197	0.9
11	1.035	0.9
12	1.064	0.9
13	1.026	0.88
14	0.973	0.84
15	0.937	0.85
16	0.868	0.94

[2] CH2MHILL report, Wastewater Flow Diurnal Patterns, May 29, 2009

Table TM5.2: Diurnal Pattern Peaking Factor Comparison		
17	0.995	1.1
18	1.152	1.23
19	1.191	1.39
20	1.257	1.59
21	1.378	1.69
22	1.51	1.46
23	1.468	1.14
24	1.359	0.8

FLOW ALLOCATION

The future wastewater flows are outlined in TM 2 – Summary of Water and Wastewater Forecasts and based on the International Gateway scenario in the Unified Plan. These flows were allocated to specific nodes in the SewerGEMS model based on the following steps:

- The most appropriate input manhole nodes were determined based on the 482 traffic analysis zone (TAZ) boundaries, generally in the centroid of the boundary area.
- Future wastewater annual average day flows were assigned to specific manholes and the diurnal pattern was then applied.

FLOW SCENARIOS

The annual average day flows presented in TM 2 range from 73 to 104 MGD, based on the planned development identified in the Unified Plan International Gateway scenario. The hydraulic model evaluated a wider range of future flows, including flows lower than the forecasted flows. If growth anticipated in the Unified Plan is not realized or if water conservation efforts are more successful than anticipated, there will be information on the projects needed at these lower flow rates. The flows evaluated and presented in TM 8 – Wastewater Collection and Pumping Evaluation and Recommendations include annual average flows of 55, 60, 67, 74, 81, 85, 94, and 104 MGD.

These eight annual average day flow scenarios were allocated throughout the system using the methodology described in the previous subsection. The eight flow scenarios evaluated for the wastewater and water models are expected to occur in the same time period. The collection system was evaluated for its ability to adequately handle these flows while maintaining a defined set of operating guidelines described in the next section.

WASTEWATER COLLECTION SYSTEM EVALUATION

The hydraulic model was used to evaluate system performance for each of the flow scenarios listed above against specific hydraulic evaluation criteria or operating guidelines. The two evaluation criteria include the system capacity and velocity. If an evaluation criterion was not met, then a proposed system improvement was identified. The operating guidelines include flow management to optimize available system capacity and reduce pumping (and energy consumption), where possible. The wastewater system operating guidelines were developed from past experience along with information provided by Gwinnett County personnel. The wastewater system hydraulic evaluation criteria are described in detail below.

SYSTEM CAPACITY (SURCHARGING)

The collection system capacity was determined to be insufficient if the hydraulic model identified surcharging. Surcharging is defined as the condition in a pipe when the water level exceeds the crown elevation (i.e. the pipe is full). Based on meetings with DWR, surcharging was not considered acceptable for interceptors. When surcharging was identified, interceptor upgrades were simulated until the surcharging was eliminated. In a limited number of instances, surcharging was considered acceptable based on the level of surcharging relative to the depth of the sewer and the overall extent of surcharging. For purposes of the Master Plan, interceptor upgrades were recommended as opposed to parallel or relief sewers; however, both would accomplish the same goal and should be considered in the preliminary design phase of the system improvements.

In some instances the surcharging was caused by insufficient pumping capacity and not the pipe capacity. The hydraulic capacity at the regional pump stations was determined by reviewing the existing firm capacity for each flow scenario. In general, when the pump station inflows exceeded the pump station's firm capacity, the simulated water levels would increase and cause surcharging upstream of the interceptor system. When this occurred, additional pumping capacity was simulated to eliminate these surcharges. Typically, additional pumps of equal size (to that of the existing station pumps) were evaluated. For purposes of the Master Plan modeling, preliminary design considerations such as sufficient space for additional pumps, wet well volume requirements, intake velocities, and pump efficiencies and energy requirements were not evaluated.

VELOCITY

Similar to the water distribution evaluation, velocity was an evaluation criterion for the wastewater collection model. The focus for this evaluation was on force main velocity. High pipe velocity results in high headloss which leads to high energy loss within a pipe. The higher the energy loss, the more pumping is required and therefore higher energy usage and energy costs. If velocity in the pipe is too low, solids can settle in the force main. Therefore, this evaluation set an acceptable range of a maximum velocity of 8 feet per second (ft/s) for high flows, and a minimum velocity of 3 ft/s[3].

Upgrades were recommended when the pipe velocity exceeded the maximum. If additional pumping capacity at a pump station was required, the maximum force main velocity was compared against the criterion. If velocities exceeded 8 ft/s, upsizing of the force main was evaluated and recommended. The minimum velocities were only evaluated as they related to recommended pump station upgrades to confirm that the additional pumping capacity would not cause an unacceptable low velocity.

FLOW MANAGEMENT

Flow management was also considered in the wastewater system evaluation. Because many interceptors within the Gwinnett County system have considerable reserve capacity, the opportunity for flow diversion was investigated to maximize the existing capacity and minimize the proposed infrastructure cost. Maximizing treatment capacity at each of the three wastewater treatment facilities was also part of the overall flow management strategy.

[3] Pump station standards recommend 2.5 ft/s minimum force main velocity, therefore this evaluation is more conservative.

CONCLUSIONS

This Technical Memorandum provides a summary of the hydraulic computer models used to evaluate the water distribution and wastewater collection systems. The existing Gwinnett County Department of Water Resources water distribution and wastewater collection system models were used as a foundation for this analysis. This TM provides an overview of the adjustments to the water distribution and wastewater collection system models and how they were used to evaluate future capacity improvements that may be needed by the 2030 planning horizon.

Pipe, valve, and control modifications were made to the water distribution model to account for importing errors simulate existing conditions. The wastewater collection system models were computationally too intensive for SewerGEMS to handle and the long model run times would make evaluating alternatives infeasible. A system-wide wastewater collection system model was completed by incorporating the data used in the individual area models, identifying missing data (major interceptor lines, invert elevations, etc.) and filling in the gaps based on GIS files and as-built drawings. In addition, the diurnal patterns of each model were modified to make the model more suitable for use in long-range planning.

The water distribution model was used to evaluate the existing water distribution system for its ability to adequately supply existing and projected future demands, while maintaining a defined set of operating guidelines. Recommendations were suggested whenever the existing system was unable to handle the future projected demands. The evaluation and recommendations can be found in TM 7 – Water Transmission and Storage Evaluation and Recommendations.

The wastewater collection model was used to evaluate the existing wastewater system performance for various flow scenarios against specific wastewater system evaluation criteria and operating guidelines. System improvements were identified whenever evaluation criteria were not met. The evaluation and suggested improvements can be found in TM 8 – Wastewater Collection and Pumping Evaluation and Recommendations.

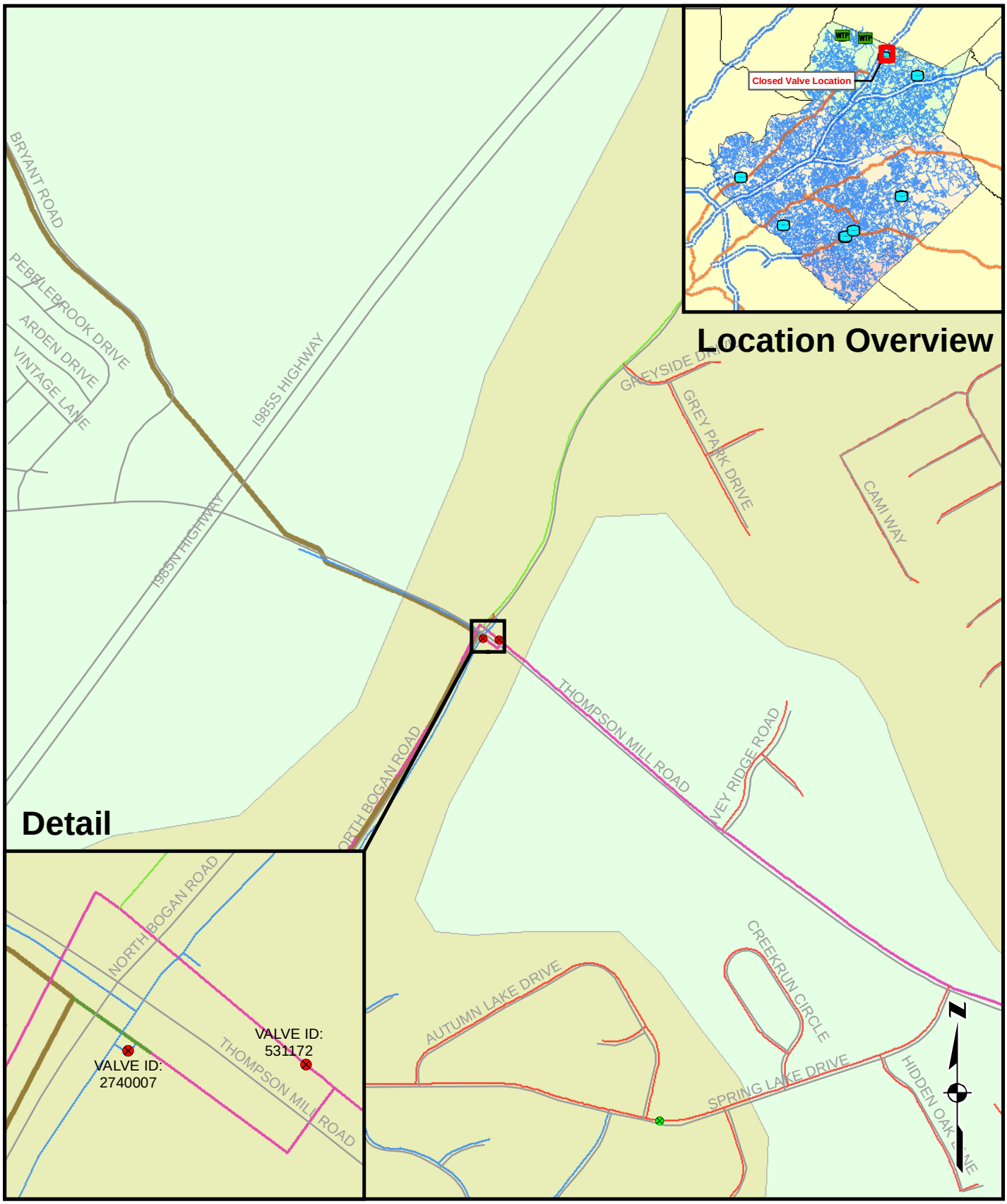
Neither the water nor the wastewater models were fully calibrated as part of this Master Plan. The water model was calibrated by DWR prior to the Master Plan. The wastewater collection system model was validated based on pump station flows as part of this master planning project. Gwinnett DWR will need to calibrate the wastewater model based on systemwide flow monitoring prior to using the results of the model for detailed design of any of the recommendations. As described in TM 8 – Wastewater Collection and Pumping Evaluation and Recommendations, there are no immediate capacity needs in the collection system; therefore detailed modeling for design purposes is not an immediate need.

APPENDIX A

The figures included in Appendix A depict the eight areas of the distribution system where valves were closed in the system model to separate the pressure zones.

APPENDIX A:

System Valve Modifications



Gwinnett County 2030 Water & Wastewater Master Plan

Assumed Closed Valves

Figure TM5.A1

Legend

Closed Valves

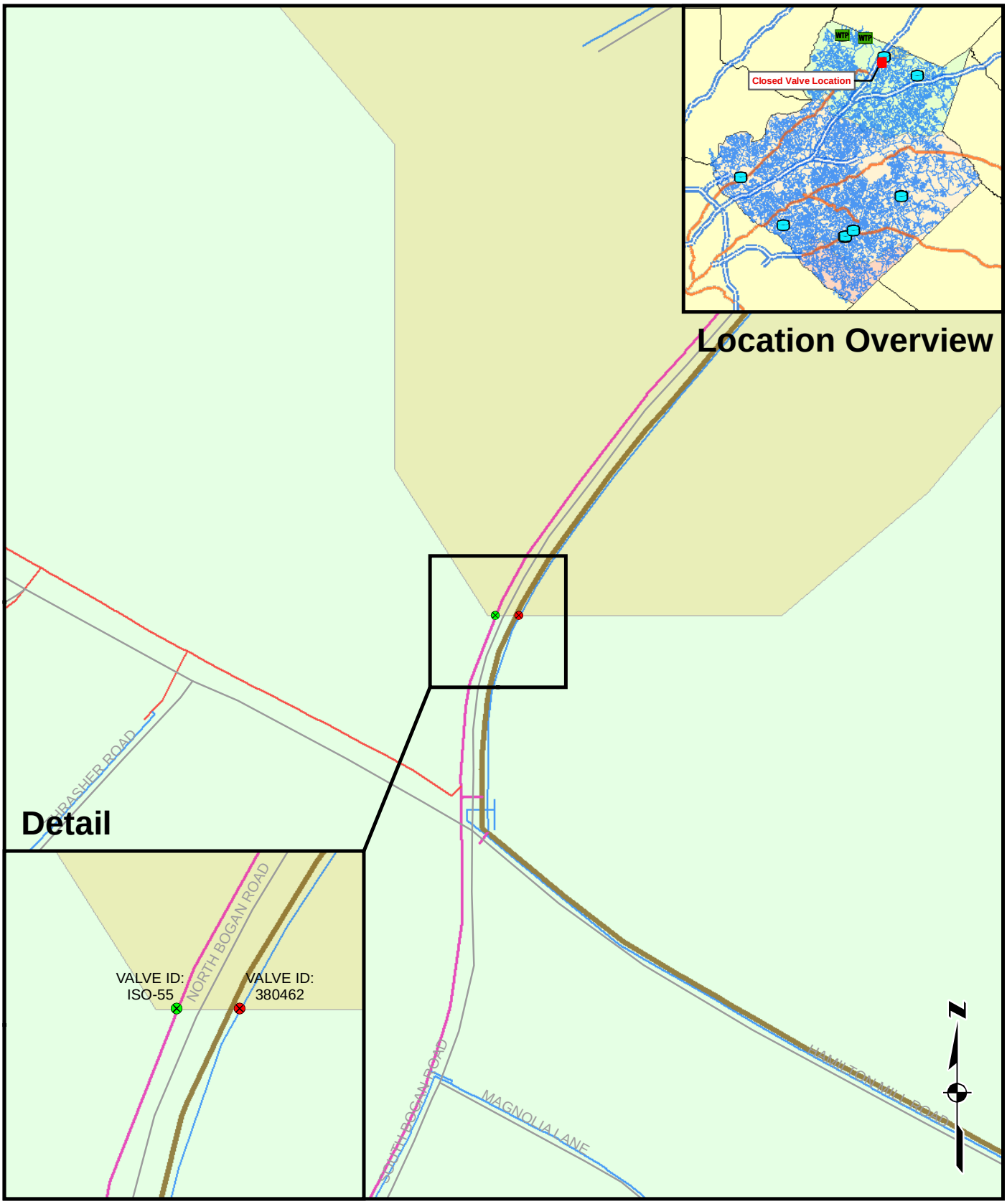
STATUS

- Closed (originally)
- Closed (assumed)

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Assumed Closed Valves

Figure TM5.A2

Legend

Closed Valves

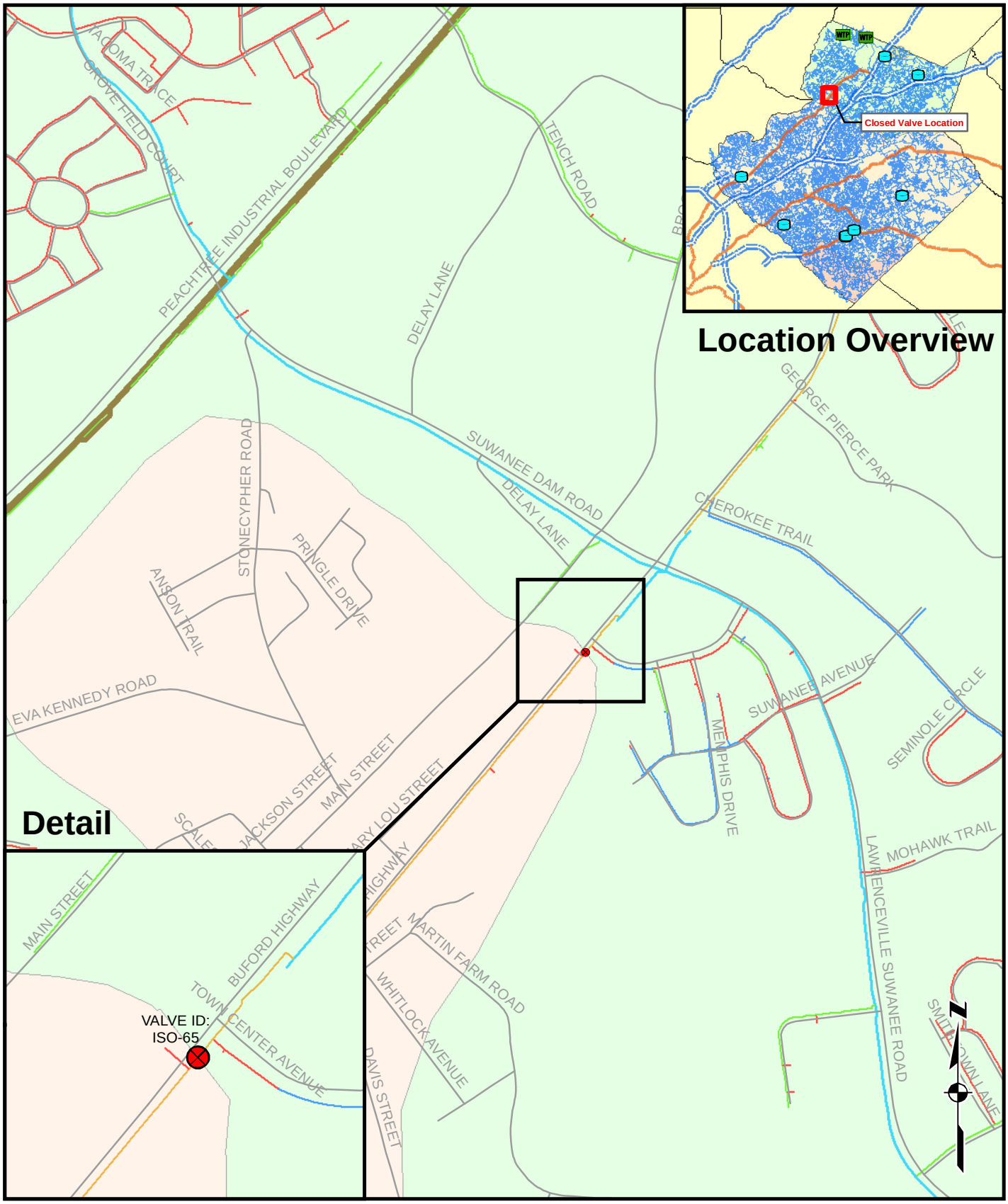
STATUS

- Closed (originally)
- Closed (assumed)

Existing Pipes

PIPE SIZE (inch)

- 6
- 8
- 10
- 12
- 14
- 16
- 20
- 24
- 30
- 36
- 42
- 48
- 54
- 60
- 72
- 78



Gwinnett County 2030 Water & Wastewater Master Plan

Assumed Closed Valves

Figure TM5.A3

Legend

Closed Valves

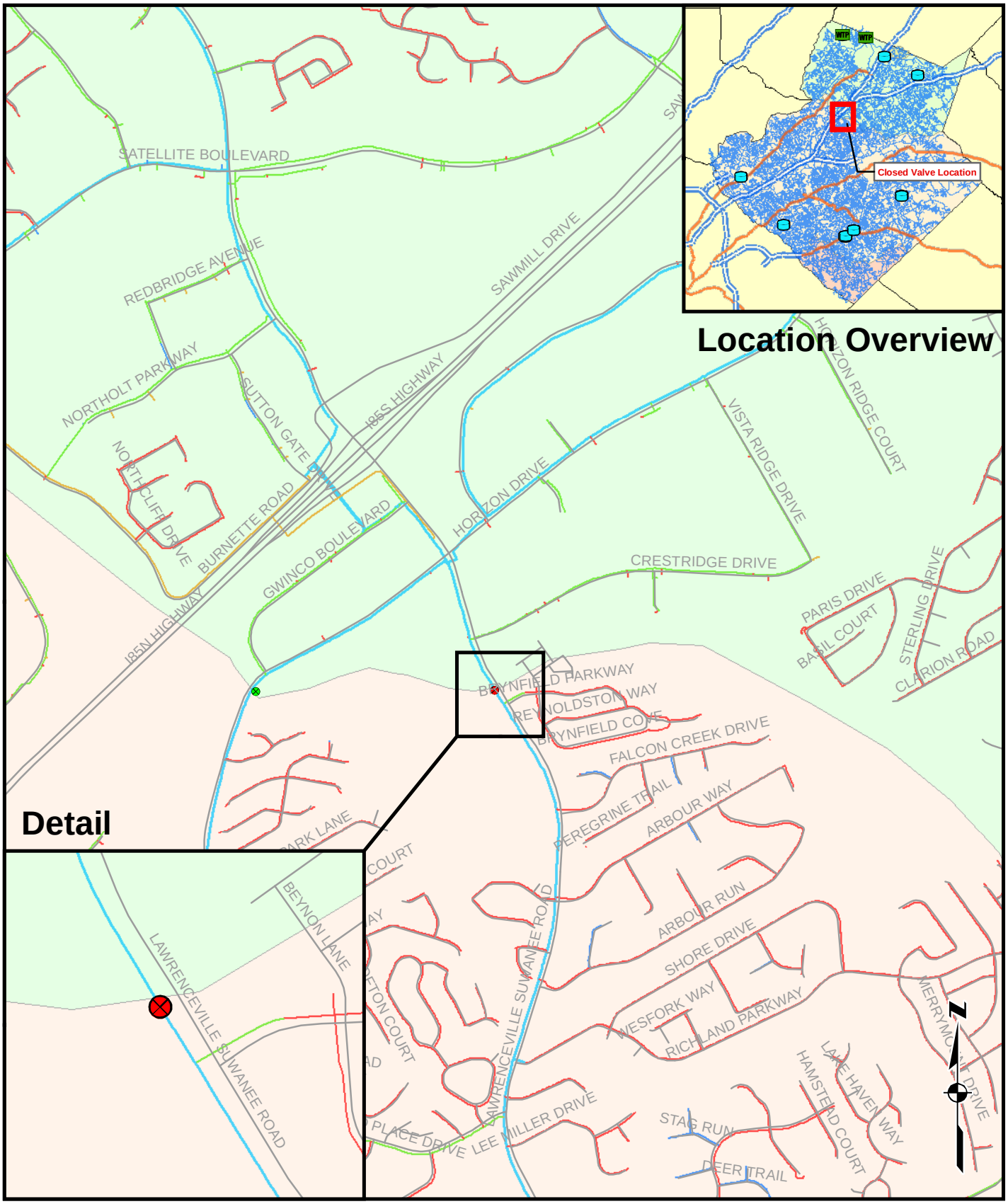
STATUS

- Closed (originally)
- Closed (assumed)

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Assumed Closed Valves

Figure TM5.A4

Legend

Closed Valves

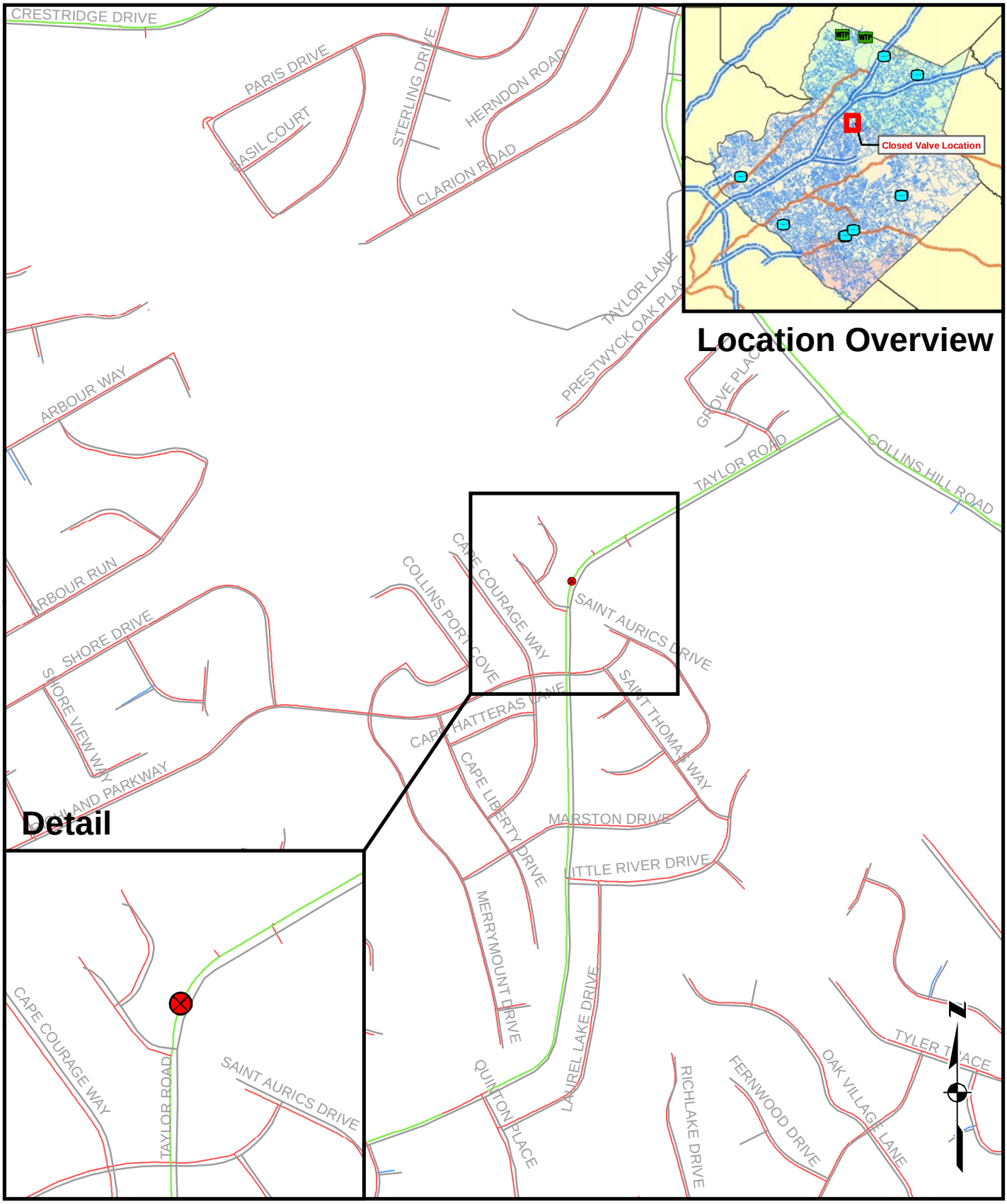
STATUS

- Closed (originally)
- Closed (assumed)

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Assumed Closed Valves

Figure TM5.A5

Legend

Closed Valves

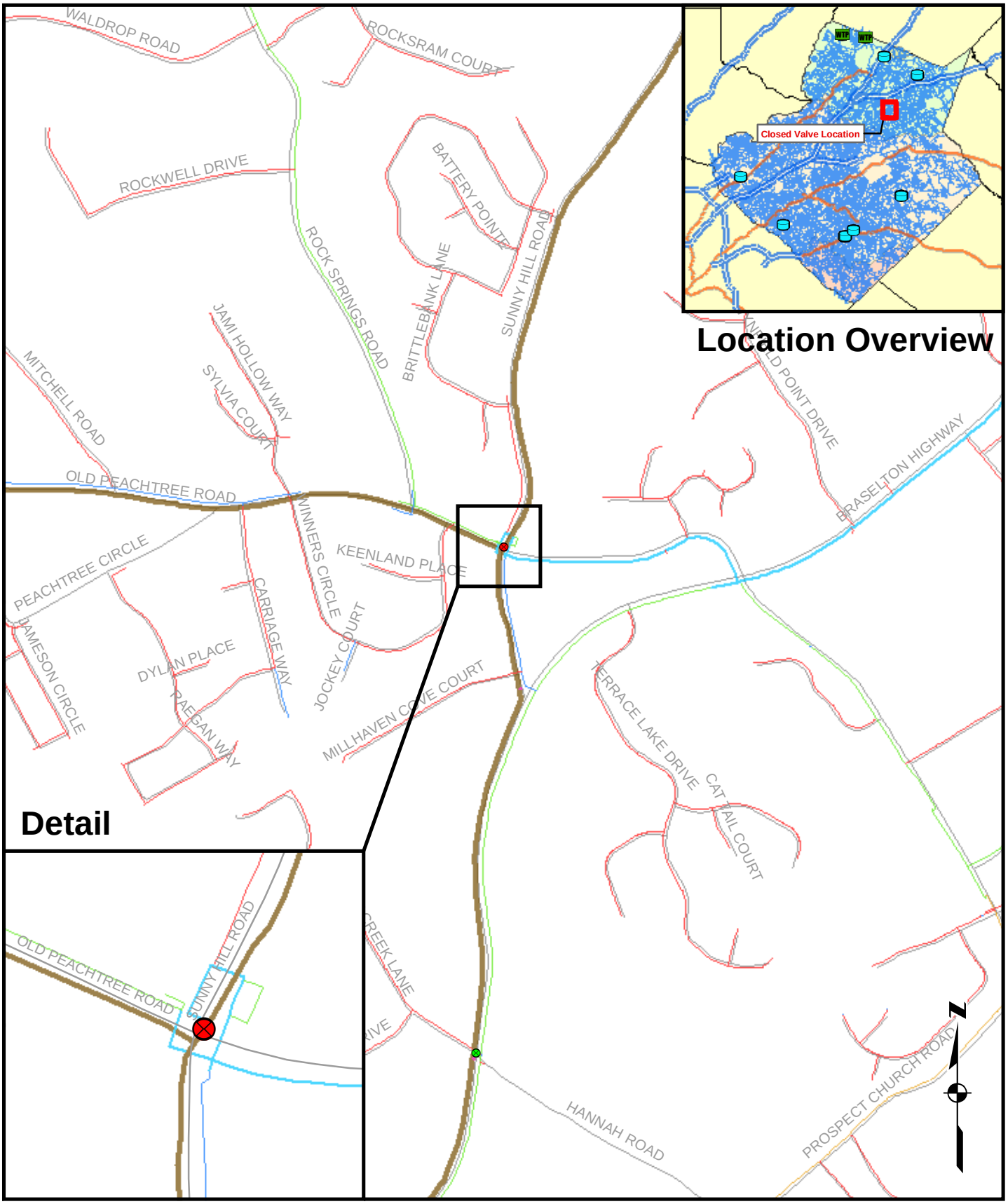
STATUS

- Closed (originally)
- Closed (assumed)

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Assumed Closed Valves

Figure TM5.A6

Legend

Closed Valves

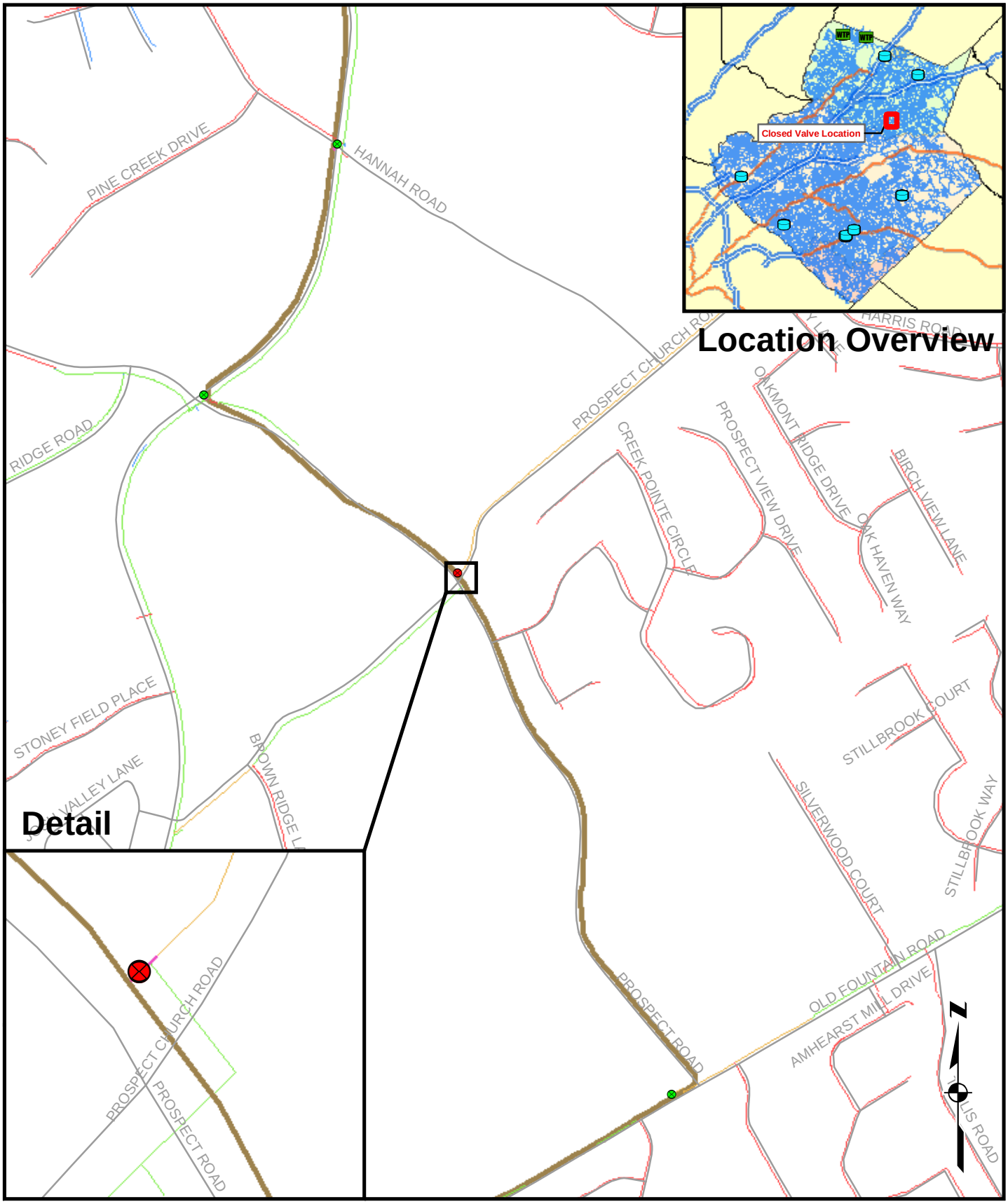
STATUS

- Closed (originally)
- Closed (assumed)

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Assumed Closed Valves

Figure TM5.A7

Legend

Closed Valves

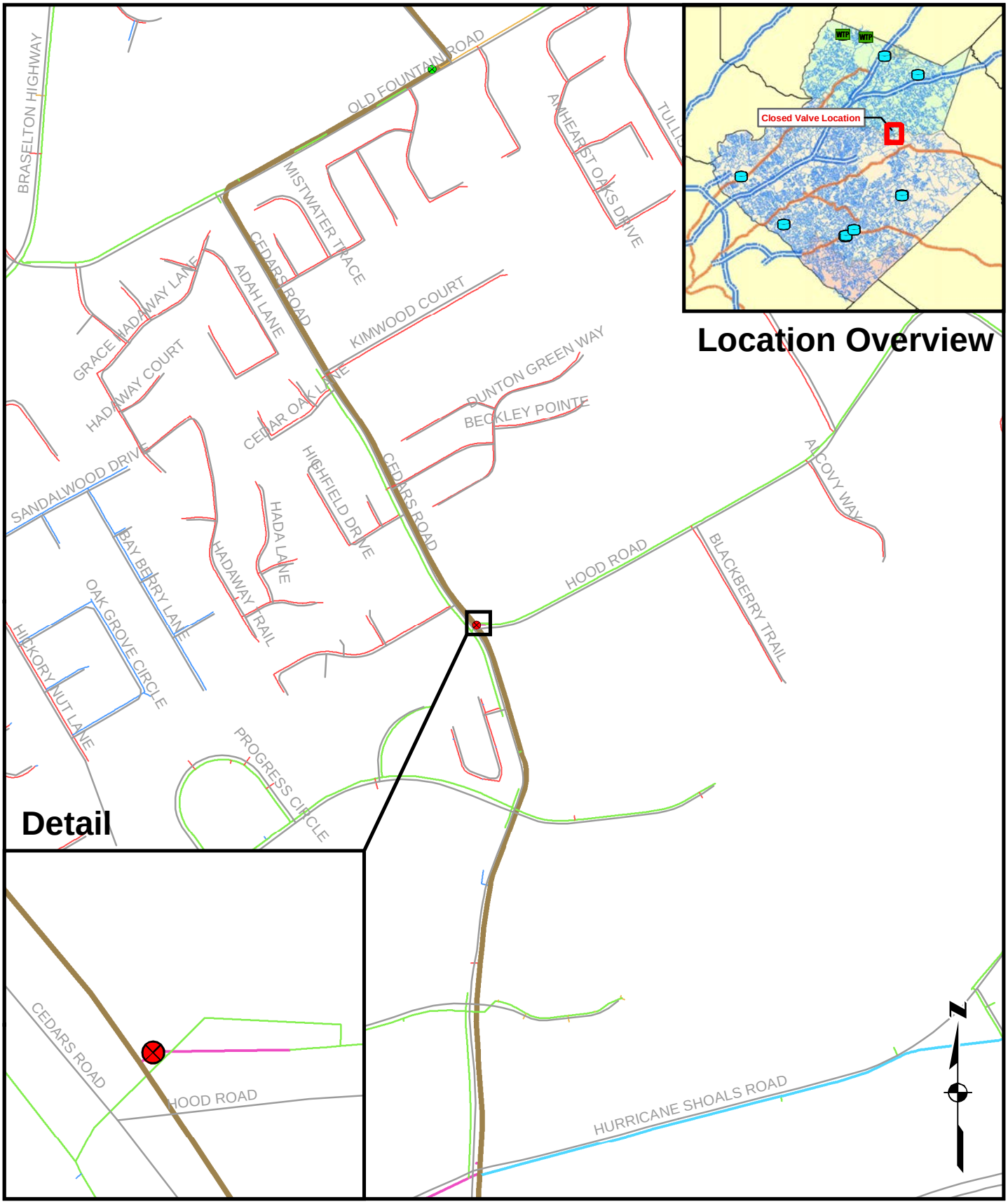
STATUS

- Closed (originally)
- Closed (assumed)

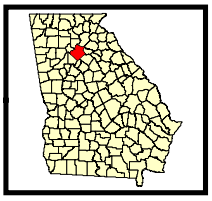
Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan



Assumed Closed Valves

Figure TM5.A8

Legend

Closed Valves

STATUS

- Closed (originally)
- Closed (assumed)

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78

Gwinnett County 2030 Water & Wastewater Master Plan

Technical Memorandum 6

Water Supply and Treatment Evaluation and Recommendations

TO:	Todd Cleaver - Gwinnett County Planning & Development	PAGES:	16
SUBJECT:	Gwinnett County 2030 Water & Wastewater Master Plan Technical Memorandum 6 – Water Supply and Treatment Evaluation and Recommendations		
FROM:	Kim Shorter, AECOM		
BY:	Kim Shorter and Chandra Mysore		
DATE:	May 10, 2011		

EXECUTIVE SUMMARY

This Technical Memorandum presents an overview of 1) the water supply and water treatment system for Gwinnett County, and 2) the recommended improvements that may be needed by 2030.

The water demands for Gwinnett County are forecasted to reach 154 MGD on an annual average basis (231 MGD on a peak day basis) as described in TM2 – Summary of Water and Wastewater Forecasts. The forecasted demands include the 23 MGD annual average day demand reduction anticipated in 2030 for the adopted water conservation program as outlined in TM2 – Summary of Water and Wastewater Forecasts. The water supply and water treatment needs include the in-plant water needs of 3.6 percent, resulting in 160 MGD on an annual average basis.

Currently, Gwinnett County is permitted to withdraw 150 MGD on an average monthly basis and has a rated treatment capacity of 225 MGD, with a firm capacity of 200 MGD. Therefore, additional drinking water supplies and treatment may be needed to meet the forecasted water need of 240 MGD on a peak day basis (with in-plant water need).

Currently, Gwinnett County is in compliance with all drinking water regulations and produces high quality drinking water for its customers. However, an increase in water production and distribution capacity and/or improvements to the current unit operations and processes may be necessitated by triggers resulting from the following:

- new drinking water regulations,
- potential decline in source water quality owing to changes in source water,
- opportunities to increase efficiency, and
- changes in regulations for safety of operations.

INTRODUCTION

Technical Memorandum 6, as part of the Gwinnett County 2030 Water and Wastewater Master Plan, summarizes the water supply and water treatment projects recommended for the 20-year planning horizon. The water demands presented in this section are based on Technical Memorandum 2 – Summary of Water and Wastewater Forecasts.

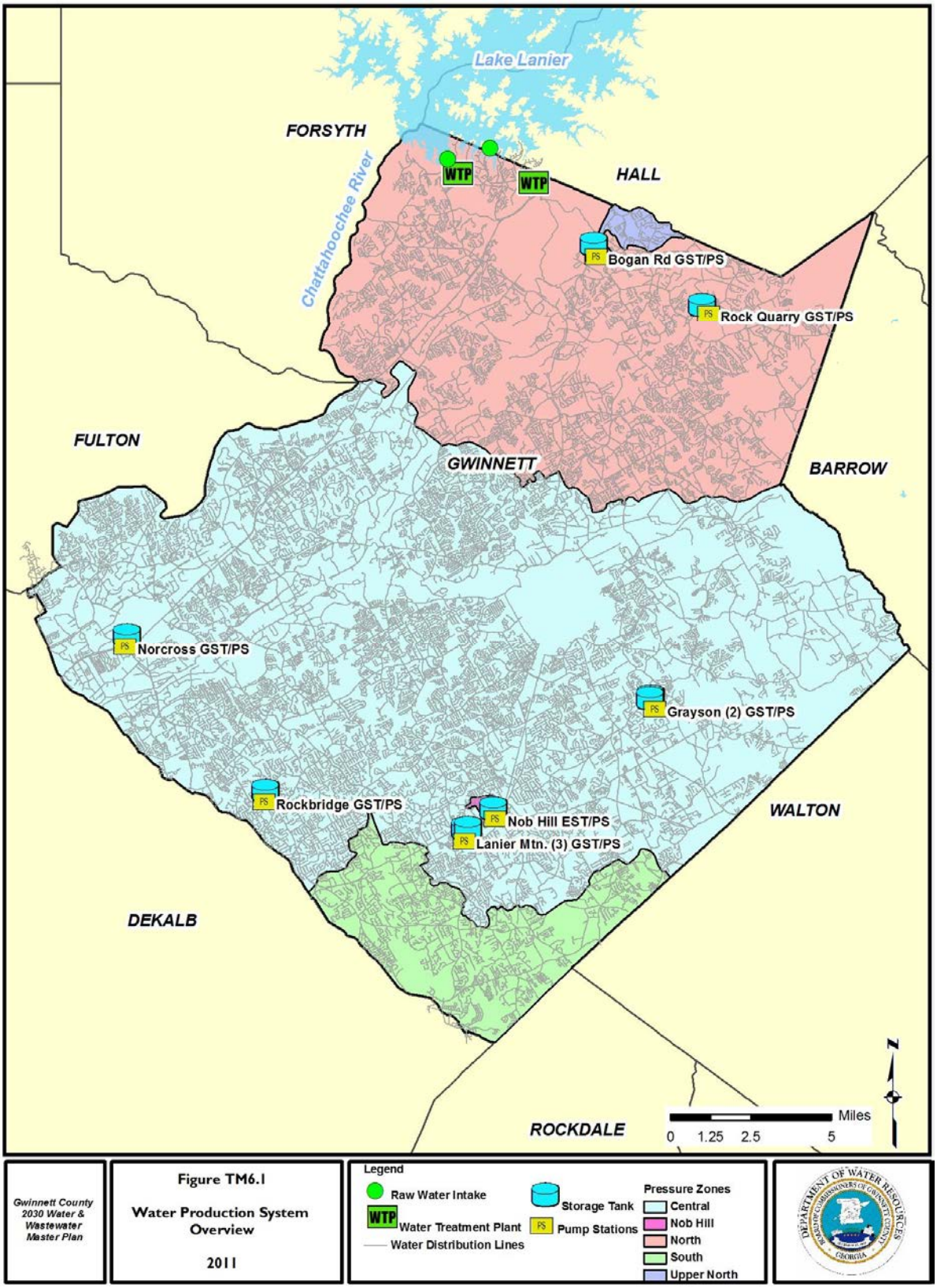
This Technical Memorandum is organized in the following sections:

- Existing water supply – This section provides a summary of the current Gwinnett County drinking water supply from Lake Lanier, and the two raw water withdrawal points (or intakes). This section also briefly discusses the ongoing legal challenges to the continued use of this water supply and presents future water supply considerations.
- Existing water conservation measures – This section presents the regional water conservation program as well as the enhanced water conservation measures that were recently adopted. The planned reduction in demand associated with these water conservation measures is presented.
- Water supply and water conservation recommendations – This section presents recommendations in terms of future supplies and demand management that may be needed within the timeframe of this Master Plan.
- Existing water treatment facilities – This section provides a summary of the existing water treatment facilities.
- Future policies and regulations – This section summarizes regulations that might be promulgated during the timeframe of the Master Plan.
- Water treatment recommendations – This section provides a summary of recommended water treatment projects based on future demands and potential changes in regulations.
- Cost of recommended improvements – This section outlines the basis and estimated costs of the recommended improvements.
- Conclusion – This section provides a summary of the recommendations and costs presented in this TM.

EXISTING WATER SUPPLY

Gwinnett County's water source is Lake Sidney Lanier, a 38,000-acre Federal impoundment created by Buford Dam on the Chattahoochee River, located along a portion of the northern border of the County, as shown in Figure TM6.1. Currently, Gwinnett County has a permit from the Georgia Environmental Protection Division (EPD) to withdraw up to 150 million gallons per day (MGD) on an average monthly basis from Lake Lanier. Gwinnett County currently pays the Corps $18.80 per million gallons for net withdrawals. Water from Lake Lanier is very high quality, so direct filtration combined with disinfection produce excellent drinking water quality for the consumers.

Figure TM6.1: Water Production System Overview



Currently, Gwinnett County operates two withdrawal points, or intakes, on Lake Lanier that pump water to the County's two water filter plants. These intakes on Lake Lanier, as described below, provide all of Gwinnett County's raw water supply. Gwinnett County previously operated an intake on the Chattahoochee River. While the permit is expired, Gwinnett County still owns the intake site at the Chattahoochee River.

INTAKES

Gwinnett County operates two raw water intakes that withdraw water from Lake Lanier. The intakes are located in two separate coves, approximately 3 miles east of Buford Dam. The Lanier intake has been in operation since 1977 and the Shoal Creek intake has been in operation since 2004. In addition to the second intake, a raw water line was constructed to connect the Shoal Creek and Lanier Water Filter Plants. This pipeline provides redundancy, such that either intake can provide water to both plants.

The Shoal Creek intake consists of a water intake structure on the floor of Lake Lanier connecting to a 14-foot diameter intake tunnel that runs underneath Lake Lanier and serves the raw water pump station. Twin 72-inch diameter pipelines connect the pump station to the Shoal Creek Water Filter Plant. The pump station has four pumps (35 MGD each) dedicated to the Shoal Creek Filter Plant, and four pumps (50 MGD each) dedicated to the Lanier Filter Plant. The Shoal Creek intake has a water withdrawal capacity of 255 MGD with an expansion potential to 360 MGD. The interconnection of the two water filter plants improves reliability and redundancy of the water system.

The Lanier intake consists of three 72-inch diameter pipes, which draw water at 10, 24, and 45 feet below the conservation surface elevation in Lake Lanier. Gwinnett County can withdraw water from the zone of optimum quality, which may vary according to season. The Lanier Raw Water Pump Station has six pumps (30 MGD each), allowing for a peak pumping capacity of 180 MGD and a firm capacity of 150 MGD. Water is taken to the Lanier Filter plant by two raw water force mains, 48-inch and 72-inch in diameter. These mains are protected using a steel hydropneumatic surge tank, which prevents water column separation in the event of a power failure or emergency pump shutdown. A major upgrade to the Lanier Raw Water Pump Station was completed in January 2008. The work included new pumps and motors, hydraulic system, electrical switchgear, motor starters and controls, and HVAC systems. There is a raw water junction box at the Lanier intake that allows Gwinnett County to send water either to the Shoal Creek WTP or to the Lanier WTP.

Although not currently operational, Gwinnett County historically operated a raw water intake on the Chattahoochee River near the City of Duluth. This intake had a permitted capacity of 10 MGD and has been inactive since 1991. If withdrawals from the Chattahoochee River were needed in the future, this site would require a new withdrawal permit from EPD, a new intake structure, and a new pumping station.

The Shoal Creek and Lanier intakes in combination have a total pumping capacity of 435 MGD which will meet the demands through 2030. While an increase in the existing permits for water withdrawal will be needed, no increases in withdrawal pumping capacity are anticipated in this planning horizon.

INTERSTATE WATER CONFLICTS

On July 2, 1973, the County entered into the "Contract between the United States of America and Gwinnett County, Georgia, for Withdrawal of Water from Lake Sydney Lanier," administered by the Corps of Engineers and has since entered into several extensions and modifications to that agreement (collectively known as the "Contract"). The Contract granted the County the right to withdraw raw water from Lake Lanier for municipal and industrial uses at a rate of 53 MGD. The Contract permitted the County to construct and operate facilities to withdraw water and requires the County to maintain certain records.

The Contract originally provided that either party could terminate it upon providing three years notice. Unless otherwise terminated, the Contract would continue for 30 years or until the Federal government completed its study of area water storage, discharge, and withdrawal needs. In June 1985, the U.S. Corps of Engineers, Army Engineers District-Mobile (Corps) gave the County notice that the Contract would be terminated on July

1, 1989. In June 1989, the Contract was extended for six months, until January 1, 1990. That historical contract is no longer in effect; however, the County has continued to withdraw and pay for water from Lake Lanier, which provides all of the County's raw water.

From 1990 to 2000, the County paid $9.74 per million gallons for water withdrawn. In April 2000, the Corps increased this amount to $18.80 per million gallon.

The use of storage in Lake Lanier for water supply has been under litigation since 1990. The multiple lawsuits in this litigation have been directed at the U.S. Army Corps of Engineers. The litigation affects water supply for the entire region. As of the date of this publication, the amount of Lake Lanier storage available for municipal and industrial use and its corresponding yield has not been determined.

As a party to the litigation, Gwinnett seeks to secure its water rights by obtaining storage contracts, as necessary, pursuant to past acts of Congress. Further Congressional actions which would remove any residual doubt regarding the use of Lake Lanier storage for water supply is an alternative means of resolving the conflict.

The Corps is preparing an updated Water Control Manual for its dams in the Apalachicola-Chattahoochee-Flint (ACF) basin. The outcome of the litigation will bear upon the Water Control Manual. Gwinnett County will be engaged in this update through public participation channels.

Gwinnett County plans to continue withdrawing water from Lake Lanier and to maximize its return flows. However, the County will explore additional water supply alternatives which could augment and diversify its water rights portfolio for the long-range future.

FUTURE WATER SUPPLY CONSIDERATIONS

Gwinnett County water supply needs are anticipated to reach 160 MGD on an annual average basis or approximately 192 MGD on a monthly average basis near the end of this planning period. Currently, Gwinnett County has a permit to withdraw a total of 150 MGD on a monthly average basis. Additional water supply will be needed to meet future demands; therefore, Gwinnett County will take credit for its inflows into Lake Lanier. If the legal issues regarding Lake Lanier are resolved, the continued use of Lake Lanier will remain the priority. Additional discussion regarding the ongoing practice of indirect potable reuse is outlined in TM10-Water Reuse Evaluation and Recommendations.

EXISTING WATER CONSERVATION MEASURES

Gwinnett County has a proactive water conservation program and provides incentives for customers to increase their water efficiency. Recently, Gwinnett County hired a full-time water conservation coordinator to assist with the management of the ongoing programs.

Gwinnett County is part of the Metropolitan North Georgia Water Planning District (Metro Water District), created by the Georgia General Assembly in 2001 (O.C.G.A. §12-5-572) to serve as the water planning organization for the greater metropolitan Atlanta area. As required in the legislation, the Metro Water District developed three long-term regional plans. One of these three plans, the Water Supply and Water Conservation Management Plan outlines a regional water conservation program that is required by all of the counties and cities within the Metro Water District. The required water conservation measures included in the District's Water Supply and Water Conservation Management Plan are summarized in Table TM6.1. Gwinnett County is periodically audited by EPD to assess the ongoing implementation of these water conservation measures. The last audit process occurred in 2008 and Gwinnett County received a certification of compliance and good faith effort from EPD in early 2009. The next audit will likely be in the 2012 to 2013 timeframe.

Gwinnett County planning staff actively participated in the Metro Water District Plan update process, leading to the completed 2009 Water Supply and Water Conservation Management Plan. The planning process included reviewing and ranking over 70 potential water conservation measures before selecting the 12 measures included in the Plan and shown in Table TM6.1. The measures were selected based on the water use patterns for each county, the anticipated implementation rate by each category of water user (i.e., residential, multi-family, commercial, industrial), and the anticipated program costs. The selected measures in Table TM6.1 were selected by the water providers based on this analysis and are actively being implemented in Gwinnett County and across the Metro region.

Table TM6. 1: Regional Water Conservation Measures

Measure Name	Brief Description [1]
Conservation Pricing	Implement a tiered rate structure to encourage water conservation by charging higher rates for customers with the highest water use.
Replace Older, Inefficient Plumbing Fixtures	Implement a program to convert older, inefficient toilets to low flow toilets (rebate program).
Require Pre-Rinse Spray Valve Retrofit Education Program	Develop an education program targeting food service establishments on retrofitting with low-flow pre-rinse spray valves.
Rain Sensor Shut-Off Switches on New Irrigation Systems	Implement state law requiring the installation of rain sensor irrigation shut-off switches for all new properties.
Require Sub-Meters in New Multi-Family Buildings	Adopt local ordinances or policy to require that all new multi-family buildings be individually metered or sub-metered.
Assess and Reduce Water System Leakage	Develop a program for identifying and reducing local water system loss and assess local water losses annually using the IWA/AWWA water audit methodology.
Conduct Residential Water Audits	Provide residential water audit information to residential water customers.
Distribute Low-Flow Retrofit Kits to Residential Users	Distribute low-flow retrofit kits to customers.
Conduct Commercial Water Audits	Develop a commercial water audit program that targets high water users.
Implement Education and Public Awareness Plan	Develop a local public education program with both education and outreach activities.
Install High Efficiency Toilets and High Efficiency Urinals in Public Buildings	Develop a program and schedule for the replacement of inefficient toilets and urinals within government buildings with high efficiency toilets and urinals.
Require New Car Washes to Recycle Water	Adopt an ordinance that requires all new drive through car washes to recycle water.

Sources of Information:
[1] adapted from the Metro Water District "Water Supply and Water Conservation Management Plan". AECOM. May 2009.

These water conservation measures were adopted by the Metro Water District Board in June 2009 and subsequently adopted by Gwinnett County. In response to the legal challenges to the continued use of Lake Lanier, Gwinnett County collaborated with the other water users who rely on water from Lake Lanier and the

Chattahoochee River downstream of Lake Lanier to evaluate additional water conservation measures. The water providers considered over 70 water conservation measures including previously considered measures, enhancements to existing measures, and measures used in other regions. Following the evaluation, 8 new measures were recommended to the Metro Water District Board for adoption in December 2010 and 2 new measures were tabled to provide time for additional analysis and stakeholder coordination. The 8 new adopted measures and 2 tabled measures are presented in Table TM6.2.

Table TM6. 2: Chattahoochee/Lanier Additional Water Conservation Measures

Measure Name	Brief Description [1]
Adopted Additional Water Conservation Measures	
Expedited Water Loss Reduction	Expedite existing programs to identify and reduce both real and apparent water losses.
Multi-Family HET Rebates	Implement a program to convert older, inefficient toilets to high-efficiency (HET) in multi-family homes.
Install Meters with Point of Use Leak Detection	Develop a point of use leak detection program to notify customers of possible leaks using the most appropriate meter technology.
Require Private Fire Lines to be Metered	Adopt an ordinance or policy to meter private fire lines in commercial buildings to identify and reduce improper water use.
Maintain a Water Conservation Program	Provide sufficient funding and staffing to implement the required water conservation measures.
Water Waste Policy	Adopt a water waste policy or ordinance to reduce outdoor water waste.
Require High Efficiency Plumbing Fixtures Consistent with State Legislation	Comply with the state legislation requiring high efficiency plumbing fixtures.
Education Measures	Add specific educational topics to the District's education work plan in future years.
Proposed Additional Water Conservation Measures	
Fixture Retrofit on Reconnect	Adopt an ordinance or policy that requires residential and non-residential property owners to replace inefficient fixtures upon water service reconnection following a change in property ownership.
WaterSense New Home Mandatory Program	Adopt an ordinance or policy to require new single-family homes to meet EPA WaterSense program requirements for water efficiency both indoor and in landscaping practices.

Sources of Information:
[1] adapted from the memo from Metro Water District Staff. November 11, 2010.

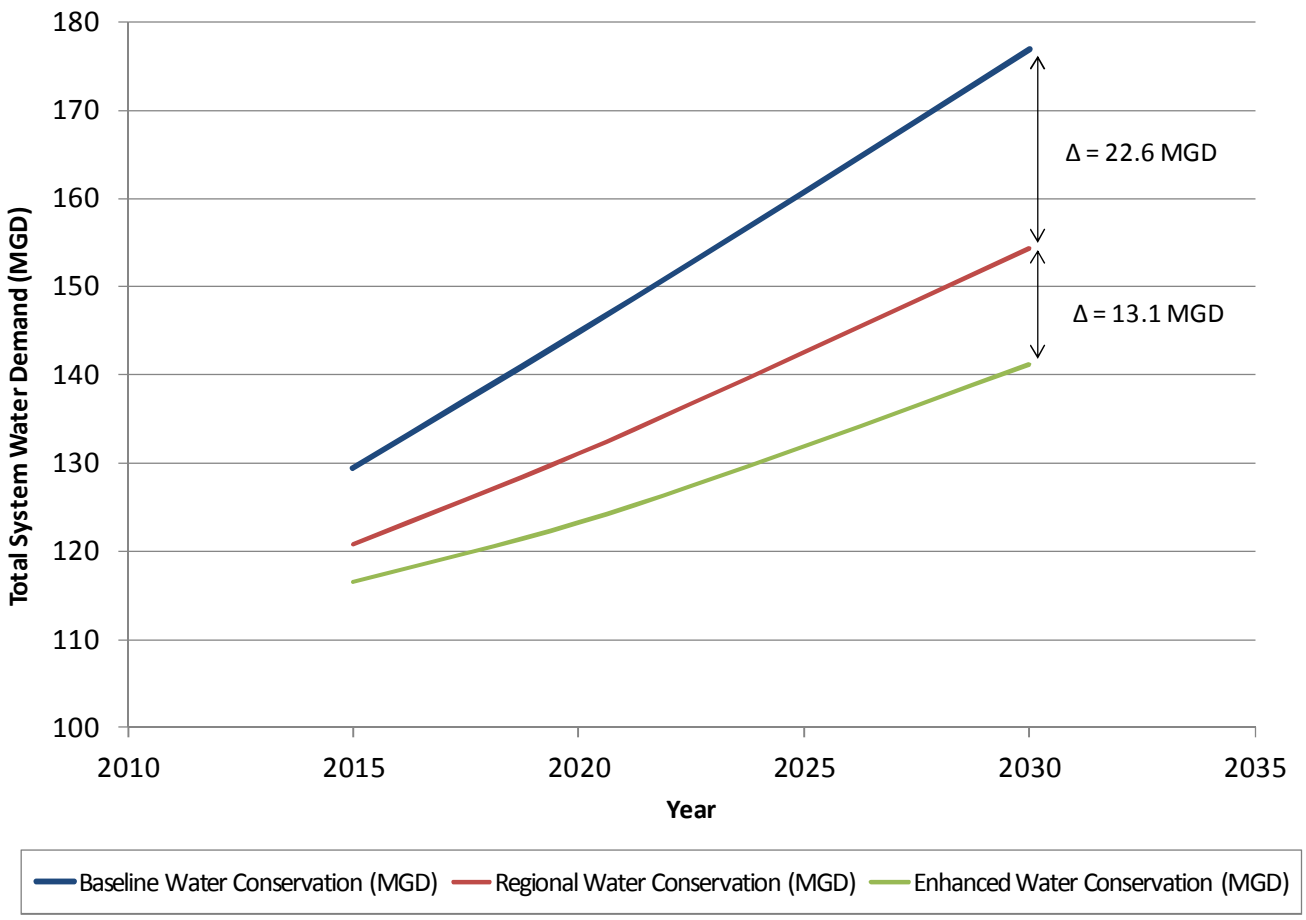
In addition to the measures above, the Georgia General Assembly passed the Water Stewardship Bill (SB 370) in 2010. The Water Stewardship Bill requires the installation of high efficiency water fixtures in new construction, including 1.28 gallon per flush toilets, after July 1, 2012. These required plumbing code changes were considered in the future demand forecasts presented in TM2 - Summary of Water and Wastewater Forecasts.

The potential savings from these water conservation measures were estimated using a water conservation model. As shown in Table TM6.3 and Figure TM6.2, the demand reduction in 2030 associated with implementation of the 2009 Plan is almost 23 MGD and the additional 2010 Water Conservation measures (which include implementation of the Water Stewardship Bill) reduce the 2030 demands by an additional 13 MGD. The total estimated water savings in 2030 of almost 36 MGD represents approximately 20% of the baseline water demands (i.e. demands without adjustments for water conservation measures).

Table TM6.3: Total System Water Demand Forecasts: Baseline and Conservation Scenarios (MGD)

Scenario	YEAR			
	2015	2020	2025	2030
Baseline (No Conservation)	129.4	144.8	160.7	176.9
2009 Plan Water Conservation Programs	120.7	131.0	142.5	154.3
2010 Water Conservation Programs	116.5	123.2	131.9	141.2

Figure TM6.2: Water Demand Forecasts Comparison (Based on International Gateway Population Projection)



Since the enhanced water conservation measures (2010) were adopted following the demand forecasts for this Plan, only the Regional water conservation reductions (2009 Water Plan) are included in the modeled results. However, the final Plan will be designed around flow triggers, such that projects will not be

constructed unless they are necessary based on observed and expected near-term increasing water demands. The benefit of the additional water conservation measures will be to extend the need for some future capital improvement projects identified in this TM as well as in TM7 – Water Distribution and Storage Evaluation and Recommendations.

WATER SUPPLY & WATER CONSERVATION RECOMMENDATIONS

Additional water withdrawals will be needed by 2030 based on the water demands outlined in TM2-Summary of Water and Wastewater Forecasts. If the legal issues are resolved regarding the current and future use of Lake Lanier, then additional withdrawals will likely be requested to meet Gwinnett County's needs. If the legal issues regarding Lake Lanier are not resolved or Gwinnett County can only use the current or a portion of the currently permitted withdrawal, then additional sources of water supply will be needed in the future. New water supply sources were identified as a component of this Master Plan. However, due to the ongoing legal challenges, information about these supply sources is protected by attorney-client privilege and cannot be described in this TM.

Gwinnett County is a regional leader in water conservation. With additional supply needed in the 2030 timeframe, Gwinnett County will continue to evaluate how water conservation could be used to extend existing supplies and delay the need to build additional and/or new supply. With the diminishing returns associated with water conservation, it is unlikely that water conservation will be able to bridge the approximately 42 MGD gap in future water supply needs (difference between the 150 MGD permitted and the estimated 192 MGD demand on an monthly average basis in 2030 using the 2009 Metro Water District Plan water conservation programs). Water conservation is typically more cost-effective than developing new sources of water supply, but water conservation alone does not fully address the need for additional water.

EXISTING WATER TREATMENT FACILITIES

Gwinnett County currently operates two drinking water treatment plants: (1) Lanier Filter Plant (LFP) with a rated capacity of 150 MGD and (2) Shoal Creek Filter Plant (SCFP) with a rated capacity of 75 MGD for a combined capacity of 225 MGD. In 2010, the LFP treated approximately 41 MGD, and SCFP treated approximately 33 MGD on an annual average basis, for a total of approximately 75 MGD. A brief description of the two plants that both treat water from Lake Lanier is provided below in the Table TM6.4. The current distribution system consists of 2 high service pump stations, 13 booster stations, 10 treated water storage facilities, and 3,600 miles of transmission and distribution lines (described in TM 7 - Water Distribution and Storage Evaluation and Recommendations).

Table TM6. 4: Existing Water Treatment Plants

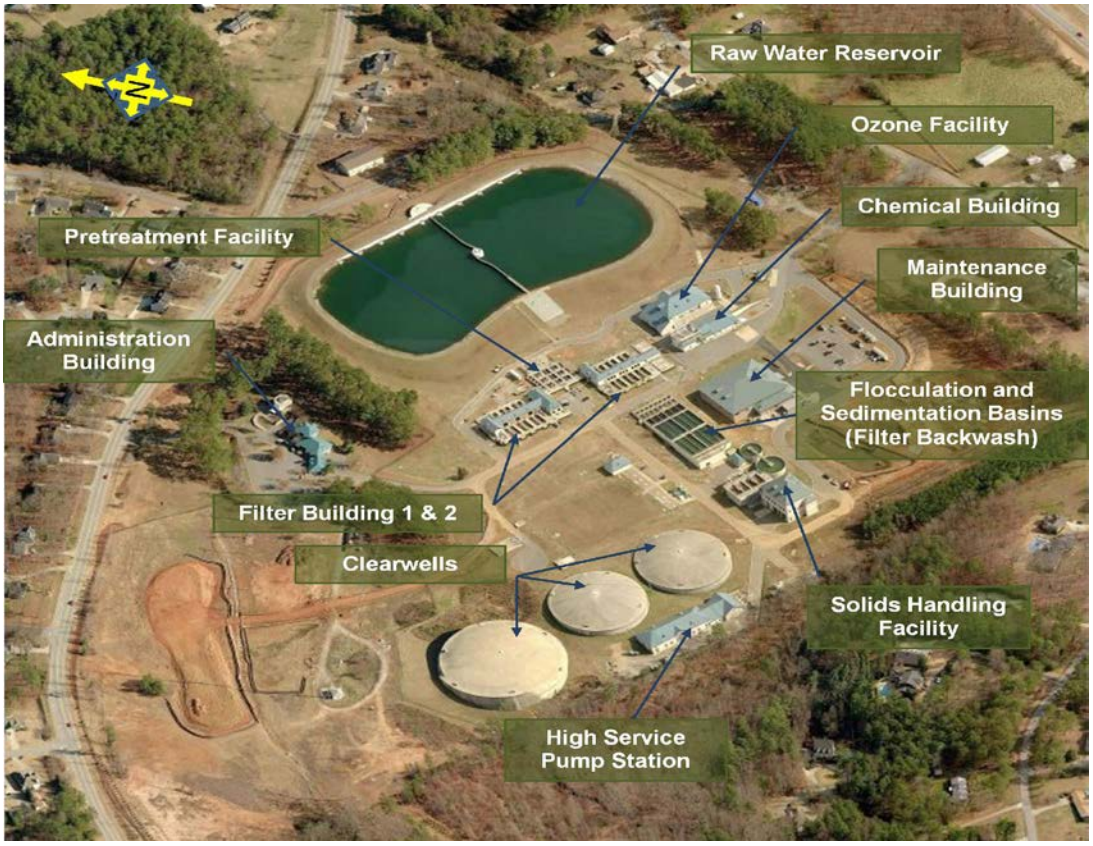
WTP	Rated Capacity	Process Descriptions
Lanier Filter Plant (LFP)	150 MGD	Raw water intake pump station, two raw water force mains, a surge tank, raw water junction box, a raw water storage reservoir, primary disinfection using ozone, rapid mix, flocculation, deep bed filtration with dual media, chlorination, fluoridation, corrosion control, finished water storage and high service pumping (7 high service pumps)
Shoal Creek Filter Plant (SCFP)	75 MGD	Raw water intake pump station, raw water equalization, primary disinfection using ozone, rapid mix, flocculation, dual-media filtration, chlorination, fluoridation, corrosion control, finished water storage, and high service pumping (3 high service pumps to the Central Zone and 2 finished water transfer pumps to Lanier)

LANIER FILTER PLANT

The Lanier Filter Plant (LFP), shown in Figure TM6.3, is located on a 94-acre site north of the City of Buford. It was initially constructed in 1977 with an expansion in 1986 and upgrade in 1998 and further modifications made in 2000. It is a direct filtration plant and includes a raw water storage basin, primary disinfection using ozone (pre-ozonation), rapid mixing, three-stage flocculation, granular media deep bed filtration, chlorination, fluoridation, corrosion control, finished water storage, and high service pumping. The pre-ozonation system (primary disinfectant) has been designed to achieve 0.5 Log inactivation of *Giardia*. There are a total of 12 dual media filters of anthracite and sand that have a hydraulic loading rate of 7.5 gallons per minute (gpm)/square feet (sq.ft.). Free chlorine is a secondary disinfectant and is added downstream of the filters to maintain a disinfectant residual in the distribution system. There are seven (7) high service pumps with a firm pump capacity of 200 MGD that pump treated water to the north and central service area of the distribution system.

LFP practices 100-percent recycling of the filter backwash stream. The residuals handling facility at LFP treats waste backwash water from both the Lanier and Shoal Creek Filter Plants and includes waste backwash clarification and dewatering of solids. The waste backwash clarification is composed of flocculation with polymer addition, high-rate clarification using inclined plate settlers, and gravity thickening. The dewatering facility uses ferric chloride and slurry lime to condition the sludge. Dewatering is achieved by two plate-and-frame diaphragm filter presses. The dewatered residuals are hauled off-site by truck for disposal at a landfill or other land-application site. The clarified water is ultimately recycled to the raw water storage facility at the head of the LFP. The residuals handling process has been designed to handle backwash water from a treatment capacity of 225 MGD (note: treatment and dewatering of residuals from both plants occur at the LFP residuals handling facilities). The facilities can be expanded to accommodate 300 MGD of treatment capacity by adding additional presses, if needed in the future.

Figure TM6.3: Lanier Filter Plant (LFP)



SHOAL CREEK FILTER PLANT

The Shoal Creek Filter Plant (SCFP), shown in Figure TM6.4, is located on an 88-acre tract of land in the City of Buford. Construction was completed in 2004 and the facility has a rated capacity of 75 MGD. If necessary, the plant has enough space to be expanded to 150 MGD on a peak day basis. Gwinnett County has the two water treatment plants (i.e. LFP and SCFP) in two different locations alongside Lake Lanier to provide system redundancy.

Figure TM6.4 Treatment Facilities at the Shoal Creek Filter Plant (SCFP)

The treatment processes at SCFP repeat those of the LFP and consist of raw water equalization, primary disinfection using ozone (pre-ozonation), rapid mixing, flocculation, dual-media filtration, finished water storage, and high service pumping. The pre-ozonation system (primary disinfectant) has been designed to achieve 1.0 Log inactivation of *Cryptosporidum*, which provides a higher level of treatment than required by the Safe Drinking Water Act. There are 6 dual media filters with anthracite and sand that have a hydraulic loading rate of 7.5 gpm/sq.ft.. Free chlorine is added downstream of the filters as a secondary disinfectant to provide additional disinfection and to maintain a disinfectant residual in the distribution system. Additionally, Gwinnett County adds fluoride for dental health, lime to adjust acidity, and phosphates for corrosion control. There are 5 high service pumps with a firm capacity of 95 MGD. Of the 5 high service pumps, 3 pumps are dedicated to the central service area and 2 are dedicated to transfer finished water to the Lanier Filter Plant for distribution by the LFP high service pumps to either the central or north service area. The waste filter backwash water (residuals) from SCFP is transferred to the Lanier Filter Plant via a 20-inch force main. The treatment and dewatering of residuals from both plants occur at the LFP residuals handling facilities.

FUTURE REGULATIONS

Treatment standards are expected to become more stringent over the next 30 years as the ability to detect and understand the potential health implications of new constituents improves. The EPA and other regulatory agencies are continually in the process of revising existing regulations, and developing additional regulations. Gwinnett County staff track the status of potential regulations through participation in statewide and national professional associations, water industry journals, and announcements provided by the agencies.

Some of the potential regulations to track over the planning horizon include:

- Revisions to the total chromium drinking water standard – EPA is considering a new standard for Chromium-6, as the current standard is a combined total for Chromium-3 and Chromium-6. EPA is reviewing the potential human health risks associated with Chromium-6 before proposing new regulation.

- Unregulated Contaminant Monitoring (UCM) - EPA is continually evaluating compounds in drinking water, unregulated contaminant monitoring, which may be regulated in the future. Based on past experience, it takes approximately 10 to 20 years for a contaminant to go from being listed on the Contaminant Candidate List (CCL) to being regulated. Because of this continually-updated process, it is likely that additional drinking water contaminants will be regulated during the 20-year planning period. Gwinnett County has done some proactive testing for certain unregulated compounds. For example, Gwinnett County has conducted initial monitoring for PPCPs and EDCs in raw water, drinking water, and the FWHWRC effluent.

If any of these compounds move toward being regulated, Gwinnett County will review the proposed regulations and provide appropriate comments during the public comment period as is current practice. Gwinnett County has made proactive decisions and now is well suited to deal with the possible future regulations. For example, Gwinnett County currently practices ozone-biologically active filtration (BAF) processing, which is the most suitable treatment option for addressing some of the potential compounds on the CCL[1]. As with any new regulation, Gwinnett County will consider available technologies and operational changes to determine the most effective management approach.

WATER TREATMENT RECOMMENDATIONS

This section presents recommendations for the Gwinnett County water filter plants in terms of (1) expansions needed to meet future demand forecasts, (2) optimization of system operations, and (3) process improvements to address future changes in raw water quality/regulatory requirements.

EXPANSIONS NEEDED TO MEET FUTURE DEMAND FORECASTS

Based on TM2 – Summary of Water and Wastewater Forecasts, the projected peak day demands could reach 231 MGD, which will require 240 MGD of water treatment. The LFP and SCFP have a combined rated capacity of 225 MGD. The combined firm capacity with one filter out of service for maintenance at each plant is estimated at 200 MGD. Therefore, additional treatment capacity will be needed when peak demands approach 200 MGD. This plan will address improvements needed to provide additional capacity of at least 40 MGD.

The SCFP plant was designed for a maximum firm production capacity of 150 MGD in the future (with two filters out of service). The expanded SCFP and LFP with its present firm capacity would give the total system a rated capacity of 300 MGD, which should be sufficient to meet the peak need of 240 MGD. The new residuals handling facility at the LFP is designed to handle backwash water from a treatment capacity of 225 MGD and can be expanded to accommodate 300 MGD of treatment capacity. This expansion requires the addition of plates to the filter presses while increasing the capacity of SCFP. Therefore, the additional treatment capacity that is needed to meet the anticipated demands will be met through an expansion of the SCFP.

ADDITIONAL RELIABILITY FOR EMERGENCY PLANNING

Currently, the LFP and SCFP are interconnected so that most of the total water demand could be treated by either water filter plant if one of the water plants was impacted. Gwinnett County currently meets the requirements in the 2009 Metro Water District Water Supply and Water Conservation Management Plan for emergency water supply planning. The requirement is that water systems have a plan to meet 35-percent of the annual average water demands either through interconnections within the system or with neighboring systems, to provide for basic water needs during an emergency. The interconnection of the two water plants satisfies this requirement.

[1] Neuremberg R. et al., *Ozonation and Biofiltration for Removing MIB and Geosmin*, Journal AWWA (2000), 92:85:95.

In 2011, the Georgia Environmental Facilities Authority (GEFA) initiated a study to identify opportunities in the 15-county Metro Water District for additional interconnections. The GEFA study established a goal of meeting 65-percent of the annual average water demands (based on the 2009 Metro Water District Plan) through interconnections. Increasing the rated capacity of the SCFP by 15 MGD to 90 MGD by 2030 will meet this requirement. Therefore, the recommended increase in firm capacity of SCFP by 42 MGD on a monthly average basis will cover this reliability requirement.

OPTIMIZATION OF SYSTEM OPERATIONS

Gwinnett County is continually exploring ways to optimize chemical and electricity use to minimize operating costs. One of many options being evaluated is to replace the existing gaseous chlorine with sodium hypochlorite, which is considered an inherently safer technology. Gwinnett County could either produce sodium hypochlorite on-site, or purchase and transport it to the water filter plants. Gwinnett is currently exploring these alternatives looking at the benefits and challenges of each of the alternatives.

Gwinnett County currently uses the pump scheduling software from Derceto, Inc. (controls pump on /off) which reduces the overall electrical costs associated with pumping. Gwinnett County may also consider alternative forms of energy (e.g. solar, wind, hydropower, etc.) to reduce non-renewable energy consumption and operational costs in the future. A recently completed Business Case Evaluation considered solar, wind, and hydropower energy sources; based on these results, Gwinnett County will only continue to investigate the use of hydropower at this time.

PROCESS IMPROVEMENTS TO ADDRESS FUTURE CHANGES IN RAW WATER QUALITY AND REGULATORY INITIATIVESS

Process improvements will likely be required in the future to address changed conditions including but not limited to new regulations, changes in raw water quality, new technologies, and/or the need for greater system efficiencies. Gwinnett County will continue to evaluate new processes through the programmatic approach (including the use of Business Case Evaluations), looking also at operational improvements and process improvements. Some of the triggers for a review of existing processes may include:

- New Regulations: Gwinnett County is currently in compliance with all applicable existing water quality regulations and is well-positioned to comply with most of the impending regulations. The current raw water from Lake Lanier is of good quality and the existing processes (i.e. pre-ozonation, direct filtration) adequately treat the source water such that it meets all current drinking water regulations. Process improvements and/or operational changes may be needed in the 20-year planning horizon to address changes in water quality and new regulatory requirements.
- Changes in raw water quality: Currently, Lake Lanier water is very high quality. If increasing upstream development in the future causes the quality of source water in Lake Lanier to decline then changes to the current and effective treatment processes may be required.
- New technologies: New technologies are continuing to enter the water market. Gwinnett County staff are actively engaged in the water professional associations and watch for emerging technologies that could be beneficial to Gwinnett County. New technologies are likely to become available in the 20-year planning horizon that could address process and operational challenges and efficiencies.
- Need for greater efficiencies; Gwinnett County continues to evaluate opportunities to increase systemwide efficiencies (for example the recent analysis of alternative forms of energy). The need for greater efficiencies in the future could be triggered by the increase in prices for goods, services, and energy. For example, if chemical costs increase then alternative processes or chemicals may be more cost-effective. Gwinnett will continue to programmatically review current practices and the need for efficiencies based on changing market conditions.

SUMMARY OF RECOMMENDATIONS

Table TM6.5 summarizes the recommended water treatment plant process improvements addressed in this section.

Table TM6. 5: Recommended Water Treatment Process Improvements

Trigger	Lanier Filter Plant (LFP) Recommendations	Shoal Creek Filter Plant (SCFP) Recommendations
Demands exceed the combined firm capacity of 200 MGD	No recommended projects.	Expand the firm yield by at least 40 MGD to meet the combined peak day demand of 240 MGD and provide additional redundancy.
Conditions change (additional regulations are passed, decline in source water quality, new technologies, need for greater efficiencies.)	Evaluate the change in conditions to determine the best course of action for Gwinnett County through a Business Case Evaluation or other process.	

COST ESTIMATE FOR RECOMMENDATIONS

The cost estimates for the recommended improvement projects are shown in Table TM6.6. The cost to expand the Shoal Creek Filter Plant is based on a unit cost of $4 million per MGD for additional capacity. This cost was developed for planning purposes and will need to be evaluated in greater detail prior to design and construction. A 25% contingency was added to the calculated cost to account for the planning level nature of this estimate.

Although additional permitted withdrawal capacity will be needed within the planning horizon, there is sufficient intake pumping capacity to meet the future demands. No significant capital expenditures for water withdrawal are anticipated as a result of the increasing demand.

Table TM6. 6: Cost Estimates for Recommendations

Improvement	Expected Year of Construction	Cost[1,2, 3]
Expand the firm yield of SCFP by at least 40 MGD to meet the combined peak day need of 240 MGD (estimated)	2030	$155,000,000

Notes:
1. A planning level contingency of 25% was added to the cost.
2. The cost was based on previous project costs and professional judgment.
3. Costs are presented in 2010 dollars.

CONCLUSION

Gwinnett County currently withdraws, and intends to continue to withdraw drinking water from two raw water intakes on Lake Lanier. The tri-state legal issues have challenged the continued use of this drinking water supply source. While this Master Plan evaluated potential drinking water supply sources that could augment

withdrawals from Lake Lanier, the results of the evaluation are protected under attorney-client privilege. According to TM2- Summary of Water and Wastewater Forecasts, the water supply and treatment needs could reach 240 MGD on a peak day basis or approximately 192 MGD on a monthly average basis. As the permitted supply is currently 150 MGD, additional water supply will be needed, either from Lake Lanier, or other sources.

Water from Lake Lanier is treated at one of two drinking water treatment plants: the LFP with a rated capacity of 150 MGD and the SCFP with a rated capacity of 75 MGD for a combined rated capacity of 225 MGD, on a peak day basis. These water treatment plants withdraw water from Lake Lanier and have a combined firm capacity of 200 MGD on a peak day basis (with one filter out of service at each of the plants). Future (2030) demands are expected to exceed this firm capacity at 240 MGD on a peak day basis. As the SCFP was designed with plans for future expansions, the expansion needed near the end of the planning horizon is recommended for the SCFP. The additional capacity needed could cost $155 million.

Gwinnett County is in compliance with all applicable existing water quality regulations and is well-positioned to comply with many of the anticipated regulations. New regulations, changes in water quality in Lake Lanier, availability of new technologies, or a need for greater efficiency could require additional treatment process for both the LFP and SCFP. A “trigger” approach, based on monitoring of real time present day data, will be developed as a part of this Master Plan. Gwinnett County Strategic Infrastructure Planning Division is charged with monitoring these triggers and initializing projects to meet future needs.

AECOM

AECOM Water

In association with: **Jacobs & PPI**

Gwinnett County 2030 Water & Wastewater Master Plan

Technical Memorandum 7

Water Transmission and Storage Evaluation and Recommendations

TO:	Todd Cleaver - Gwinnett County Planning & Development	PAGES:	72
SUBJECT:	Gwinnett County 2030 Water & Wastewater Master Plan Technical Memorandum 7 – Water Transmission and Storage Evaluation and Recommendations		
FROM:	Kimberly Shorter, AECOM		
BY:	David King & Brad Curran, Jacobs		
DATE:	July 8, 2011		

EXECUTIVE SUMMARY

Gwinnett County currently serves approximately 750,000 water customers through the water distribution system that includes two water filter plants, two high service pump stations, nine ground storage tanks, one elevated storage tank, 13 re-pump and booster pump stations, and 3,600 miles of distribution piping. Seven major re-pump and booster stations were modeled and are discussed in this technical memorandum (TM). The remaining booster pump stations serve small subdivisions with only a few customers. In 2009, Gwinnett County delivered approximately 71 MGD of treated water on an annual average basis; water demands are projected to increase to 154 MGD on an annual average day (231 MGD on a peak day) during the 20-year planning period addressed by the Master Plan. As a point of reference, Gwinnett County has experienced peak day demands as high as 143 MGD in 2000 and 130 MGD in 2006.

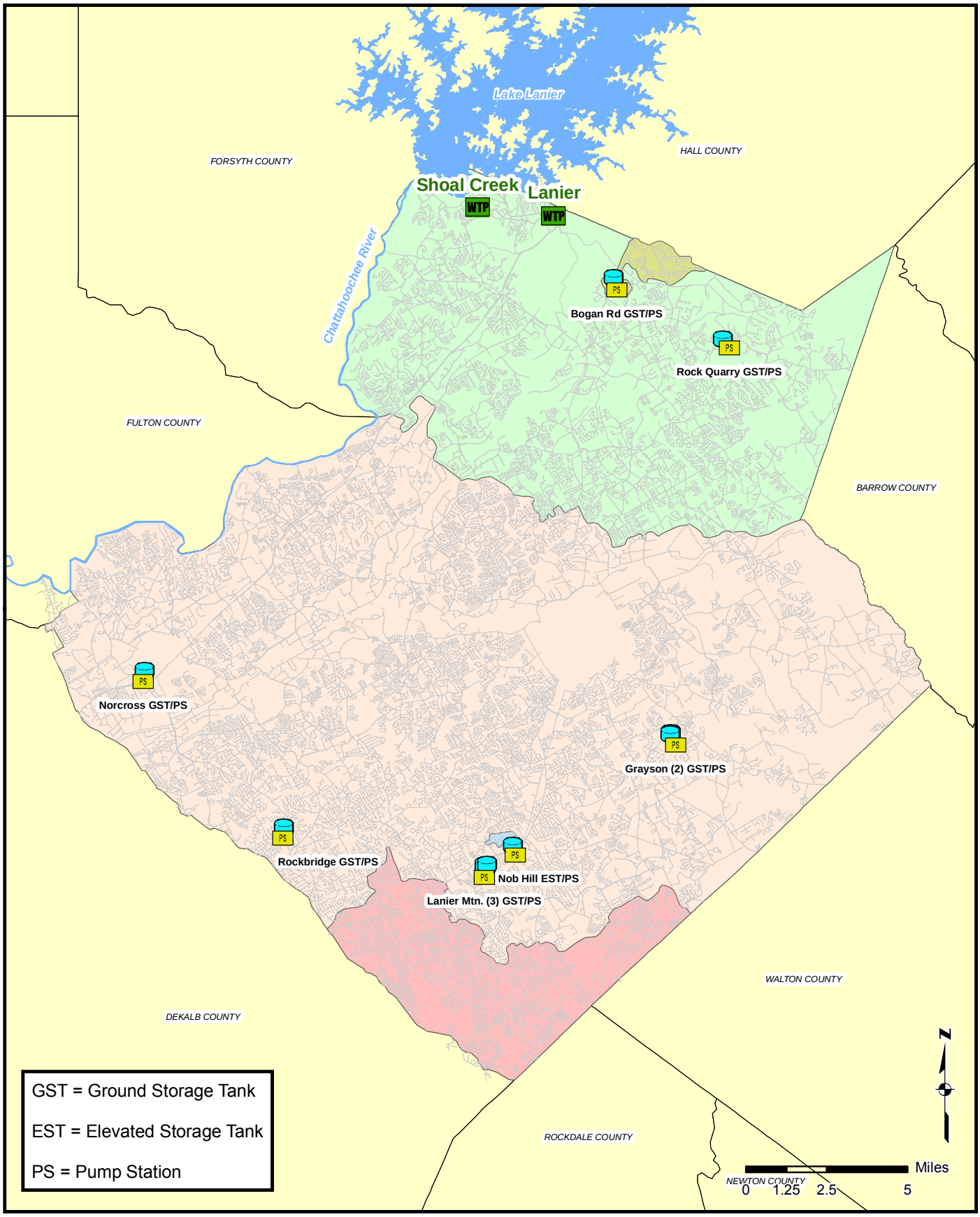
The existing Gwinnett County water distribution model was used to evaluate the ability of existing infrastructure to serve future retail and wholesale customers. The model assessed specific system operating criteria including minimum velocities, maximum headloss, minimum system pressure, adequate fire flow supply, and proper system storage turnover time. With each increasing demand scenario, projects were added to meet these basic system operating criteria. A total of 16 projects, with some projects including different phases, are recommended to meet the planned peak day demand of 231 MGD. One additional project is listed as an alternative to one of the recommended projects. In addition to future demand-based hydraulic improvements, the system was evaluated for areas of insufficient fire flow supply in future demand scenarios. Additional fire flow supply projects were developed to address these deficient areas of the Gwinnett County Water Distribution System. These system improvements are presented in more detail in this TM.

INTRODUCTION

This TM, as part of Gwinnett County's 2030 Water and Wastewater Master Plan, summarizes the existing water distribution system and evaluates the ability of the system to meet future demands. This TM also outlines the projects that will be needed as the system demands increase over the planning period from 2010 to 2030. This TM was developed in coordination with TM6 - Water Supply and Water Treatment Evaluation and Recommendations.

This Technical Memorandum is organized in the following sections:

- Existing Water Distribution System – This section describes the existing water filter plants, pressure zones, high service pump stations, storage facilities, and distribution networks for the Gwinnett County water distribution system.
- Model Analysis – This section describes the model used to evaluate the system performance with increasing future water demands.
- Water System Evaluation – This section presents the performance standards evaluated using the distribution system model.
- Proposed Hydraulic Improvement Projects – This section presents the projects that will be needed to meet future water demands for each of the water demand scenarios evaluated.
- Conclusion – This section presents a summary of the recommended system improvements by demand scenario.



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.1

Water Distribution System Overview

Legend

- PS Pump Station
- WTP WTP
- Storage Tank
- Water Main

PRESSURE ZONE

- Central
- Nob Hill
- North
- South
- Upper North (Bogan Rd)

EXISTING WATER DISTRIBUTION SYSTEM

The existing Gwinnett County distribution system starts at the Lanier and Shoal Creek Water Filter Plants and includes nine ground storage tanks, one elevated storage tank, and 3,600 miles of water mains as shown in Figure TM7.1. A supervisory control and data acquisition (SCADA) system is used to monitor and manage the tanks, pumps, pressures, and valve settings in the distribution network. In 2009, the distribution system delivered an average of 71 million gallons per day (MGD) of potable water to approximately 750,000 people. This section provides an overview of the existing water system including the water filter plants, pressure zones, high service pump stations, storage facilities, and the distribution network.

WATER FILTER PLANTS

The two water filter plants are located in the northwestern extent of the service area, shown in Figure TM7.1, near the system's raw water source, Lake Lanier. The Shoal Creek Filter Plant is the newer of the two (built in 2004) and can currently treat 75 MGD. The Lanier Filter Plant was built in 1977 and upgraded in 1986 and 1998 to a current production capacity of 150 MGD. Therefore, collectively the treatment system has a capacity to produce 225 MGD of water for the Gwinnett County service area. Additional details on the two water filter plants are outlined in a separate memorandum, TM6 – Water Supply and Water Treatment Evaluation and Recommendations.

PRESSURE ZONES

There are five pressure zones, shown in Figure TM7.1, that are used to moderate the water pressure throughout the distribution system; the North, Central, Nob Hill, South, and Upper North (Bogan Road) pressure zones. Two of the five pressure zones are created by the high service pump stations at the filter plants, North and Central, and are considered primary pressure zones. The Bogan Road and Nob Hill pressure zones are created by pump stations and are subsets of the North and Central pressure zones, respectively. The South Pressure Zone is created by a collection of pressure reducing valves and is a subset of the Central Pressure Zone.

In addition to regulating system pressure, mainly associated with changes in elevation in the distribution system, pressure zones are a common tool to reduce water loss in a distribution system. High pressures can lead to excess system leakage and damage infrastructure.

HIGH SERVICE PUMP STATIONS

There are two sets of high service pumps at the Lanier Filter Plant: the Lanier Central High Service Pump Station (HSPS) and the Lanier North HSPS. The Lanier Central HSPS includes one set of four pumps dedicated to the Central Pressure Zone and the Lanier North HSPS includes one set of three pumps dedicated to the North Pressure Zone. The Shoal Creek Filter Plant HSPS has three pumps that supply water to the Central Pressure Zone under normal conditions. However, for treatment plant redundancy, the Shoal Creek Filter Plant also has two high service pumps that can supply water to the clearwells at the Lanier Filter Plant, allowing the Shoal Creek plant to supply water directly to the Central Pressure Zone or indirectly to the North Pressure Zone. Consequently, the pumps at the Shoal Creek HSPS will be referred to as the Shoal Creek Central HSPS and Shoal Creek-Lanier HSPS in this document.

The high service pumps operate the two primary pressure zones at different hydraulic grade lines (HGLs). The variable speed pumps dedicated to the Central Pressure Zone are set to maintain a downstream HGL of approximately 1320 ft MSL and the North Pressure Zone high service pumps (also variable speed) maintain a HGL of 1400 ft MSL. Table TM7.1 summarizes the design capacities of the HSPSs for the system with the appropriate indications of the pressure zone served. The capacities are summarized by firm pumping capacity (the capacity with one of the pumps out of service) and total capacity.

Table TM7.1: High Service Pump Overview

High Service Pumps	No. of Pumps	Design Capacity: Single Pump (MGD)	Design Head: Single Pump (ft TDH[1])	Nominal[2] Firm[3] Capacity (MGD)	Nominal Total Capacity (MGD)
Lanier Central HSPS	4	50	130	150	200
Lanier North HSPS	3	25[4]	230[4]	50	75
Shoal Creek Central HSPS	3	35	300	70	105
Shoal Creek-Lanier HSPS	2	25	235	25	50

1 – TDH represents total dynamic head
2 – Nominal refers to the design operating capacity of the pump; a pump's capacity can vary depending on the system head conditions as well as the number of pumps in operation at the pump station
3 – Firm capacity is with one large HSP turned off
4 – Estimated based on pump curve included in hydraulic model from Gwinnett County Department of Water Resources

The nominal firm capacities of the HSPSs indicate that the existing pumping capacity is able to supply the two filter plant's combined treatment capacity of 225 MGD to the system. However, this general pumping capacity does not consider the distribution of total system demand between the two primary pressure zones. For example, if demand exceeds 50 MGD in the North Pressure Zone, then the Lanier North HSPS will need to be upgraded to meet the demand regardless of having total pumping capacity surplus.

STORAGE FACILITIES

Currently, there are nine ground storage tanks and one elevated storage tank actively operated in the Gwinnett County Water Distribution System. In the past decade there have been as many as 13 storage tanks utilized in the system, but three tanks have been decommissioned in recent years. Improvements in other areas of the distribution system removed the need for these tanks.

All of the ground storage tanks have a corresponding pump station that supplies water back to the surrounding area at the appropriate system pressure. The one elevated storage tank (Nob Hill) has a booster pump station to pump water from the Central Pressure Zone to this higher elevation. Table TM7.2 summarizes general characteristics of the 10 storage tanks in the distribution system.

Table TM7.2: Distribution Storage Tank Overview

Storage Tank	Configuration (ground/elevated)	Volume (MG)	Diameter (ft)	Bottom of Bowl Elevation (ft MSL)	Overflow Elevation (ft MSL)
Rock Quarry Tank	Ground	10.5	192	1197	1246
Bogan Road Tank	Ground	5	130	1280	1330
Grayson Tank 1	Ground	10	190	1016	1063
Grayson Tank 2	Ground	10	190	1016	1063
Norcross Tank	Ground	5.25	150	1069	1109
Lanier Mountain Tank 1	Ground	5	146	1165	1205
Lanier Mountain Tank 2	Ground	5	146	1165	1205
Lanier Mountain Tank 3	Ground	5	146	1165	1205
Rockbridge Tank	Ground	5	146	1114	1154
Nob Hill Tank	Elevated	0.4	40	1266.5	1304

DISTRIBUTION NETWORK

The distribution system consists of a network of approximately 3,600 miles of water mains ranging from 2 to 78 inches in diameter. According to the hydraulic model from Gwinnett County Department of Water Resources (DWR), a majority of the distribution network consists of ductile iron pipe and PVC (small diameter only). However, some large diameter transmission mains were made from steel or concrete. There were a small number (< 5 percent) of asbestos concrete (AC) pipes in the system. Thin-walled PVC and AC should be considered for replacement sooner than pipes made of stronger materials.

The Lanier Central HSPS serves the Central Pressure Zone with one 78-inch and two parallel 48-inch transmission mains; the 78-inch transmission main serves the eastern portion and the two 48-inch transmission mains serve the western portion of the Central Pressure Zone. The Shoal Creek Water Filter Plant supplies water to the system through a 60-inch transmission main that manifolds with the two parallel 48-inch transmission mains from the Lanier Water Filter Plant and continues to the Central Pressure Zone. The primary transmission mains in the Central Pressure Zone are connected by a 30-inch east-west transmission main to form a loop. The North Lanier HSPS supplies the North Pressure Zone through a 48-inch transmission main to the east and a 12-inch transmission main to the west.

MODEL ANALYSIS

A hydraulic model was used to evaluate the performance of the distribution system under current and future water demand conditions. The hydraulic modeling analysis used the most-recent DWR water distribution system model (the most recent calibration changes were made by DWR personnel in October 2009). The existing Gwinnett water system model was developed in Bentley's WaterGEMS distribution system modeling software. A more detailed summary of the model analysis is provided in TM 5 – Distribution and Collection System Modeling.

DEMAND ALLOCATION

The future water demands are presented in TM 2 - Summary of Water and Wastewater Forecasts and are based on the International Gateway scenario in the Unified Plan. The water demands associated (geographically) with each traffic analysis zone (TAZ) were allocated to specific points, or nodes, within the distribution model using the following methodology:

- The nodes were assigned to a traffic analysis zone (TAZ) using a spatial join in GIS. The 482 TAZs within Gwinnett County were the basis for allocating the demand projections presented in TM 2 – Summary of Water and Wastewater Forecasts.
- There were 10 TAZ's with water demands that did not overlay any nodes in the distribution system. The demands were manually placed on representative nodes.
- The Gwinnett County distribution model does not contain information on the pipe network for wholesale areas. Wholesale demand nodes were designated using the water meter shapefile and the existing pipe configuration. The proportion of the total wholesale demand was allocated to each wholesale customer according to their average demands over the last five years. If there were multiple wholesale demand nodes for the same customer, then their demand was divided equally among those nodes.

DEMAND SCENARIOS

The peak day demands presented in TM 2 - Summary of Water and Wastewater Forecasts range from 182 MGD to 231 MGD during the planning period, based on the planned development identified in the Unified Plan International Gateway scenario. The hydraulic model evaluated a wider range of future demands, including demands lower than the forecasted demands. If the growth anticipated in the Unified Plan is not realized or if water conservation efforts are more successful than anticipated, this TM includes information on the projects needed at these lower flow rates. The water demands evaluated include 131, 142, 154, 167, 182, 197, 215, and 231 MGD on a peak day basis. These eight peak day demand scenarios were allocated throughout the system using the methodology described in the previous subsection. The distribution system was evaluated for its ability to adequately supply these demands while maintaining a defined set of operating guidelines that are described in the following subsection.

WATER SYSTEM EVALUATION

The water system was evaluated for each of the demand scenarios shown in Table TM7.3 against specific water system evaluation criteria or operating guidelines. These operating guidelines include pipe system, system pressure, fire flow supply, and system storage capability.

The hydraulic model evaluated the system performance for each demand scenario and for each evaluation criteria. If evaluation criteria were not met, then a proposed system improvement was identified. The water system operating guidelines were developed from past experience along with project team meetings that included Gwinnett County personnel.

A water distribution system must meet state and federal regulations as well as some industry best practices. The operating guidelines are generally based on the peak day demand, ensuring that the system meets these guidelines on the single day with the highest water demand. The operating guidelines for this analysis were developed using information from the following sources:

- AWWA M31 *Distribution System Requirements for Fire Protection*
- AWWA M32 *Computer Modeling of Water Distribution Systems*
- *Water Distribution Systems Handbook* by Larry W. Mays
- *Modeling, Analysis, and Design of Water Distribution Systems* by Lee Cesario, published by AWWA
- *Water Distribution Modeling* by Thomas M. Walski, Donald V. Chase, and Dragan A. Savic

If the distribution model showed that the system could not meet the operating guidelines at a specified demand, then system improvements were identified so that the system met the operating guideline. The analysis started at the lowest demand, so that projects needed were carried forward to the evaluation at the next demand interval. The established operating guidelines are divided into four categories including piping system, system pressure, fire flow supply, and system storage. Each of these categories is discussed in detail in the following subsections as they relate specifically to the Gwinnett County Water Distribution System.

PIPE SYSTEM VELOCITY AND HEADLOSS

The velocity and headloss in the pipe system can be used to evaluate the potential for inadequate system pressure and/or water quality. Headloss represents the energy lost within a pipe. The higher the energy loss, the more pumping is required and therefore higher energy usage and energy costs. Headloss and pipe velocity are also directly proportional to the system pressure. Areas in the distribution system with high headloss or high velocity can result in unacceptable pressure in the distribution system.

As pipe velocities reach 5 feet per second (ft/s) or headlosses reach 6 ft/1,000 ft, pressures begin to decrease significantly within a given length of pipe. Consequently, the water system operating guidelines include a maximum velocity of 5 ft/s and a maximum headloss of 6 ft/1,000 ft for most pipes. For larger diameter transmission mains (i.e., pipes 16 inches in diameter and larger), the maximum allowable headloss is lower. The large diameter transmission mains convey water long distances, which can lead to large headloss accumulation, thus justifying the more constrained headloss recommendation. Specifically, transmission mains between 16 inches and 24 inches in diameter should maintain a headloss of less than 4 ft/1,000 ft, and transmission mains 30 inches in diameter and greater should not exceed a headloss of 2 ft/1,000 ft.

The recommended operating criteria are:

- Maximum instantaneous velocity: 5 ft/s at peak day demand conditions
- Maximum headloss for small diameter pipes (less than 16 inches in diameter): 6 ft/1,000 ft of pipe at peak day demand conditions

- Maximum headloss for 16 to 24-inch diameter transmission mains: 4 ft/1,000 ft of pipe at peak day demand conditions
- Maximum headloss for 30-inch and greater diameter transmission mains: 2 ft/1,000 ft of pipe at peak day demand conditions

SYSTEM PRESSURE

An acceptable pressure range is dependent on the specific features and conditions of each individual distribution system. If pressure in the distribution system is too low, then water quality and customer satisfaction can be jeopardized. If pressure in the distribution system is too high, there is an increased risk of damage to the distribution system and a higher level of water leakage. Currently, there are areas of the Gwinnett County Water Distribution System where the pressure exceeds a recommended maximum of 200 pounds per square inch (psi).

For distribution systems in general, low system pressures were observed in the vicinity of ground storage tanks or the suction side of booster pump stations. However, these areas of low pressure did not impact customers and therefore improvement projects were not identified. From general area guidelines and discussions with Gwinnett County personnel, a minimum pressure of 40 psi must be maintained at all customer service locations under normal conditions and 20 psi residual pressure (active flow pressure) during fire flows, which are discussed in the next subsection. The resulting operating criteria are summarized as follows:

- Minimum system pressure: 40 psi at customer connection points under peak day, peak hour demand conditions
- Minimum residual pressure: 20 psi at customer connection points during fire flow conditions
- Maximum system pressure: 200 psi at average day demand conditions

FIRE FLOW SUPPLY

An adequate supply of water is needed to maintain minimum system pressures while meeting the intense demands associated with fire fighting conditions for a designated period of time. The fire flow supply criteria for this evaluation required the presence of fire hydrants on water mains 6 inches or larger. The fire hydrants must be able to provide 1,000 gallons per minute (gpm) of water for 2 hours in residential areas of the system and 3,000 gpm of water for 4 hours in commercial areas of the distribution system. These fire flow rates correspond with ISO recommended guidelines for residential structures that are 11 to 30 feet apart and an average needed fire flow calculation for a non-sprinklered commercial building according to the *Guide for Determination of Needed Fire Flow* (ISO 2008).

Typical guidelines for water system operation recommend evaluating the fire flow conditions during an average hour on the peak day. This recommendation exists because the likelihood of a large fire occurring during the peak hour on the peak day is negligible. As a result, planning for this unlikely event would result in the overdesign of system components.

SYSTEM STORAGE CAPACITY

System storage is required to balance supply and demand fluctuations, equalize pump station operation, and deliver water during emergencies such as fires, pipe breaks, pump station failure, or loss of the water supply source. While system storage serves many important functions, the water in storage tanks must drain and fill (i.e. tank turnover) frequently in order to minimize water age and maintain water quality in the system. Storage tanks should drain at least 10 percent (preferably up to 25 percent) of the storage volume during the average day demand conditions to minimize water age and maintain water quality. To meet emergency water needs, system storage should also maintain storage tank levels above 60 percent full during the peak day demand conditions.

PROPOSED HYDRAULIC IMPROVEMENT PROJECTS (DEMAND BASED)

This section presents the infrastructure improvements required to meet the water system operating guidelines under each of the modeled demand scenarios. As previously mentioned, the eight modeled demand scenarios range from 131 MGD to 231 MGD on a peak day. As a point of reference, Gwinnett County has experienced peak day demands as high as 143 MGD in 2000 and 130 MGD in 2006. Proposed system improvements were recommended for each demand scenario to meet all of the operating guidelines presented in the previous section, as needed. However, the size or capacity of each recommended improvement was developed for meeting the ultimate projected 231 MGD of peak day demand. One alternative project (Project WDAlt1) was also evaluated and is presented following the descriptions of proposed projects. In addition to meeting demands, a goal of the recommended system improvements is to adequately provide fire flow supply to the system. An outline of the recommended fire flow-related projects follows the demand-based hydraulic improvement projects.

Brief discussions of the projects are provided in the following subsections along with applicable modeling results that illustrate the purpose of each project. In addition, individual project sheets that illustrate the general alignments and system connections of each project are included in Appendix A.

PROPOSED SYSTEM IMPROVEMENTS: 131 MGD DEMAND SCENARIO

Four projects, outlined in Table TM7.3 are recommended for the 131 MGD demand scenario. Additional project narratives follow Table TM7.3 and illustrative project sheets are included in Appendix A.

Table TM7.3: 131 MGD Demand Scenario Recommended System Improvements

Project ID	Figure	Description	Diameter (in.)	Approximate Length (ft)	Other
WD1A	TM7.A1	Connect discharge side of Lanier North HSPS to the existing 54-inch transmission main from Shoal Creek-Lanier HSPS. Upgrade Shoal Creek-Lanier HSPS to provide treatment redundancy and connect discharge side of Shoal Creek-Lanier HSPS a with 48/42-inch transmission main.	48/42	3,400/3,000	100/100 LF[1] of 30/24-inch main included for connections to system. HSPS upgrade to firm capacity of 70 MGD at 350 ft TDH
WD2	TM7.A2	Upgrade existing pump station and install various pipe segments and valves to serve the area east of Lanier Mountain Tanks to Nob Hill Pressure Zone.	12	~300 misc. piping & valve adjustments	Two pumps with approximate operating point of 1.5 MGD at 60 ft TDH
WD3	TM7.A3	Install two pressure reducing valves (PRVs) from North Pressure Zone to eastern area of Central Pressure Zone on existing, closed lines between the pressure zones to assist in maintaining area pressures.	N/A	N/A	Two 8-inch PRVs set to approx. HGL of 1350 ft MSL
WD4	TM7.A4	Discontinue the use of Lanier Mountain Tank 1, reducing the total Lanier Mountain storage capacity from 15 MG to 7 MG. This will improve the ability to fill the remaining Lanier Mountain tanks.	N/A	N/A	Close valves and decommission 1 of 3 tanks

1 - LF represents linear feet

Project WD1A

The Lanier North HSPS serves the western portion of the North Pressure Zone through a 12-inch water main. Under the 131 MGD demand scenario, this 12-inch water main exceeds both the maximum instantaneous velocity and the maximum headloss criteria. The velocity predicted by the model for the existing 12-inch main exceeded 11 ft/s (greater than the 5 ft/s criterion) and the headlosses approached 35 ft/1,000 ft (greater than the 6ft/1,000 ft criterion). Under the 131 MGD scenario, the 12-inch water main is unable to maintain system pressures due to the significant energy losses. For this reason, additional transmission capacity is necessary.

There is an existing 54-inch transmission main from the Shoal Creek-Lanier HSPS that provides an emergency source of water to Lanier Filter Plant's clearwell to provide partial treatment plant redundancy (i.e. Lanier Filter Plant failure). This connection meets the Metro Water District Plan requirements for interconnection reliability target of 35% of annual average demand. Gwinnett County has indicated that treatment and transmission reliability is a long-term system goal. Converting this existing 54-inch transmission main into a high pressure regular service main and connecting it to the HSPSs from both filter plants provides treatment and transmission redundancy and the transmission capacity needed to meet the 231 MGD demand scenario. Figure TM7.2 illustrates the reduction in velocity in the existing 12-inch water main with the proposed improvement.

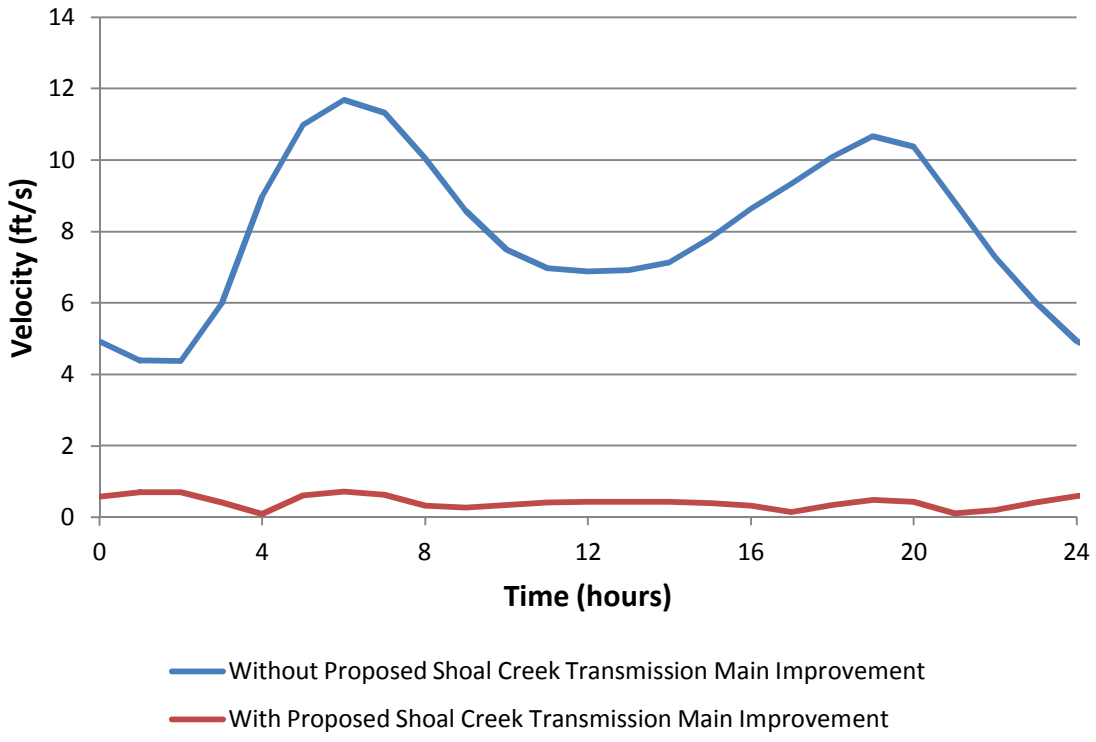


Figure TM7.2: Reduced Velocity in Existing 12-inch Water Main with Proposed 42-inch Transmission Main Improvement

As illustrated in the Figure TM7.2, the improved transmission capacity reduces the energy loss and, therefore, allows the system to adequately meet future demands while maintaining appropriate system-wide pressure. The existing transmission main would connect to the discharge side of the Lanier North HSPS at the northern end of the 54-inch main. Once this connection to the Lanier Filter Plant clearwell is in service, the existing connection to the clearwell will be closed as the pipe will serve as a high pressure transmission main. After the 54-inch transmission main, an additional 3,400 ft of 48-inch transmission main is needed to connect to the existing network of 12-inch water mains at Buford Dam Road. Then approximately 2,000 feet of 42-inch transmission main is needed to parallel Buford Dam Road and connect to the existing system at Sycamore

Road. This is the first phase of transmission main improvements in the western portion of the North Pressure Zone needed to meet the 131 MGD demand scenario. Additional segments of the transmission main are recommended for future demand scenarios and are designated as Projects WD1B and WD1C.

Before proceeding with this project, Gwinnett County should verify (e.g. pressure testing, design specification review, etc.) that the existing 54-inch steel pipe can withstand operating pressures between 175 and 200 psi as well as potential surge and transient pressures. The original use of this pipe required lower pressures and, therefore, it is appropriate to confirm the existing pipe can perform under higher pressures. General maintenance of the 54-inch transmission main may also be needed, such as disinfection or flushing, although the pipe is currently used routinely. In addition to the proposed transmission main projects, the existing Shoal Creek-Lanier HSPS should be upgraded to a firm capacity of 70 MGD at 350 ft TDH to provide system redundancy and allow the Shoal Creek Filter Plant to supply all of the North Pressure Zone's demand under both current and future demand conditions. The additional pumping capacity is only needed to provide complete redundancy to the North Pressure Zone and phasing the increased pumping capacity could be studied based on funding levels and measured system demands.

Project WD2

A concentrated area of low pressure was identified in the Central Pressure Zone, east of the Lanier Mountain Tanks and south of the existing Nob Hill Pressure Zone. The low pressure is attributed to the relatively high elevations in the area. Expanding the Nob Hill Pressure Zone across Stone Mountain Highway to encompass this low-pressure area will address the low pressures. This project includes upgrading the existing Nob Hill Pump Station capacity to accommodate the additional demand. The recommended firm capacity, the capacity with one standby pump, is approximately 1.5 MGD at 60 feet TDH for the upgraded Nob Hill Pump Station. Figure TM7.3 illustrates the improvement to a representative low pressure node resulting from the expanded pressure zone.

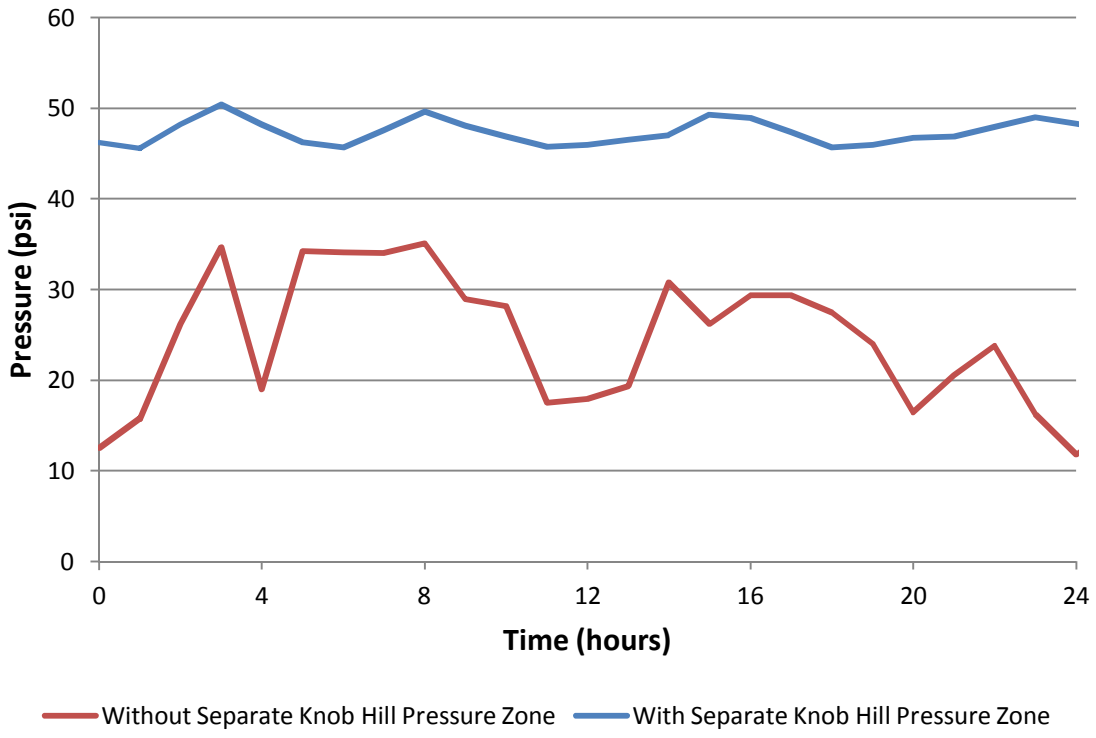


Figure TM7.3: Pressure Improvement in Representative Low Pressure Node with Proposed Nob Hill Pressure Zone Expansion

With the recommended improvement, the lowest pressure node in the area is able to maintain a minimum pressure higher than 40 psi. Residential fire flow is also supported by these pressure zone modifications, where they previously were not. Various pipe and valve modifications will be required to separate the area from the existing Central Pressure Zone and add it to the Nob Hill Pressure Zone. Elements of this project include extending a new 12-inch distribution main from the discharge side of the Nob Hill Pump Station across Main Street and connecting it to the existing 10-inch distribution main that parallels Main Street/Stone Mountain Highway. The existing 10-inch main would then be added to the new pressure zone using isolation valves. Project Sheet 2 in Appendix A illustrates the water main and valve modifications required to isolate the new pressure zone.

Project WD3

The water distribution system near the City of Dacula is at a relatively higher elevation than much of the Central Pressure Zone and has a limited number of transmission mains supplying the area. These conditions result in lower than recommended pressures during peak day demands in the 131 MGD demand scenario. The installation of two pressure reducing valves (PRVs) across the adjacent pressure zone boundary between the North Pressure Zone and Central Pressure Zone will address these low pressures. The North Pressure Zone is maintained at a higher HGL; therefore, supplying water into the Central Pressure Zone from the North Pressure Zone will boost pressures enough to maintain the recommended water system operating guidelines. Figure TM7.4 illustrates the pressure boost from the recommended project.

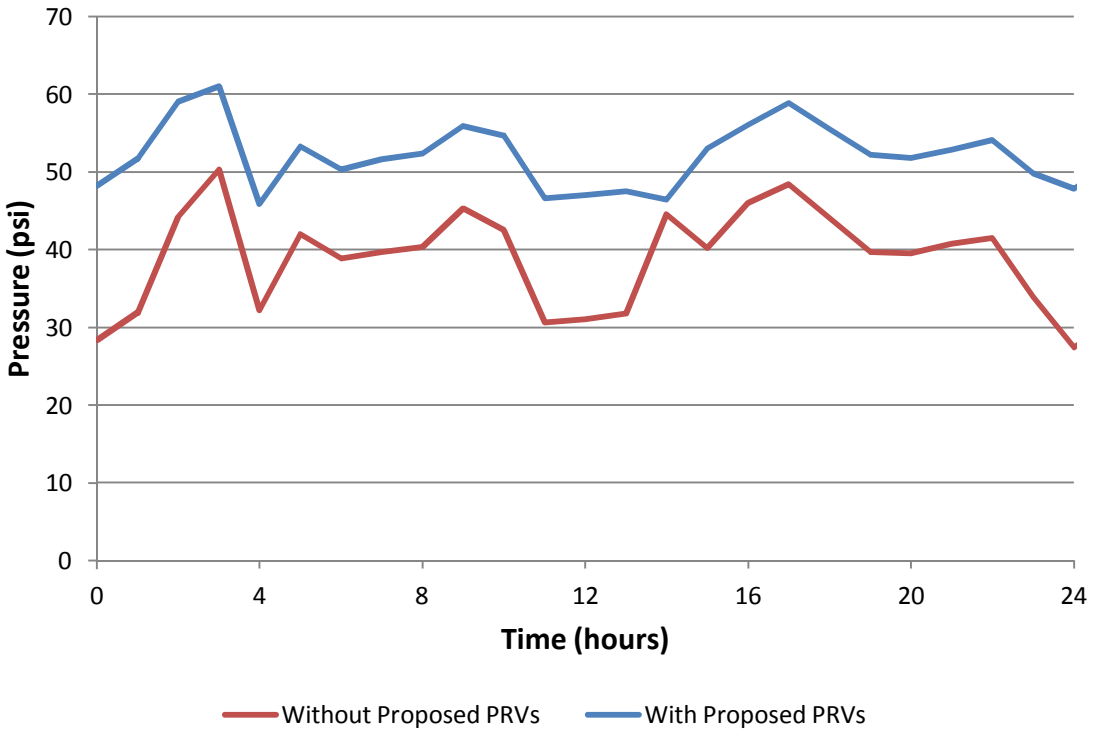


Figure TM7.4: Pressure Improvement in a Representative Low Pressure Node in the City of Dacula with Proposed PRVs

The two recommended PRVs that produce this pressure improvement would be installed north of the City of Dacula. One PRV would be installed on a currently closed 8-inch water main that parallels Auburn Avenue between the Auburn Avenue intersections with Hinton Circle and Fairmont Park Court. The other PRV would be installed between the two pressure zones on a currently closed 12-inch that transitions to an 8-inch distribution main along Hebron Church Road.

Project WD4

The Central Pressure Zone includes three tanks along High Point Road; Lanier Mountain Tanks 1, 2, and 3. Each tank has a total storage capacity of 5 MG. The operating HGL of these tanks is between 1165 and 1205 feet MSL, which is significantly higher than the other ground storage tanks in the Central Pressure Zone. Consequently, the system pressures drop while filling these three tanks. SCADA records confirm that the upstream pressure on the line supplying the tanks drops as low as 15 psi when filling the tanks during peak day demand. This is a significant enough drop in pressure to negatively impact demand-node pressures in the surrounding area.

The Lanier Mountain Pump Station boosts water pressure during peak hour demands. The recommendation is to discontinue the use of one of the three Lanier Mountain tanks and operate the remaining two tanks at a reduced storage capacity (or at a lower HGL). For example, 70 percent capacity would be considered full during peak day demand periods. This will reduce the total storage of the tank system to 7 MG, a reduction of 8 MG, but it will continue to maintain the benefits of having this tank/pump station in operation while minimizing its detrimental effects to the surrounding system.

PROPOSED SYSTEM IMPROVEMENTS: 142 MGD DEMAND SCENARIO

Two transmission main improvements are recommended to maintain system operating guidelines under the 142 MGD demand scenario. The projects are summarized in Table TM7.4, one of which is a continuation of Project WD1A that was introduced in the 131 MGD demand scenario.

Table TM7.4: 142 MGD Demand Scenario Recommended System Improvements

Project ID	Figure	Description	Diameter (in.)	Approximate Length (ft)	Other
WD1B	TM7.A5	Install new 42-inch transmission main along northwestern boundary of North Pressure Zone.	42	14,800	1,000 LF of 30-inch main included for intermediate connections to system
WD5A	TM7.A6	Extend new 54/48-inch transmission main from existing 78-inch transmission main to eastern portion of Central Pressure Zone and connect to existing 24-inch main immediately south of Lawrenceville.	54/48	32,200/18,000	4,000/400 LF of 24/12- inch mains included for intermediate connections to system

Project WD1B

Project WD1B is a continuation of Project WD1A that was recommended as a project in the previous demand scenario (131 MGD). As the demand in the North Pressure Zone increases, the 42-inch transmission main should be extended by approximately 14,800 feet along Suwanee Dam Road and connect to the existing system near the intersection of Suwanee Dam Road and Cumming Highway. The benefits of this overall transmission main improvement are the same as for Project WD1A, illustrated in Figure TM7.2.

Project WD5A

The projected demand growth in the Central Pressure Zone corresponding to the 142 MGD demand scenario requires the first phase of a major transmission main project. Currently an existing 48-inch transmission main connects to the end of the 78-inch main that supplies the Central Pressure Zone. Project WD5A recommends installing an additional 54-inch transitioning to a 48-inch transmission main that begins at the point where the

existing 78-inch main decreases in size. This is the first phase of two needed to maintain adequate pressure in the Central Pressure Zone as illustrated in Figure TM7.5 and will allow the transmission network to take advantage of the full capacity of the 78-inch transmission main.

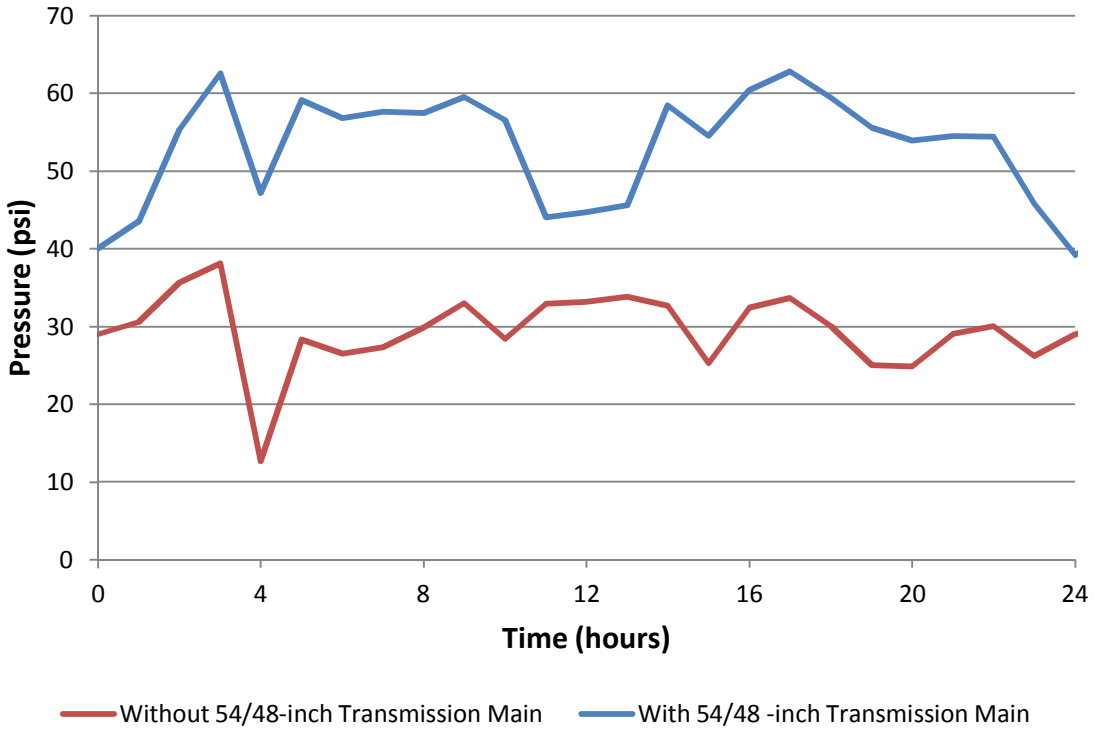


Figure TM7.5: Improved Pressures in a Representative Low Pressure Node East of Lawrenceville with Proposed Transmission Main Improvement

The 54-inch main would extend south from the end of the 78-inch transmission main (intersection of Buford Drive and Old Peachtree Road) along Buford Drive to Hurricane Shoals Road. It would then parallel Hurricane Shoals Road to the west and connect to the existing system near the Hurricane Shoals Road and Maltbie Street intersection. This is approximately 32,200 feet of 54-inch transmission main. Below this point, a proposed 48-inch transmission main would extend south for approximately 18,000 feet and connect to the existing system below Lawrenceville at the intersection of Moon Road and Scenic Highway. The continuation of this project, summarized in a later demand scenario, is Project WD5B.

PROPOSED SYSTEM IMPROVEMENTS: 154 MGD DEMAND SCENARIO

Two improvements are recommended for the system to effectively meet 154 MGD of peak day demand. Table TM7.5 summarizes the recommended system improvements, and additional illustrative details can be found in Appendix A.

Table TM7.5: 154 MGD Demand Scenario Recommended System Improvements

Project ID	Figure	Description	Diameter (in.)	Approximate Length (ft)	Other
WD6A	TM7.A7	Upgrade existing Lanier North HSPS to a firm capacity of 60 MGD at 230 ft TDH.	N/A	N/A	Two pumps, each with approx. design operating point of 35 MGD at 230 ft TDH
WD1C	TM7.A8	Continue new transmission main from Projects WD1A/WD1B with 36-inch transmission main.	36	15,100	

Project WD6A

The North Pressure Zone's total demand exceeds 50 MGD in the 154 MGD demand scenario, which is the existing firm capacity of the Lanier North HSPS as predicted by the pump curve provided by Gwinnett DWR in the existing water distribution system model. To provide total redundancy, where both Lanier North HSPS and Shoal Creek-Lanier HSPS can supply the North Pressure Zone's total demand independently, the Lanier North HSPS should be upgraded to a firm capacity of 70 MGD in a two-phase process. This first recommended phase, Project WD6A, will replace two of the existing pumps with two new high service pumps that have approximate design points of 35 MGD at 230 feet TDH (one of which will be a standby pump), while leaving one of the existing 25-MGD pumps in place. This interim project will provide a firm capacity of 60 MGD at 230 feet TDH and allow enough flexibility to continue to effectively supply lower demands using the smaller existing pump while meeting the peak day demands with the additional firm capacity. The second phase of the project is Project WD6B and will replace the remaining existing 25-MGD pump with a third 35-MGD pump.

Project WD1C

This is the third and final phase of the North Pressure Zone transmission main project along the northwestern boundary of the service area. This phase includes installing a parallel 36-inch main to connect to the previously installed 42-inch transmission main (Project WD1B) near the intersection of Cumming Highway and Suwanee Dam Road. The recommended 36-inch transmission main will continue along Suwanee Dam Road for approximately 15,100 feet where it will terminate and connect to the existing system near the intersection of Suwanee Dam Road and Level Creek Road. The benefits associated with this transmission main project are outlined in Figure TM7.2 in the 131 MGD demand scenario. This completed transmission main will supply the western portion of the North Pressure Zone similar to an existing 42-inch transmission main to the east. The existing network of 12-inch, 16-inch, and 24-inch transmission mains will provide adequate infrastructure to supply water from these two boundary transmission routes and meet the demands in the middle of the pressure zone while maintaining operating guidelines.

PROPOSED SYSTEM IMPROVEMENTS: 167 MGD DEMAND SCENARIO

Only one system improvement, a continuation of a previously recommended project, is recommended in the 167 MGD demand scenario. Table TM7.6 summarizes the recommended system improvement followed by a brief narrative.

Table TM7.6: 167 MGD Demand Scenario Recommended System Improvements

Project ID	Figure	Description	Diameter (in.)	Approximate Length (ft)	Other
WD6B	TM7.A9	Upgrade existing Lanier North HSPS to a firm capacity of 70 MGD at 230 ft TDH.	N/A	N/A	One pump with approx. design operating point of 35 MGD at 230 ft TDH

Project WD6B

The recommended system improvement is a continuation of Project WD6A, which involves upgrading the existing Lanier North HSPS. The previous recommended upgrade increased the firm capacity to 60 MGD; this final phase of the recommended pump station upgrade replaces the 25-MGD pump with a third 35-MGD pump (at 230 feet TDH). The result of the recommended two-phased pump station improvement would bring the upgraded firm capacity of the North Lanier Pump Station to 70 MGD (one pump will remain a standby pump) and would adequately meet peak day demands for the North Pressure Zone through the 231 MGD demand scenario. This upgrade is associated with Gwinnett County's long-term system reliability goal of having operational flexibility between the two filter plants.

PROPOSED SYSTEM IMPROVEMENTS: 182 MGD DEMAND SCENARIO

Three system improvements are recommended for the 182 MGD demand scenario, which are summarized in Table TM7.7.

Table TM7.7: 182 MGD Demand Scenario Recommended System Improvements

Project ID	Figure	Description	Diameter (in.)	Approximate Length (ft)	Other
WD5B	TM7.A10	Extend 48-inch transmission main from the end of Project WD5A to existing 48-inch transmission main south of Grayson Tanks.	48	25,700	
WD7	TM7.A11	Install parallel 24-inch transmission main to supply Rockbridge Tank.	24	6,400	
WD8	TM7.A12	Install various segments of parallel 12-inch distribution mains to relieve elevated velocities/headlosses in existing transmission mains	12	27,100	

Project WD5B

Project WD5B is a continuation of Project WD5A to meet the increased demands in the Central Pressure Zone. The first phase of the recommended improvement (Project WD5A) included a 54-inch transitioning to a 48-inch transmission main from the end of the existing 78-inch transmission main to the southern boundary of Lawrenceville. This final phase of the project continues the 48-inch transmission main approximately 25,700 feet south. The proposed 48-inch transmission main follows along Scenic Highway, Sugarloaf Parkway, and Loganville Highway and connects to an existing 48-inch transmission main near the intersection of Loganville Highway and Herring Road. The existing 48-inch transmission main is the primary supply to the Grayson Tanks. The proposed transmission improvement will not only relieve energy loss in this existing main and

boost pressures in the area, but it will improve the filling of the Grayson Tanks, which is illustrated in Figure TM7.6.

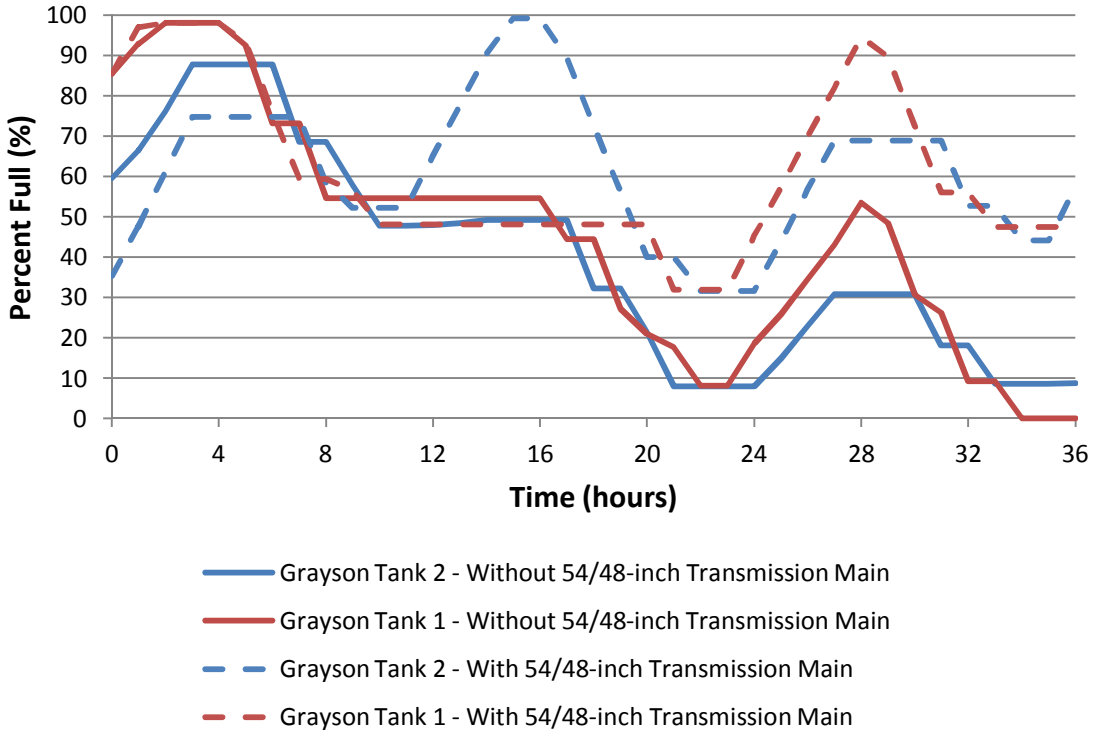


Figure TM7.6: Improved Fill of Grayson Tanks with Proposed 54/48-inch Transmission Main

The proposed transmission main improvement allows for the two Grayson Tanks, which are pivotal to maintaining operating criteria in the Central Pressure Zone, to successfully recover during peak day demand and not completely drain.

Project WD7

A 16-inch transmission main loop that currently supplies the Rockbridge Tank will exceed operating guidelines in this demand scenario. An additional parallel 24-inch transmission main is recommended to fill this tank and accommodate the higher demand rates. Without the additional supply main, the system will not be able to utilize the total capacity of the Rockbridge Tank as shown in Figure TM7.7.

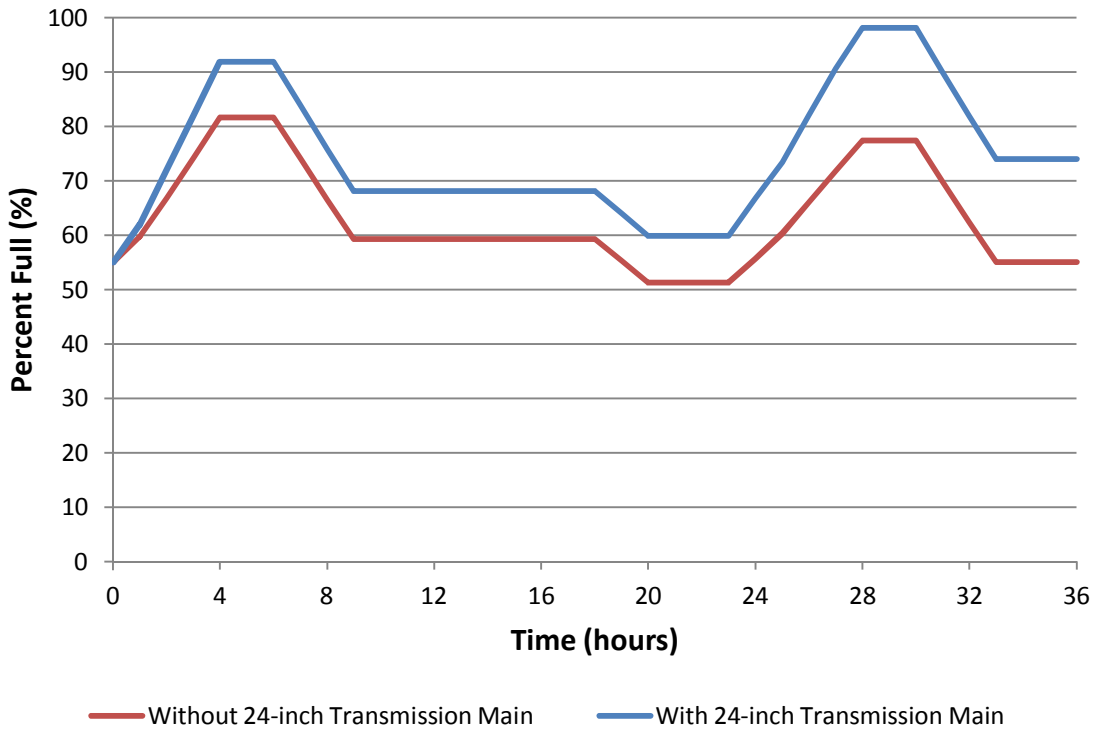
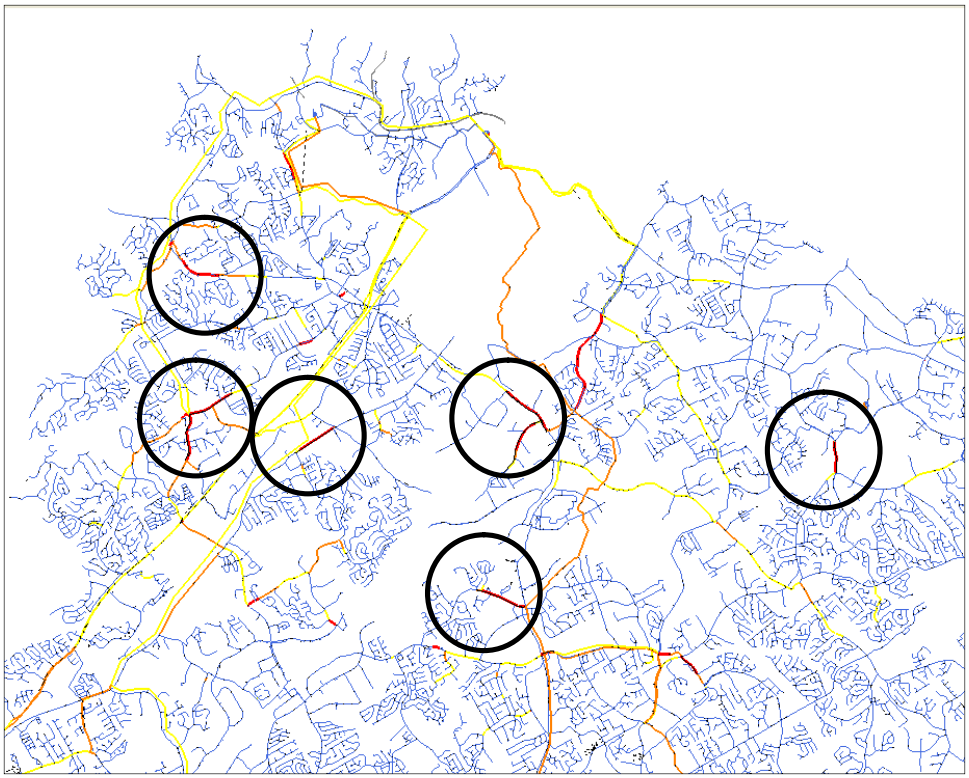


Figure TM7.7: Improved Fill of Rockbridge Tank with Proposed 24-inch Transmission Main

Full utilization of the Rockbridge Tank will maintain pressures in the surrounding areas during peak hour demand periods, and the additional supply capacity will allow the tank to recover during peak day demand periods without completely draining the tank. The specific route of the recommended project is along the north branch of the existing 16-inch loop parallel to Arcado Road. Approximately 6,400 feet of 24-inch transmission main would be needed from the existing 24-inch transmission main that is routed along Lilburn Stone Mountain Road to Rockbridge Tank.

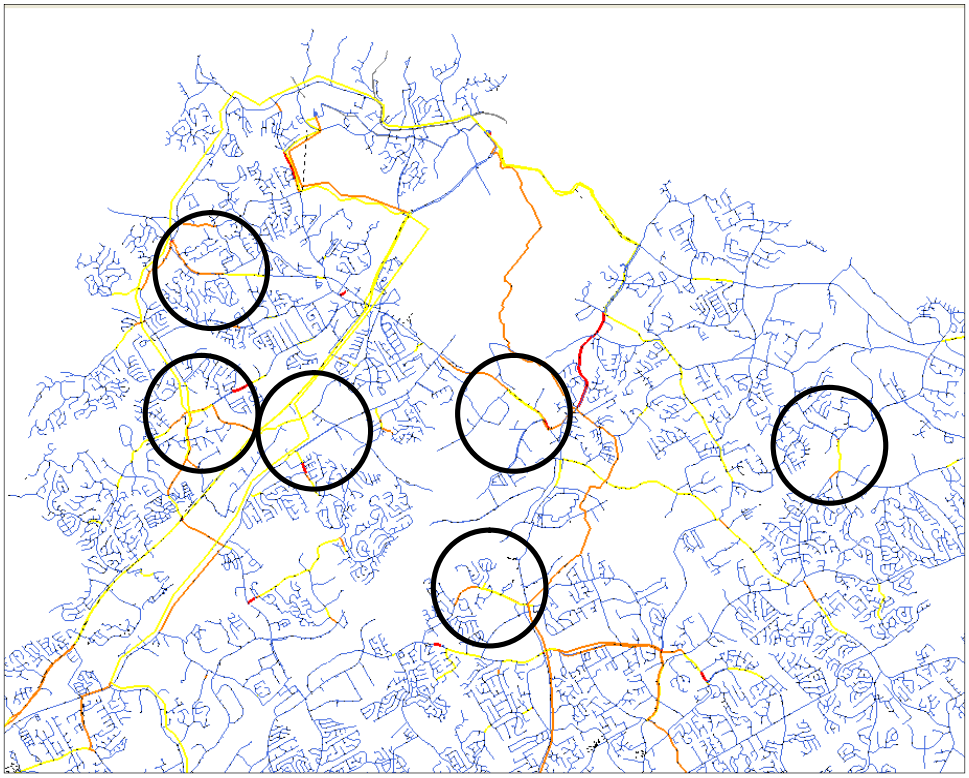
Project WD8

Project WD8 is a grouping of parallel distribution main projects that are recommended for the 182 MGD demand scenario. The recommended projects consist of six areas of 12-inch distribution main in various locations of the North Pressure Zone for a total of 27,100 feet. The projects are needed to accommodate the additional demands in the pressure zone as the existing network of 8- through 16-inch mains within the North Pressure Zone cannot maintain operating criteria under this scenario. The six projects will reduce energy loss in the North Pressure Zone to meet the recommended guidelines for velocity and headloss as indicated in Figures TM7.8 and TM7.9.



Legend	
Pipe Color	Maximum Velocity
	<= 3 ft/s
	<= 4 ft/s
	<= 5 ft/s
	> 5 ft/s

Figure TM7.8: Pipe Velocity Overview in North Pressure Zone without Proposed Parallel 12-inch Distribution Mains



Legend	
Pipe Color	Maximum Velocity
	<= 3 ft/s
	<= 4 ft/s
	<= 5 ft/s
	> 5 ft/s

Figure TM7.9: Pipe Velocity Overview in North Pressure Zone with Proposed Parallel 12-inch Distribution Mains

As indicated, the collection of six proposed 12-inch parallel distribution mains allow the North Pressure Zone network to distribute water between the two primary east and west transmission main routes through the pressure zone while maintaining operating criteria.

PROPOSED SYSTEM IMPROVEMENTS: 197 MGD DEMAND SCENARIO

Two system improvements are recommended for the 197 MGD demand scenario. Table TM7.8 summarizes the recommended system improvements followed by project narratives.

Table TM7.8: 197 MGD Demand Scenario Recommended System Improvements

Project ID	Figure	Description	Diameter (in.)	Approximate Length (ft)	Other
WD9	TM7.A13	Install parallel 72/48-inch transmission main from Shoal Creek/Lanier Filter Plant manifold to western portion of Central Pressure Zone.	72/48	44,200/ 17,800	600/2,800 LF of 24/16-inch distribution main should also be installed near end of line for additional capacity at terminus
WD10	TM7.A14	Install parallel 16-inch transmission main to supply Norcross Tank.	16	5,200	

Project WD9

As the total system demands approach 197 MGD, the two existing parallel 48-inch transmission mains that convey a majority of the water supply from the Shoal Creek and Lanier Filter Plants to the Central Pressure Zone will exceed operating guidelines. The proposed transmission main improvement adds a parallel 72-inch transmission main to the Central Pressure Zone that will expand the total transmission capacity and effectively transport the projected flows through the 231 MGD demand scenario. The reduction in velocity in the existing 48-inch transmission main can be seen in Figure TM7.10.

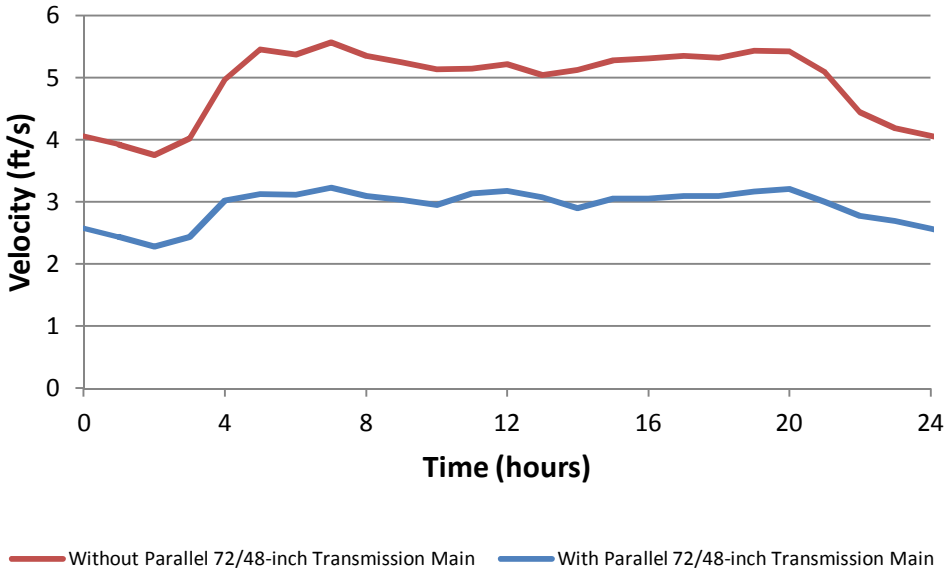


Figure TM7.10: Reduced Velocity in Existing 48-inch Transmission Mains that Supply Central Pressure Zone with Proposed 72/48-inch Transmission Main

Due to the length and size of this critical transmission route, the cumulative headloss causes low pressure issues. The benefits of the recommended improvement are illustrated in Figure TM7.11 which shows the improvement on a representative low pressure node near the area where the proposed transmission main would connect into the existing Central Pressure Zone.

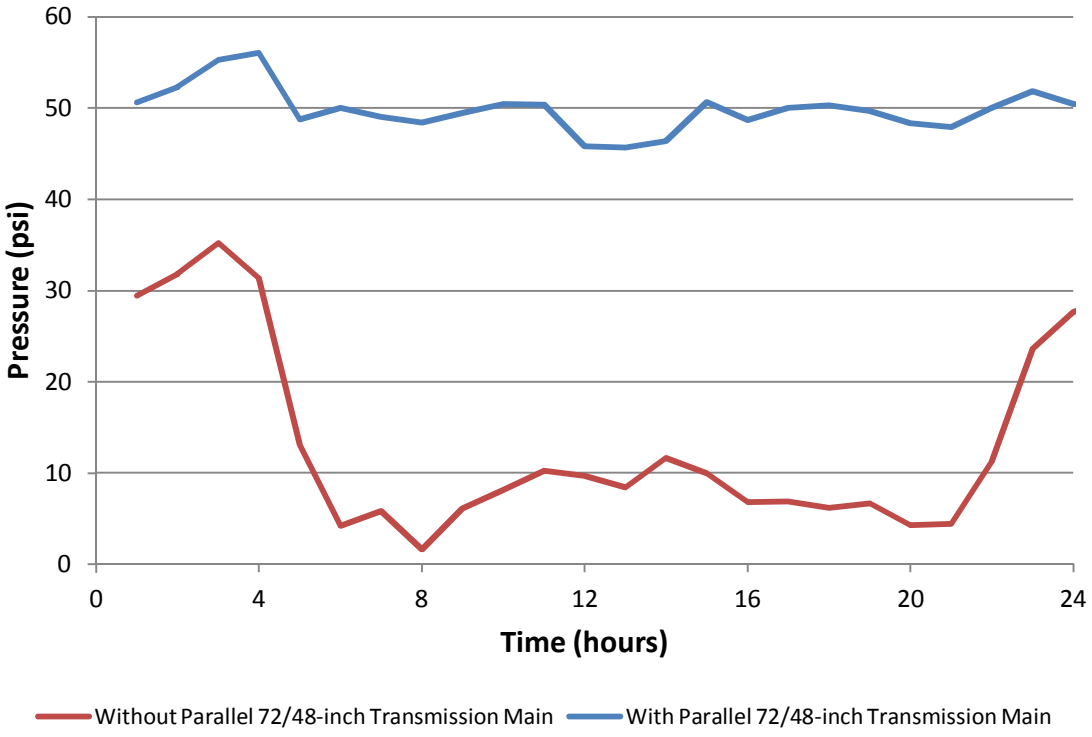


Figure TM7.11: Pressure Improvement in Representative Low Pressure Node in Northeastern Portion of the Central Pressure Zone with Proposed 72/48-inch Transmission Main

As indicated in Figures TM7.10 and TM7.11, the recommended transmission improvement will allow the system, specifically the Central Pressure Zone, to maintain operating criteria when the total system demand reaches 197 MGD. The proposed parallel 72-inch transmission main should begin at the existing manifold of the transmission mains from the Lanier and Shoal Creek Filter Plants (one 60-inch and two 48-inch mains) near the intersection of Little Mill Road and Poplar Street. The proposed 44,200-foot main will then extend south along Peachtree Industrial Boulevard and Buford Highway, where it will begin its connections to the existing system at the intersection of Buford Highway and Wildwood Road. From there, a 48-inch transmission main will connect with the existing system, and continue south for 17,800 feet along Wildwood Road where it would terminate with a connection to the system in two places along Old Peachtree Road. Appendix A provides additional details regarding the alignment and connections for the recommended transmission main.

Project WD10

Project WD10 is a relatively minor recommended improvement to facilitate filling the Norcross Tank by relieving the primary supply line to the tank, which exceeds operating criteria under this demand scenario. The recommended improvement is approximately 5,200 feet of parallel 16-inch transmission main along Jimmy Carter Boulevard. Figure TM7.12 illustrates the benefits of the recommended improvement.

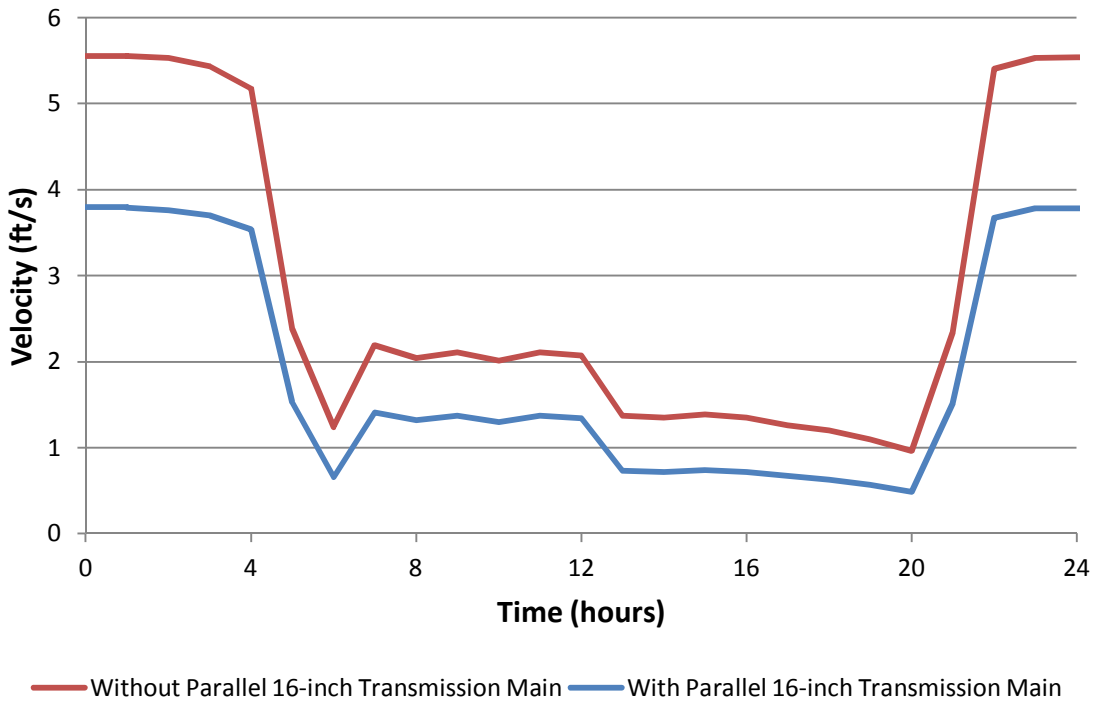


Figure TM7.12: Reduced Velocity in Existing 16-inch Transmission Main that Supplies Norcross Tank with Proposed Transmission Main Improvement

The expanded supply capacity to the Norcross Tank will allow the tank to fill and utilize the total storage capacity during peak day/peak hour demands.

PROPOSED SYSTEM IMPROVEMENTS: 215 MGD DEMAND SCENARIO

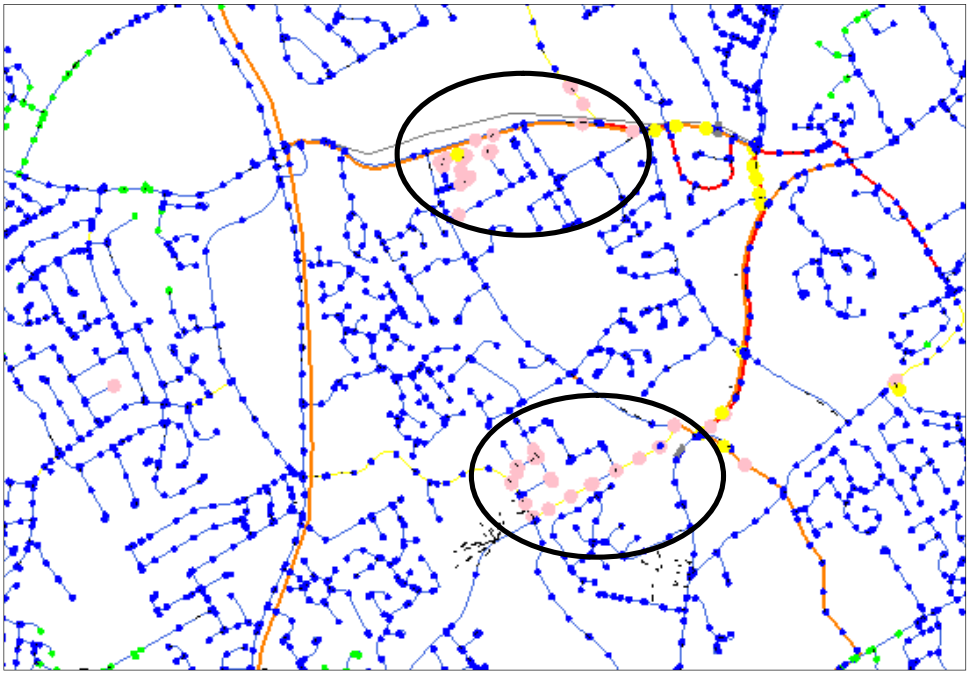
Three system improvements are recommended in the 215 MGD demand scenario. Table TM7.9 summarizes the recommended system improvements, and additional illustrative details can be found in Appendix A.

Table TM7.9: 215 MGD Demand Scenario Recommended System Improvements

Project ID	Figure	Description	Diameter (in.)	Approximate Length (ft)	Other
WD11	TM7.A15	Install new 24-inch transmission main to connect larger diameter distribution mains in the North Pressure Zone and improve area pressures.	24	7,800	
WD12	TM7.A16	Install new 48/30-inch transmission main from Project WD9 to mid-point along existing west-east transmission main within the southern portion of the Central Pressure Zone.	48/30	9,700/9,000	install approximately 5,900 LF of parallel 16-inch distribution mains at end of line for additional capacity at terminus
WD13	TM7.A17	Install parallel 60-inch transmission main to supply water from Shoal Creek Central High Service Pump Station to manifold with parallel 48-inch transmission mains from Lanier Central HSPS.	60	15,000	

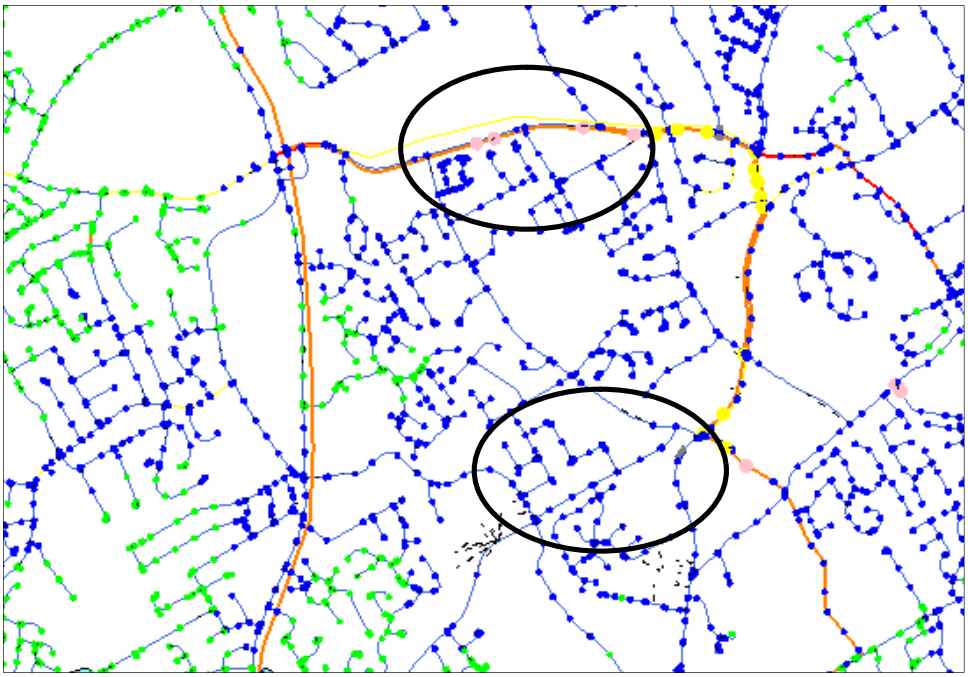
Project WD11

In the eastern portion of the North Pressure Zone under the 215 MGD demand scenario, pipe velocities exceed the operating criteria and cause demand nodes to approach the minimum pressure of 40 psi. The installation of a 24-inch transmission main to connect two areas of larger water mains alleviates the low pressure. Approximately 7,800 feet of 24-inch transmission main along Old Peachtree Road between Buford Drive and Sunny Hill Road is recommended. Figures TM7.13 and TM7.14 illustrate the area pressures with and without the proposed project.



LEGEND	
Node Color	Minimum Pressure
	<= 20 psi
	<= 40 psi
	<= 50 psi
	<= 100 psi
	<= 150 psi
	Other

Figure TM7.13: Area Node Pressures in North Pressure Zone without Proposed 24-inch Transmission Main



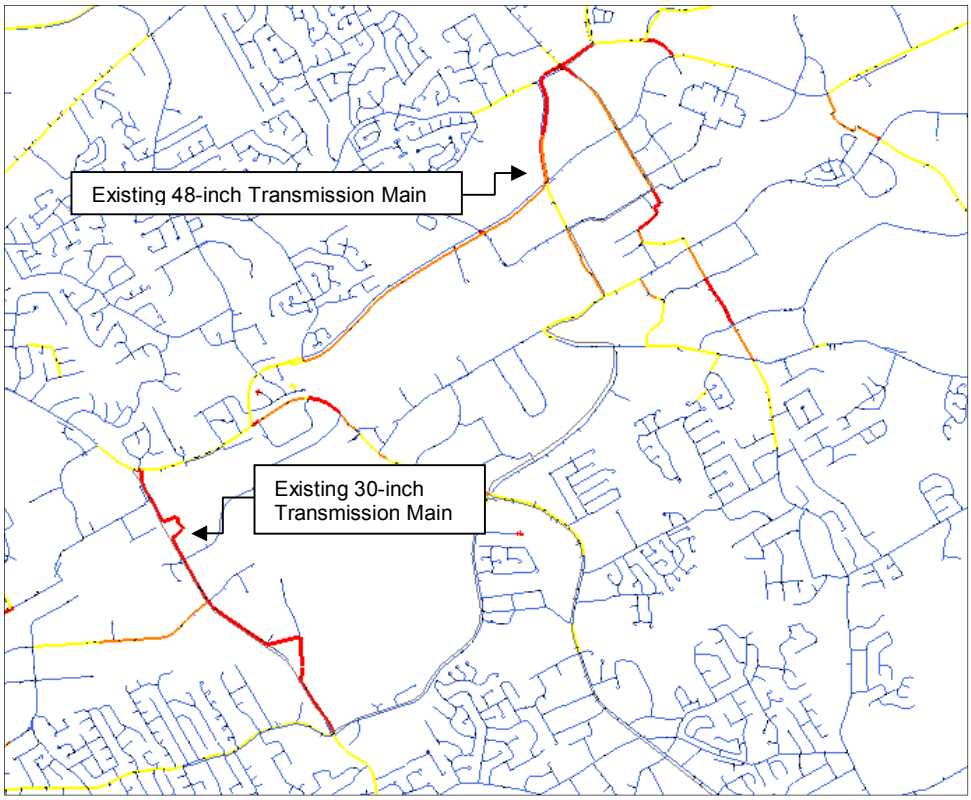
LEGEND	
Node Color	Minimum Pressure
	<= 20 psi
	<= 40 psi
	<= 50 psi
	<= 100 psi
	<= 150 psi
	Other

Figure TM7.14: Area Node Pressures in North Pressure Zone with Proposed 24-inch Transmission Main

As seen in Figures TM7.13 and TM7.14, the proposed 24-inch transmission main improves pressures in this area. Following the installation of the proposed transmission main, there are low pressure nodes associated with points of high elevation along the 78-inch and 48-inch transmission mains that extend past this area to the Central Pressure Zone. These low pressure nodes do not represent demand nodes and therefore additional infrastructure is not recommended.

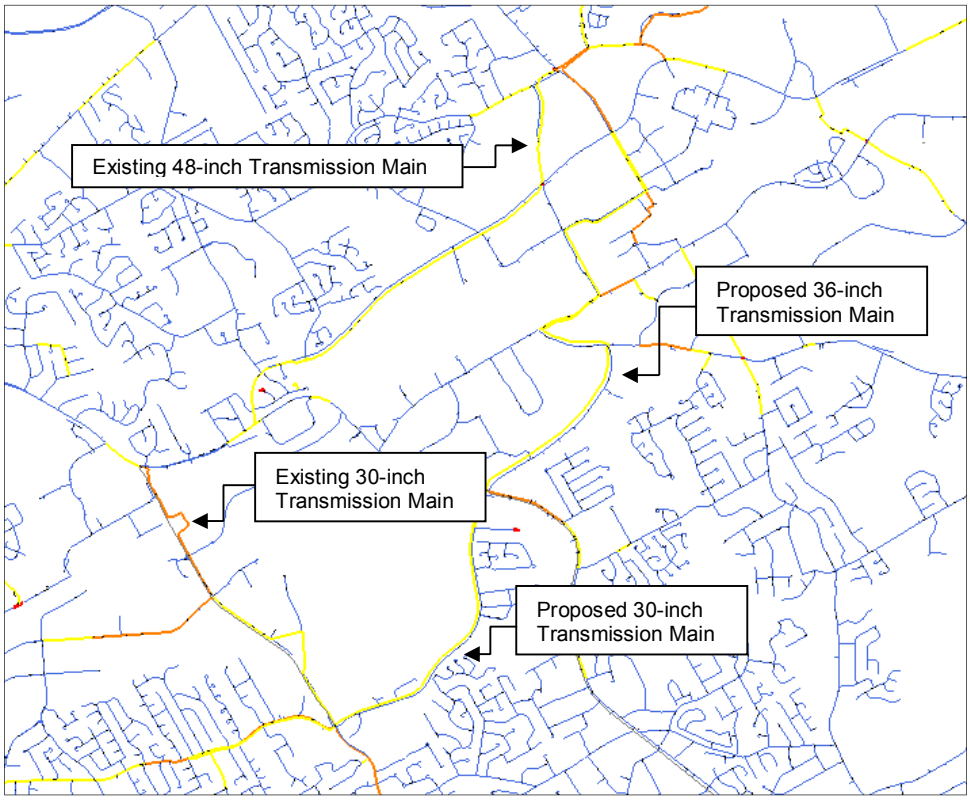
Project WD12

As the capacities of the primary transmission routes from the filter plants expand (e.g. Project WD9) and the system demands increase, several secondary transmission routes will need to be addressed. Project WD12 includes approximately 9,700 ft of 48-inch transmission main to convey water south from the existing 48-inch transmission main at the intersection of Davenport Road and Old Norcross Road to the intersection of Beaver Ruin Road and Steve Reynolds Boulevard. Then a new 30-inch transmission main approximately 9,000 feet in length will continue south along Steve Reynolds Boulevard and connect to the existing 30-inch transmission main at the intersection with Lilburn Road. Additionally, two short segments of parallel 16-inch transmission main are needed from this terminal connection along existing distribution routes to prevent the additional supply to the area from overloading the water mains in the immediate vicinity. Appendix A illustrates the specific alignments of the recommended project. Figures TM7.15 and TM7.16 illustrate the improvements to the excessive velocities in multiple system transmission mains.



Legend	
Pipe Color	Maximum Velocity
	<= 3 ft/s
	<= 4 ft/s
	<= 5 ft/s
	> 5 ft/s

Figure TM7.15: Water Main Velocities in Central Pressure Zone without Proposed 36/30-inch Transmission Main



Legend	
Pipe Color	Maximum Velocity
	<= 3 ft/s
	<= 4 ft/s
	<= 5 ft/s
	> 5 ft/s

Figure TM7.16: Water Main Velocities in Central Pressure Zone with Proposed 36/30-inch Transmission Main

The water mains in Figure TM7.15 in red exceed the maximum velocity of 5 ft/s. In some areas the velocities are significantly higher than this guideline. In Figure TM7.15, the western-most red and orange transmission route to the southwest is a 48-inch transmission main that transitions to a 30-inch transmission main when the route turns to the southeast. As indicated in Figure TM7.16, the proposed transmission main improvement reduces the velocity for most of these primary transmission routes to below 5 ft/s and many to less than 4 ft/s.

Project WD13

In the future, a higher percentage of growth is anticipated in the North Pressure Zone. This growth requires larger portions of the Lanier Filter Plant processing capacity. Consequently, the Central Pressure Zone requires additional flows from the Shoal Creek Filter Plant. Under the 215 MGD operating scenario, the volume of water pumped from the Shoal Creek Filter Plant exceeds the capacity of the existing 60-inch transmission main that currently supplies water from the Shoal Creek Filter Plant to the manifold with the primary transmission route (parallel 48-inch transmission mains) to the Central Pressure Zone. Therefore, approximately 15,000 feet of parallel 60-inch transmission main is recommended from the Shoal Creek Central HSPS along Sycamore Road and South Richland Creek Road to tie into the existing parallel 48-inch transmission mains that supply the Central Pressure Zone. The benefits of this proposed project are illustrated in Figure TM7.17.

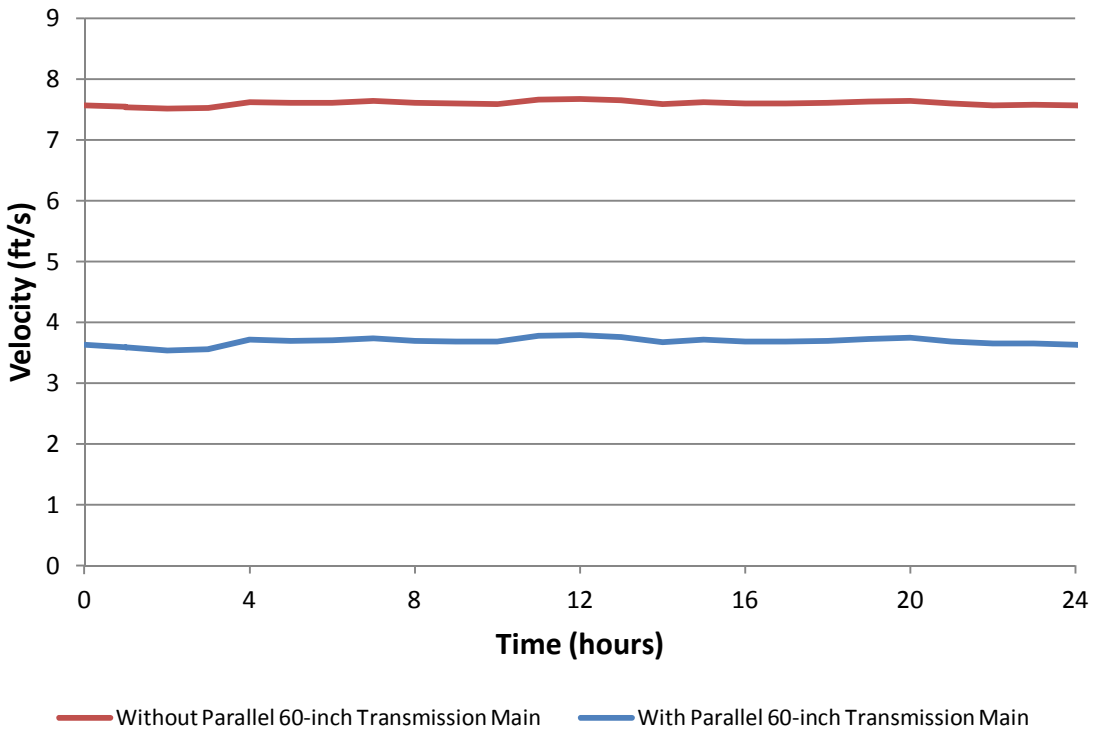


Figure TM7.17: Improved Velocities in Existing Transmission Main from Shoal Creek Filter Plant with Proposed Parallel 60-inch Transmission Main

As shown in Figure TM7.17, the velocity in the 60-inch Shoal Creek transmission main exceeds the recommended operating guideline and is a source of significant energy loss. This additional capacity will not only relieve the existing transmission main, but it will provide the transmission capacity to support future expansions of the Shoal Creek Filter Plant.

PROPOSED SYSTEM IMPROVEMENTS: 231 MGD DEMAND SCENARIO

Three system improvements are recommended to adequately meet 231 MGD demand scenario while maintaining system operating criteria. When the system demands reach 231 MGD, all of the 16 projects in this TM will be needed to meet the total peak day demand in the Gwinnett County water distribution system. Table TM7.10 summarizes the last three recommended system improvements and additional illustrative details can be found in Appendix A.

Table TM7.10: 231 MGD Demand Scenario Recommended System Improvements

Project ID	Figure	Description	Diameter (in.)	Approximate Length (ft)	Other
WD14	TM7.A18	Install 1 additional pump at the Shoal Creek High Service Pump Station matching the existing pumps to bring the firm capacity to approximately 105 MGD at 300 ft TDH (assume this would be done with plant expansion).	N/A	N/A	One pump with approx. operating point of 35 MGD at 300 ft TDH
WD15	TM7.A19	Install parallel 30/16-inch transmission main near decommissioned Duluth Tank to alleviate elevated velocities in the existing 48-inch transmission main.	48/30/16	500/9,100/2,900	
WD16	TM7.A20	Install parallel 12-inch distribution main in the Central Pressure Zone to alleviate velocities/headlosses in existing main.	12	1,500	

Project WD14

The combined treatment capacity for the Gwinnett County Water Distribution System is currently 225 MGD, with 150 MGD of capacity from the Lanier Filter Plant and 75 MGD of capacity at the Shoal Creek Filter Plant. Considering this, the total treatment capacity of the system will need to be increased to meet the 231 MGD of projected peak day demand. Since the Shoal Creek Filter Plant is newer (constructed in 2004) and the design considered the need for future expansion, the increase in treatment capacity was modeled from the Shoal Creek Filter Plant for this analysis. Gwinnett County staff confirmed that future increases in capacity should occur at the Shoal Creek Water Filter Plant and this expansion is described in greater detail in TM6 – Water Supply and Water Treatment Evaluation and Recommendations.

As part of the required expansion, the HSPS at Shoal Creek would need to be upgraded to deliver the expanded treatment capacity to the system. Under the 231 MGD demand scenario, an additional pump should be added to the existing Shoal Creek Central HSPS that matches the existing pump capacities, to provide a firm capacity of approximately 105 MGD at 300 feet TDH. This increase in firm pumping capacity would correspond to an expansion of the plant capacity.

Project WD15

As a consequence of the expanded Shoal Creek Filter Plant treatment capacity, additional flow will be directed south through the two parallel 48-inch transmission mains and the proposed 72-inch transmission main (Project WD9) that are the primary transmission routes to the western portion of the Central Pressure Zone. Segments near the ends of the 48-inch transmission mains exceed the operating guidelines as a result of this increased flow. The recommended project area is near the site of the decommissioned Duluth Tank and the intersections of Sugarloaf Parkway with Buford Highway and Peachtree Industrial Parkway. The recommended transmission main improvements include approximately 9,100 feet of 30-inch and 2,900 feet of 16-inch transmission mains with approximately 500 feet of 48-inch main used in transition to address the high

velocities in the existing mains. Figure TM7.18 illustrates the improved velocities in one of the existing 48-inch transmission mains.

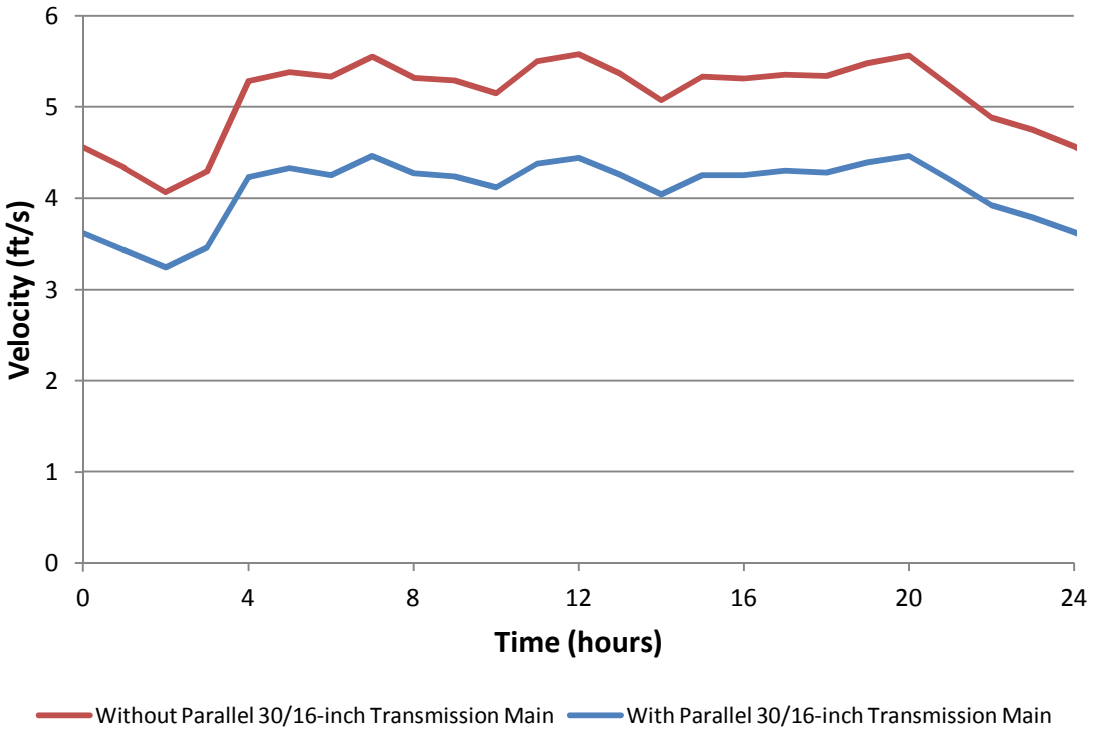


Figure TM7.18: Improved Velocity in Existing 48-inch Transmission Main that Supplies Central Pressure Zone with Proposed Transmission Main Improvement

The proposed transmission mains improve the pipe velocities as illustrated in Figure TM7.18. Existing segments of transmission mains in this area are under-utilized in the current configurations. Three segments of proposed 16-inch main complete a 16-inch transmission main route in the area. The proposed segments of 30-inch transmission main relieve demand from one transmission route by transferring more water through an underutilized portion of an existing 48-inch transmission main. The corresponding project sheet in Appendix A provides additional illustrative details about the alignments of this transmission improvement project.

Project WD16

Project WD16 is a relatively minor distribution main improvement project to decrease the velocity in an existing segment of water main along Pleasant Hill Road. Installing approximately 1,500 feet of a parallel 12-inch water main along Pleasant Hill Road between Crestwood Parkway/Koger Boulevard and Sweetwater Road will address the excessive headloss. Figure TM7.19 illustrates the benefits of the additional transmission capacity for the existing water main.

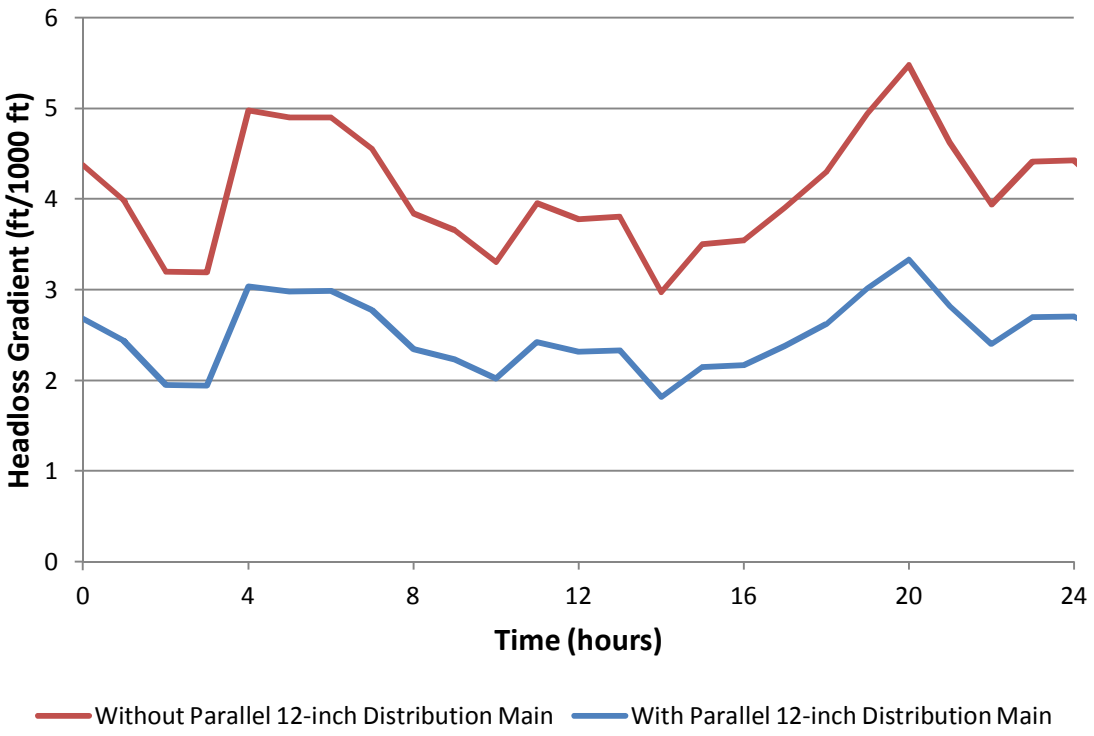


Figure TM7.19: Improved Headloss in Existing Water Main in Central Pressure Zone with Proposed Distribution Main Improvement

Although this project is minor compared to the other improvements, the reduction in energy loss shown above improves area pressures and positively contributes to the efficiency of the overall distribution system.

ALTERNATIVE PROJECT DESCRIPTIONS

In addition to the recommended system improvements, one alternative project was evaluated and is presented below. This alternative project (Project WDAlt1) could replace Project WD1A. Both Project WD1A and Project WDAlt1 address the pressure and headloss challenges in the North Pressure Zone under the 131 MGD demand scenario. While this alternative project will address the operating criteria, it would not provide the additional reliability desired by Gwinnett County. This project may be considered if the existing 54-inch pipe is not able to support the anticipated pressures under Project WD1A or if Gwinnett County decides not to proceed with providing additional reliability.

Table TM7.11: 131 MGD Demand Scenario Alternative System Improvements

Project ID	Description	Diameter (in.)	Approximate Length (ft)	Other
WDAlt1	Install new 42-inch transmission main along northwestern boundary of North Pressure Zone.	42	18,900	600 LF of 30-inch mains included for intermediate connections to system

Project WDAlt1

A new parallel 42-inch transmission main is recommended to replace the existing 12-inch water main and to add capacity to the western portion of the North Pressure Zone. The recommended 42-inch transmission main was sized based on the future system needs for the 231 MGD modeled scenario. The improved transmission capacity reduces the energy loss and, therefore, allows the system to adequately meet demands while maintaining pressures. The recommended 42-inch transmission main will extend 18,900 feet from the Lanier North HSPS to the intersection of Buford Dam Road and Sycamore Road to meet the 131 MGD of demand.

COST ESTIMATE FOR RECOMMENDATIONS

The cost estimates for the recommended improvement projects are shown in Table TM7.13. The water distribution projects include additional water distribution piping and pumping capacity. The unit costs for different pipe diameters are presented in Table TM7.14. The unit cost for pump station upgrades was estimated at $0.50/gallon for increases in capacity less than 10 MGD, and $0.15 for all other increases in pump station capacity. A 25% contingency was added to the calculated cost to account for the planning level nature of these estimates.

Table TM7.13: Cost Estimates for Recommendations

Demand Scenario (MGD)	Project ID	Cost[1,2,3]
131	WD1A	$12,652,500
	WD2	$987,500
	WD3	$140,000
	WD4	Note 4
142	WD1B	$7,072,500
	WD5A	$33,907,500
154	WD6A	$1,875,000
	WD1C	$5,338,750
167	WD6B	$1,875,000
182	WD5B	$15,938,750
	WD7	$1,700,000
	WD8	$5,111,250
197	WD9	$136,248,750
	WD10	$1,356,250
215	WD11	$2,687,500
	WD12	$15,995,000
	WD13	$26,236,250
231	WD14	$6,562,500
	WD15	$5,985,000
	WD16	$418,750
Alternate	WDAlt1	$8,831,250

Notes:
1. A planning level contingency of 25% was added to the cost.
2. The cost was based on previous project costs and professional judgment.
3. Costs are presented in 2010 dollars.
4. There is a nominal cost associated with changing the operations for the water tank.

Table TM7.14: Pipeline Unit Costs

Pipe Diameter (inches)	2010 Unit Cost (per linear foot)
8	$112.48
10	$122.45
12	$132.46
16	$160.84
24	$186.51
30	$237.24
36	$282.86
42	$366.27
48	$435.55
54	$574.13
60	$946.56
72	$1,712.23

The total cost for the water distribution projects shown in Table TM7.15 and the fire flow projects are estimated to be almost $285 million, if the development patterns follow the Unified Plan International Gateway scenario.

CONCLUSION

The Gwinnett County Water Distribution System was analyzed for its ability to effectively support a range of future water demand scenarios from 131 MGD to 231 MGD. The projected demands developed in Technical Memorandum 2 are based upon planned development associated with the Unified Plan International Gateway Scenario, and formed the basis for the demand scenarios evaluated in this TM.

The water distribution system capital improvement projects outlined in this TM are presented by increasing demand scenarios, as the need for these improvements is based on the system flows and not necessarily associated with a calendar date. These projects will be associated with an anticipated timeframe in the 2030 Water and Wastewater Master Plan, according to the anticipated water demands presented in TM2. The SCADA system can provide daily demand information that can be used to trigger the construction of the recommended projects for each demand scenario.

The recommended system improvements were developed using the Gwinnett County hydraulic model to meet the projected demand scenarios while maintaining the defined operating criteria (e.g. maximum velocities, minimum pressures, tank operation). One alternative project was evaluated in addition to the recommended system improvements.

Table TM7.15: Summary of Recommended System Improvements by Demand Scenario

Hydraulic Improvement Projects (Demand Based)				
Demand Scenario (MGD)	**Project ID**	**Recommended Improvement Type**	**Diameter (in.)**	**Approximate Length (ft)**
131	WD1A	Transmission Main Improvement & Pump Station Upgrade	48/42	3,400/3,000
	WD2	Pressure Zone Expansion & Pump Station Upgrade	12	~300 misc. piping & valve adjustments
	WD3	Valve Improvement	N/A	N/A
	WD4	Storage Tank Improvement	N/A	N/A
142	WD1B	Transmission Main Improvement	42	14,800
	WD5A	Transmission Main Improvement	54/48	32,200/18,000
154	WD6A	Pump Station Upgrade	N/A	N/A
	WD1C	Transmission Main Improvement	36	15,100
167	WD6B	Pump Station Upgrade	N/A	N/A
182	WD5B	Transmission Main Improvement	48	25,700
	WD7	Transmission Main Improvement	24	6,400
	WD8	Distribution Main Improvement	12	27,100
197	WD9	Transmission Main Improvement	72/48	44,200/17,800
	WD10	Transmission Main Improvement	16	5,200
215	WD11	Transmission Main Improvement	24	7,800
	WD12	Transmission Main Improvement	36/30	19,700/9,000
	WD13	Transmission Main Improvement	60	15,000
231	WD14	Pump Station Upgrade	N/A	N/A
	WD15	Transmission Main Improvement	48/30/16	500/9,100/2,900
	WD16	Distribution Main Improvement	12	1,500

Fire Flow Supply Projects		
Fire Flow Project	**Number of Projects**	**Cumulative Length (ft)**
New water mains for additional supply (majority 8-inch mains)	7	10,500
New water mains for additional supply (majority 12-inch mains)	5	10,700
New water mains for additional supply (majority 16-inch mains)	1	20
Valve modification for supply improvement	1	N/A

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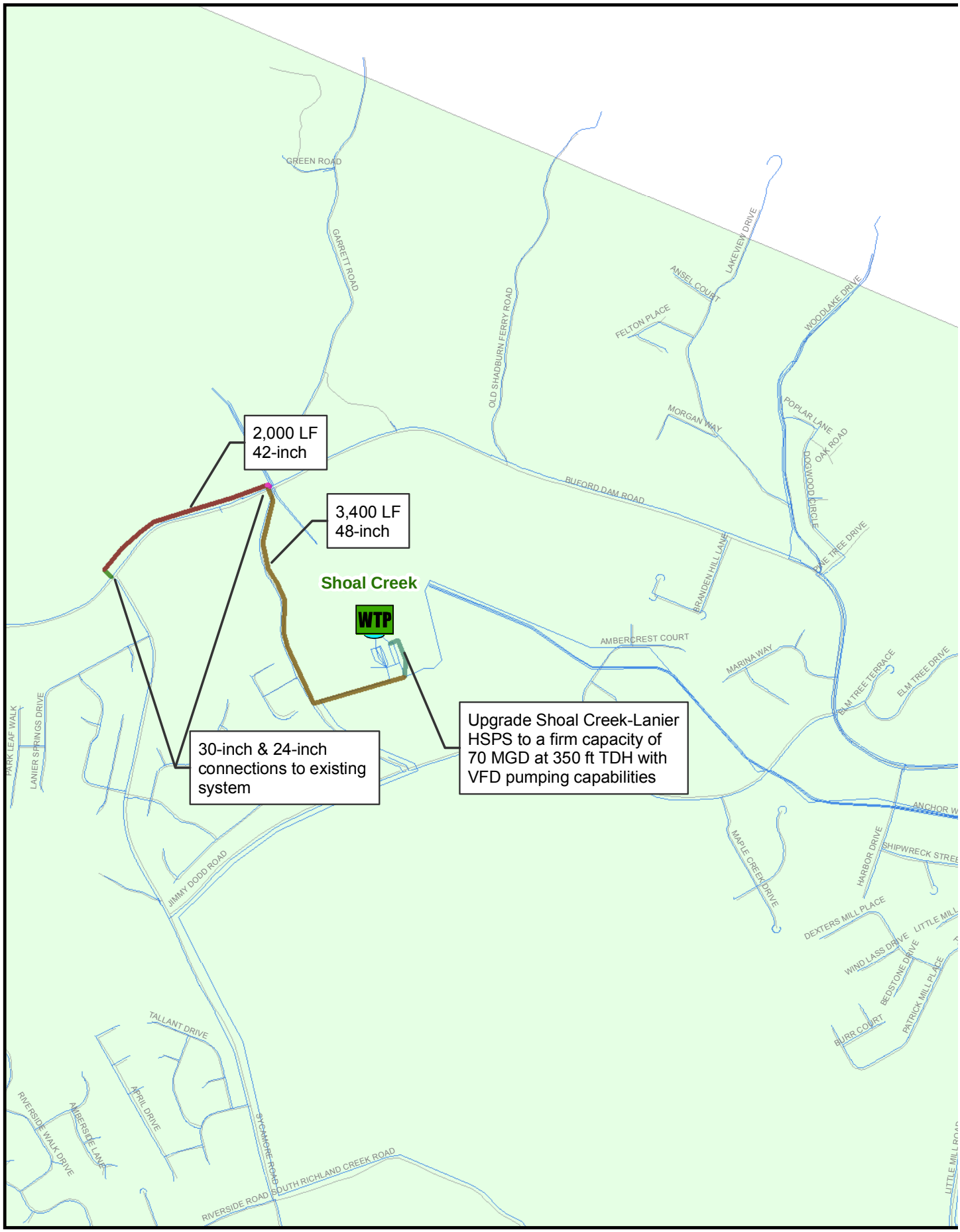
APPENDIX A:

Recommended Hydraulic Improvement Projects (Demand Based)

Project Sheets


2,000 LF
42-inch
3,400 LF
48-inch
Shoal Creek
WTP
30-inch & 24-inch connections to existing system
Upgrade Shoal Creek-Lanier HSPS to a firm capacity of 70 MGD at 350 ft TDH with VFD pumping capabilities
GREEN ROAD
GARRETT ROAD
OLD SHADBURN FERRY ROAD
ANSEL COURT
LAKEVIEW DRIVE
FELTON PLACE
WOODLAKE DRIVE
MORGAN WAY
POPLAR LANE
OAK ROAD
DOGWOOD CIRCLE
BUFORD DAM ROAD
ELM TREE DRIVE
BRANDEN HILL LANE
AMBERCREST COURT
MARINA WAY
ELM TREE TERRACE
PARK LEAF WALK
LANIER SPRINGS DRIVE
JIMMY DODD ROAD
MAPLE CREEK DRIVE
HARBOR DRIVE
DEXTERS MILL PLACE
WIND LASS DRIVE
BEDSTONE DRIVE
PATRICK MILL PLACE
BURR COURT
TALLANT DRIVE
APRIL DRIVE
RIVERSIDE WALK DRIVE
AMBERSIDE LANE
SYCAMORE ROAD
RIVERSIDE ROAD
SOUTH RICHLAND CREEK ROAD

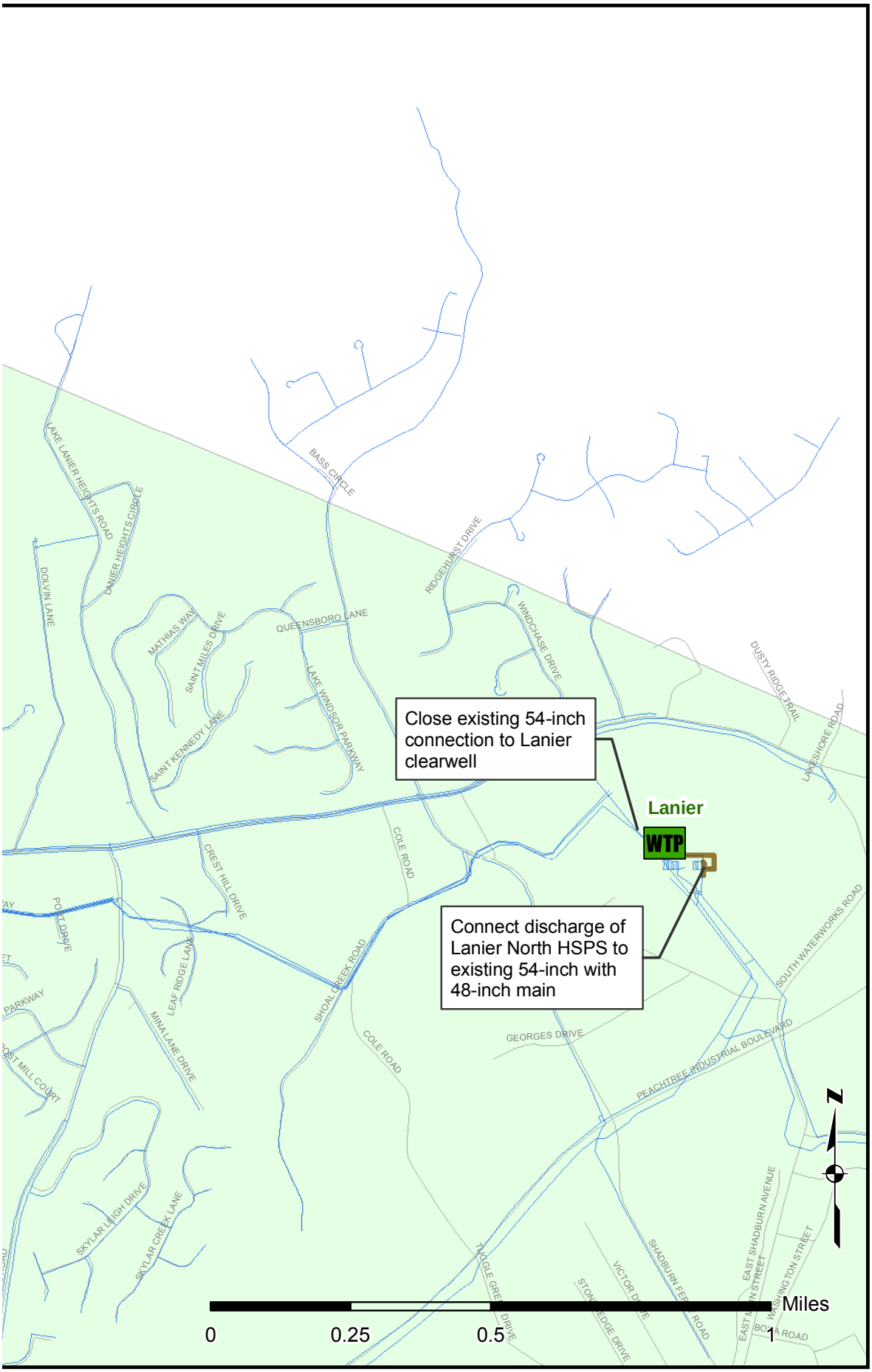


Figure TM7.A1

131 MGD Demand Scenario Proposed System Improvement

Project 1A

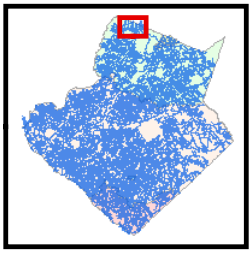
Legend

Existing Pipes

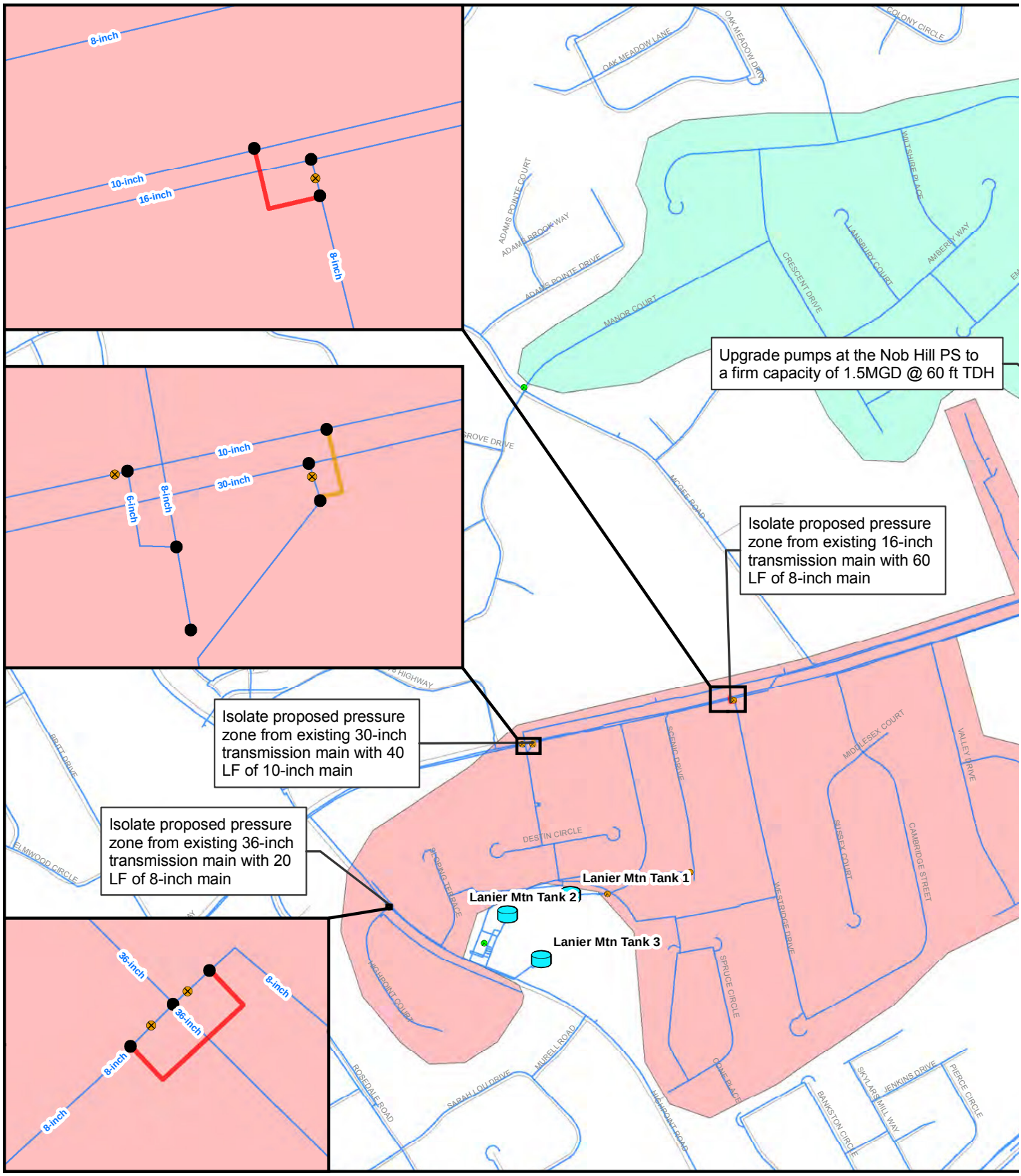
Proposed Improvements

PIPE SIZE (inch)

- 6
- 8
- 10
- 12
- 14
- 16
- 20
- 24
- 30
- 36
- 42
- 48
- 54
- 60
- 72
- 78



Gwinnett County 2030 Water & Wastewater Master Plan


8-inch
10-inch
16-inch
8-inch
10-inch
30-inch
6-inch
8-inch
36-inch
36-inch
8-inch
8-inch
8-inch
Upgrade pumps at the Nob Hill PS to a firm capacity of 1.5MGD @ 60 ft TDH
Isolate proposed pressure zone from existing 16-inch transmission main with 60 LF of 8-inch main
Isolate proposed pressure zone from existing 30-inch transmission main with 40 LF of 10-inch main
Isolate proposed pressure zone from existing 36-inch transmission main with 20 LF of 8-inch main
Lanier Mtn Tank 1
Lanier Mtn Tank 2
Lanier Mtn Tank 3
OAK MEADOW LANE
OAK MEADOW DRIVE
COLONY CIRCLE
ADAMS POINTE COURT
ADAMSBROOK WAY
ADAMS POINTE DRIVE
MANOR COURT
CRESCENT DRIVE
LANSBURY COURT
WILTSHIRE PLACE
AMBERLY WAY
MCGEE ROAD
BRITT DRIVE
ELMWOOD CIRCLE
DESTIN CIRCLE
SCENIC DRIVE
MIDDLESEX COURT
VALLEY DRIVE
SUSSEX COURT
CAMBRIDGE STREET
WESTRIDGE DRIVE
SPRUCE CIRCLE
OAK PLACE
HIGHPOINT COURT
ROSEDALE ROAD
SARAH LOU DRIVE
MURELL ROAD
HIGHPOINT ROAD
BANISTON CIRCLE
SKYLARK MILL WAY
JENKINS DRIVE
PIERCE CIRCLE

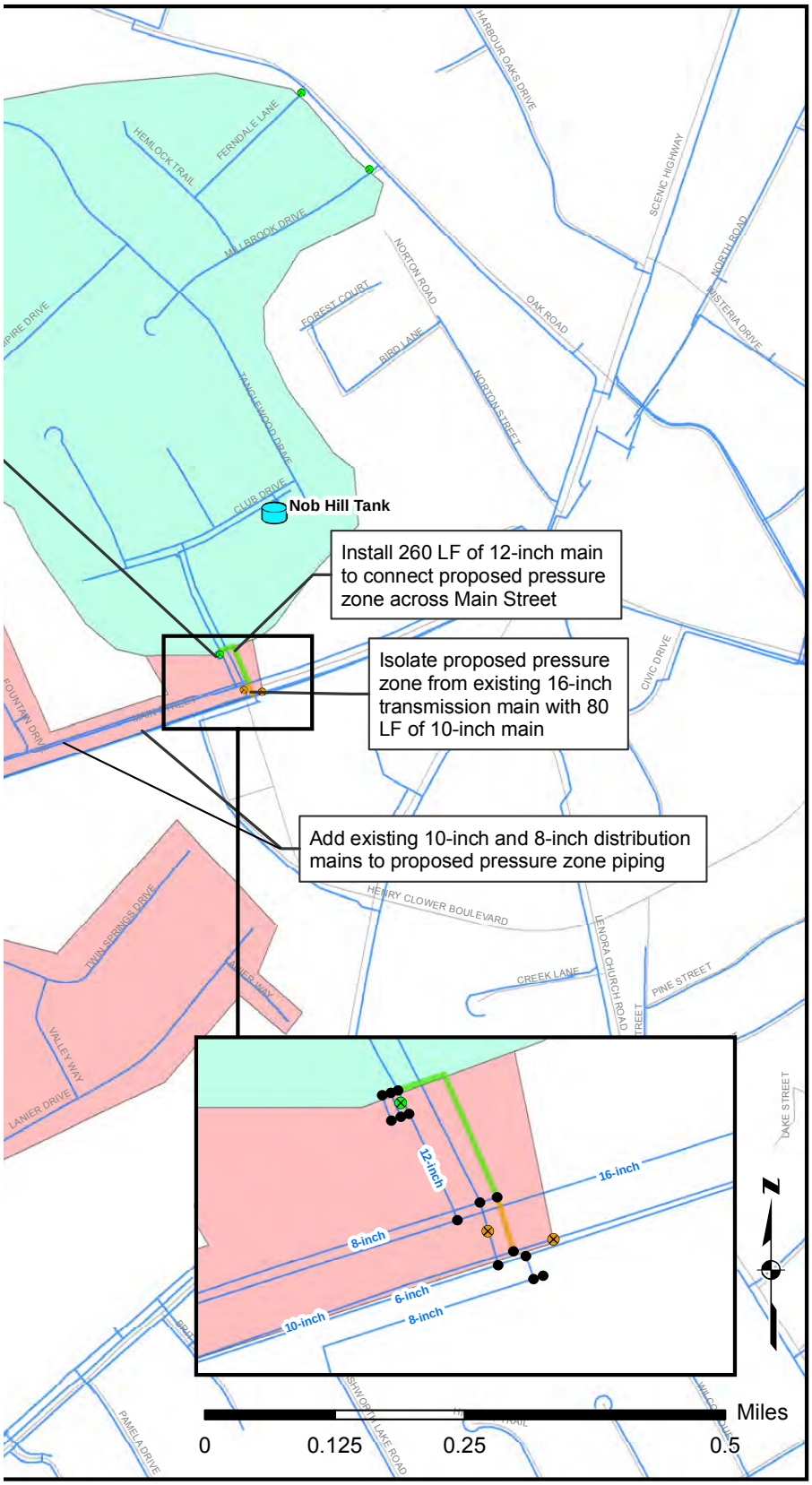


Figure TM7.A2

131 MGD Demand Scenario Proposed System Improvement

Project 2

Legend

Isolation Valves

STATUS

- Closed (originally)
- Closed (assumed)
- Closed (proposed)
- Existing Pipes
- Pipe Connections

Proposed Improvements

PIPE SIZE (inch)

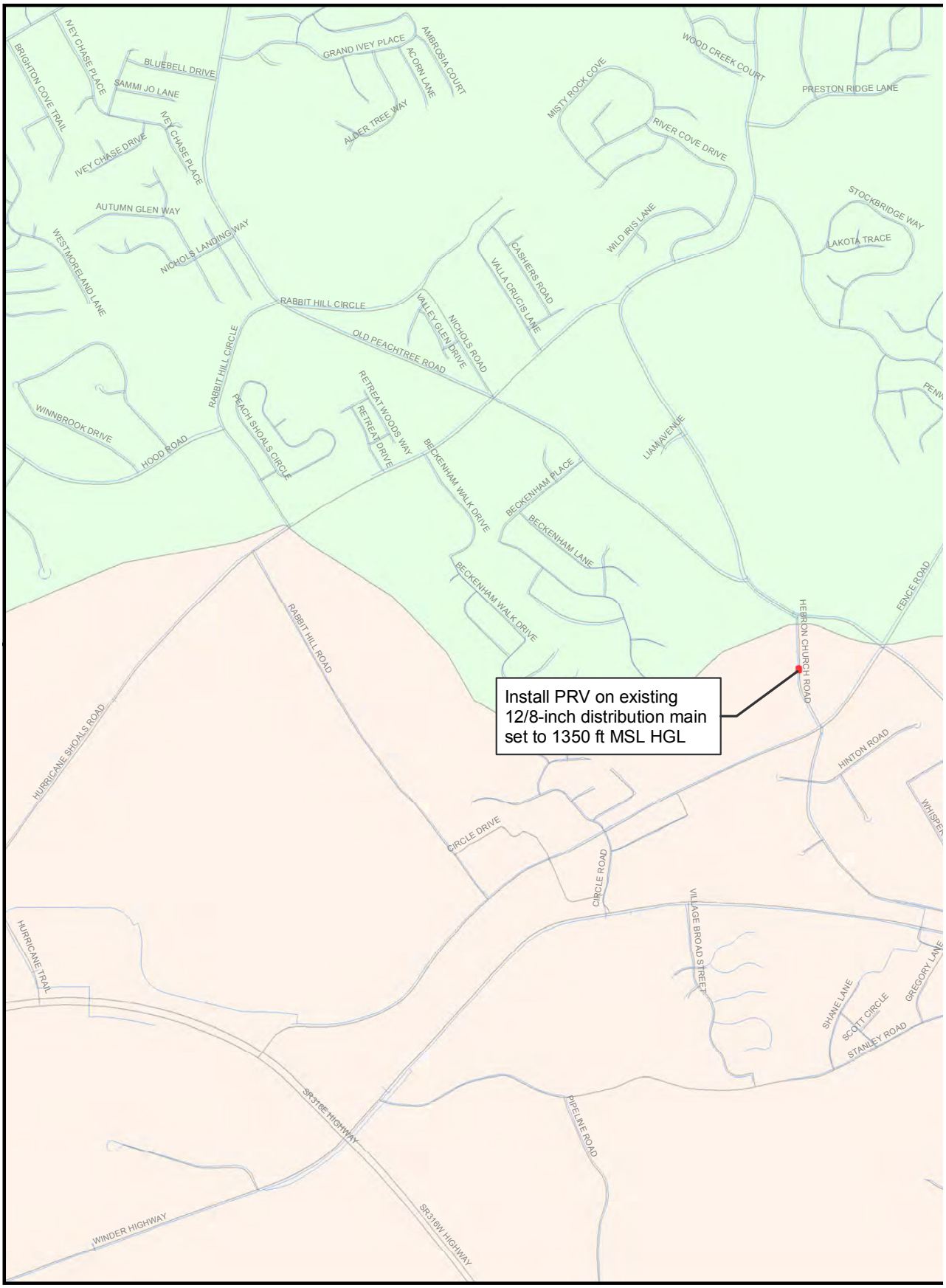
- 6
- 8
- 10
- 12
- 14
- 16
- 20
- 24
- 30
- 36
- 42
- 48
- 54
- 60
- 72
- 78

Proposed Pressure Zone

Pressure Zone

- Existing Pressure Zone
- Expanded Pressure Zone

Gwinnett County 2030 Water & Wastewater Master Plan


Install PRV on existing 12/8-inch distribution main set to 1350 ft MSL HGL
BRIGHTON COVE TRAIL
IVEY CHASE PLACE
BLUEBELL DRIVE
SAMMI JO LANE
IVEY CHASE DRIVE
IVEY CHASE PLACE
GRAND IVEY PLACE
AMBROSIA COURT
ACORN LANE
ALDER TREE WAY
MISTY ROCK COVE
WOOD CREEK COURT
PRESTON RIDGE LANE
RIVER COVE DRIVE
STOCKBRIDGE WAY
LAKOTA TRACE
AUTUMN GLEN WAY
WEST MORELAND LANE
NICHOLS LANDING WAY
WILD IRIS LANE
CASHIERS ROAD
VALLA CRUCIS LANE
RABBIT HILL CIRCLE
VALLEY GLEN DRIVE
NICHOLS ROAD
OLD PEACHTREE ROAD
RETREAT WOODS WAY
RETREAT DRIVE
PEACH SHOALS CIRCLE
WINNBROOK DRIVE
HOOD ROAD
BECKENHAM WALK DRIVE
BECKENHAM PLACE
BECKENHAM LANE
LIAM AVENUE
FENCE ROAD
HEBRON CHURCH ROAD
HURRICANE SHOALS ROAD
HINTON ROAD
CIRCLE DRIVE
CIRCLE ROAD
VILLAGE BROAD STREET
HURRICANE TRAIL
SHANE LANE
SCOTT CIRCLE
GREGORY LANE
STANLEY ROAD
SR316E HIGHWAY
PIPELINE ROAD
SR316W HIGHWAY
WINDER HIGHWAY

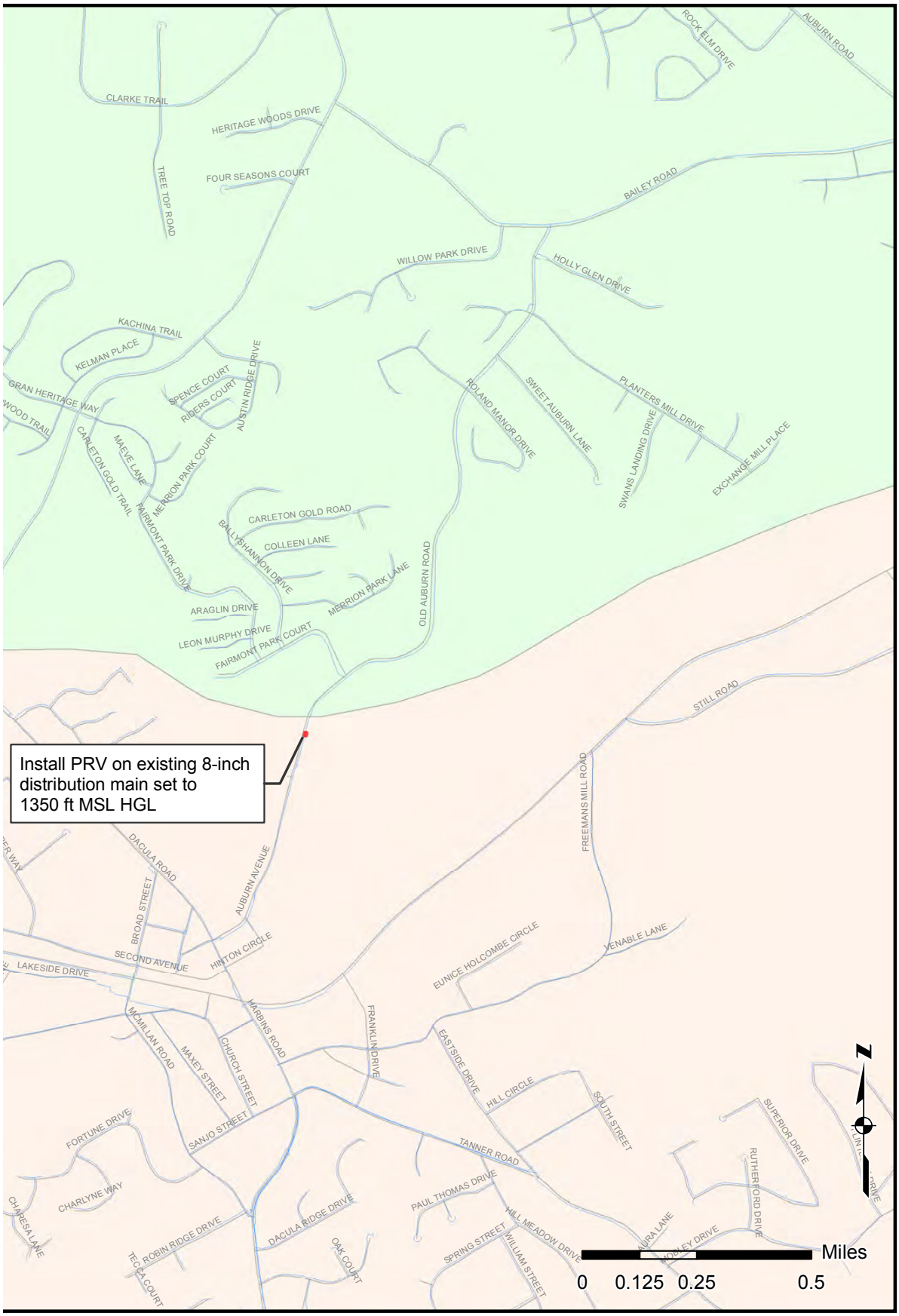


Figure TM7.A3

131 MGD Demand Scenario Proposed System Improvement

Project 3

Legend

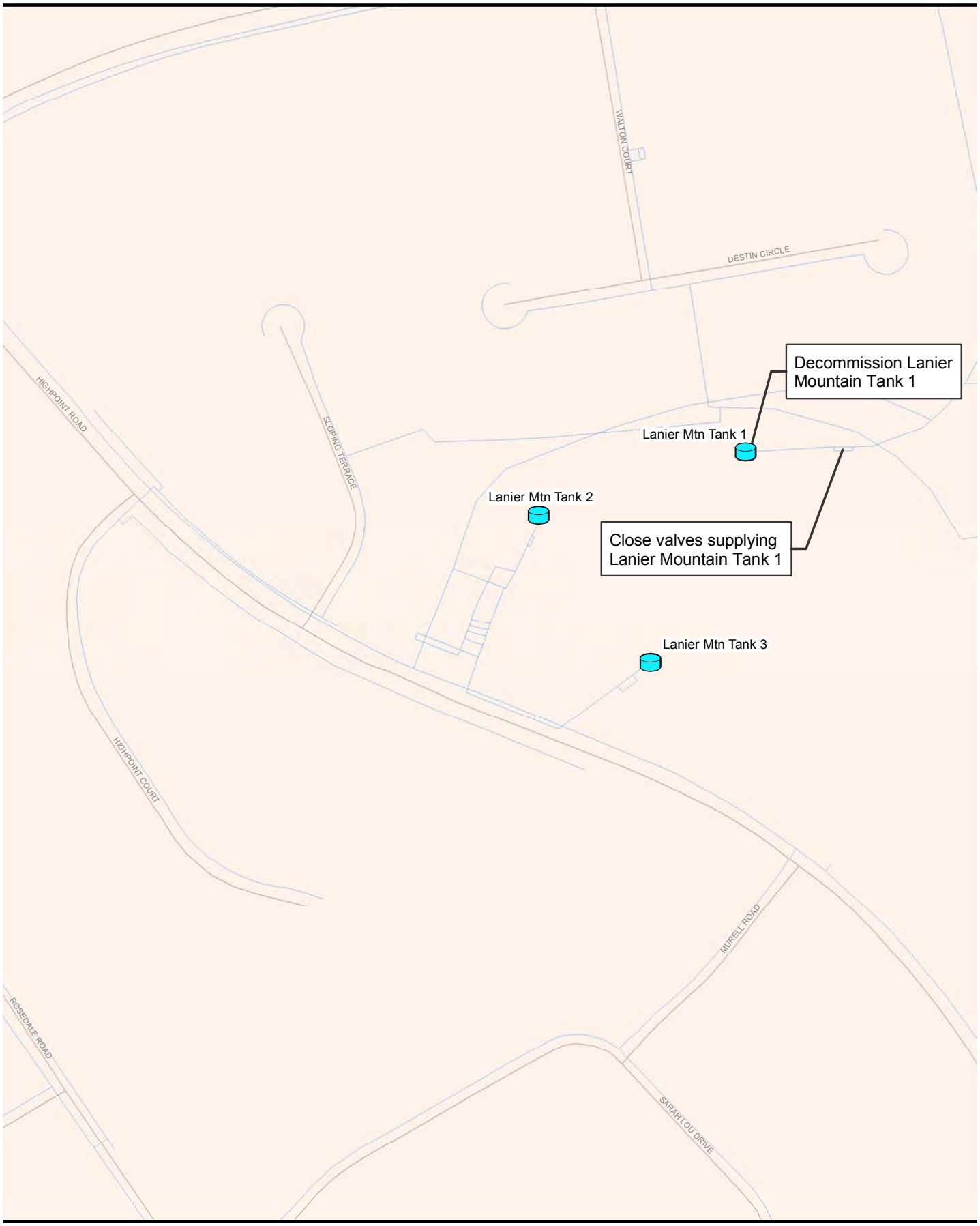
Existing Pipes

Proposed Improvements

PIPE SIZE (inch)

- 6
- 8
- 10
- 12
- 14
- 16
- 20
- 24
- 30
- 36
- 42
- 48
- 54
- 60
- 72
- 78

Gwinnett County 2030 Water & Wastewater Master Plan


WALTON COURT
DESTIN CIRCLE
Decommission Lanier Mountain Tank 1
HIGHPOINT ROAD
SLOPING TERRACE
Lanier Mtn Tank 1
Lanier Mtn Tank 2
Close valves supplying Lanier Mountain Tank 1
Lanier Mtn Tank 3
HIGHPOINT COURT
MURELL ROAD
ROSEDALE ROAD
SARAH LOU DRIVE

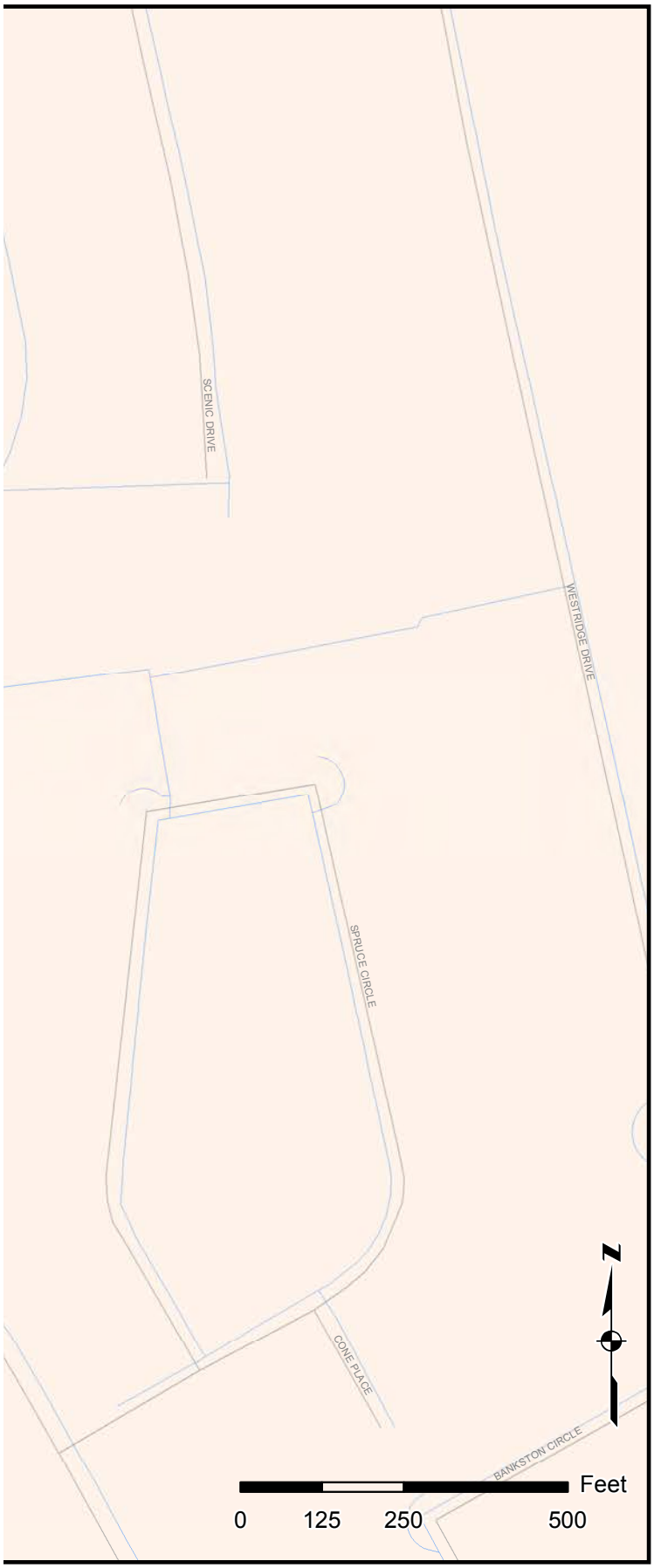


Figure TM7.A4

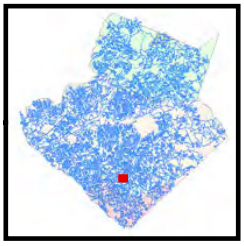
131 MGD Demand Scenario Proposed System Improvement

Project 4

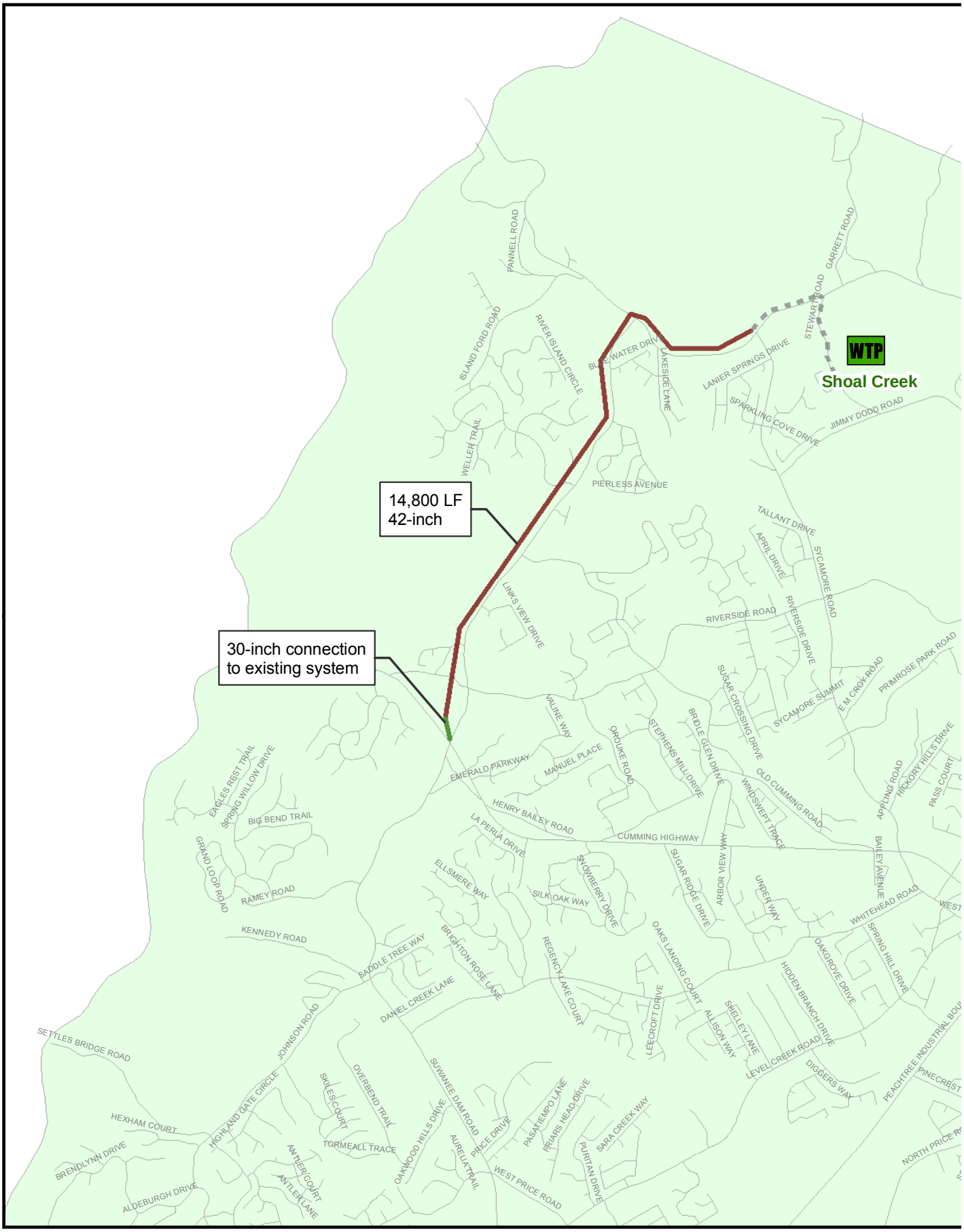
Legend

Existing Pipes

Storage Tank



Gwinnett County 2030 Water & Wastewater Master Plan


WTP
Shoal Creek
14,800 LF
42-inch
30-inch connection
to existing system
PANNELL ROAD
GARRETT ROAD
STEWART ROAD
ISLAND FORD ROAD
RIVER ISLAND CIRCLE
BLUE WATER DRIVE
LAKESIDE LANE
LANIER SPRINGS DRIVE
SPARKLING COVE DRIVE
JIMMY DODD ROAD
WELLER TRAIL
PIERLESS AVENUE
TALLANT DRIVE
APRIL DRIVE
SYCAMORE ROAD
LINKS VIEW DRIVE
RIVERSIDE ROAD
RIVERSIDE DRIVE
PRIMROSE PARK ROAD
SUGAR CROSSING DRIVE
SYCAMORE SUMMIT
E M CROW ROAD
VALINE WAY
ORDUKE ROAD
STEPHENS MILL DRIVE
BRIDLE GLEN DRIVE
EMERALD PARKWAY
MANUEL PLACE
OLD CUMMING ROAD
WINDSWEPT TRACE
APPLING ROAD
HICKORY HILLS DRIVE
PASS COURT
EAGLES REST TRAIL
SPRING WILLOW DRIVE
BIG BEND TRAIL
HENRY BAILEY ROAD
LA PERLA DRIVE
CUMMING HIGHWAY
GRAND LOOP ROAD
RAMEY ROAD
ELLSMERE WAY
SILK OAK WAY
SNOWBERRY DRIVE
SUGAR RIDGE DRIVE
ARBOR VIEW WAY
UNDER WAY
BAILEY AVENUE
WHITEHEAD ROAD
KENNEDY ROAD
SADDLE TREE WAY
BRIGHTON ROSE LANE
REGENCY LAKE COURT
OAKS LANDING COURT
SPRING HILL DRIVE
OAKGROVE DRIVE
HIDDEN BRANCH DRIVE
DANIEL CREEK LANE
LEECROFT DRIVE
SHELLEY LANE
ALLISON WAY
LEVEL CREEK ROAD
DIGGERS WAY
PEACHTREE INDUSTRIAL BOU
SETTLES BRIDGE ROAD
JOHNSON ROAD
OVERBEND TRAIL
SUWANEE DAM ROAD
HIGHLAND GATE CIRCLE
SKILES COURT
HEXHAM COURT
TORMEALL TRACE
OAKWOOD HILLS DRIVE
PRICE DRIVE
PASATIEMPO LANE
FRIARS HEAD DRIVE
SARA CREEK WAY
PURITAN DRIVE
AURELIA TRAIL
WEST PRICE ROAD
BRENDLYNN DRIVE
ANTLER COURT
ANTLER LANE
ALDEBURGH DRIVE
NORTH PRICE R

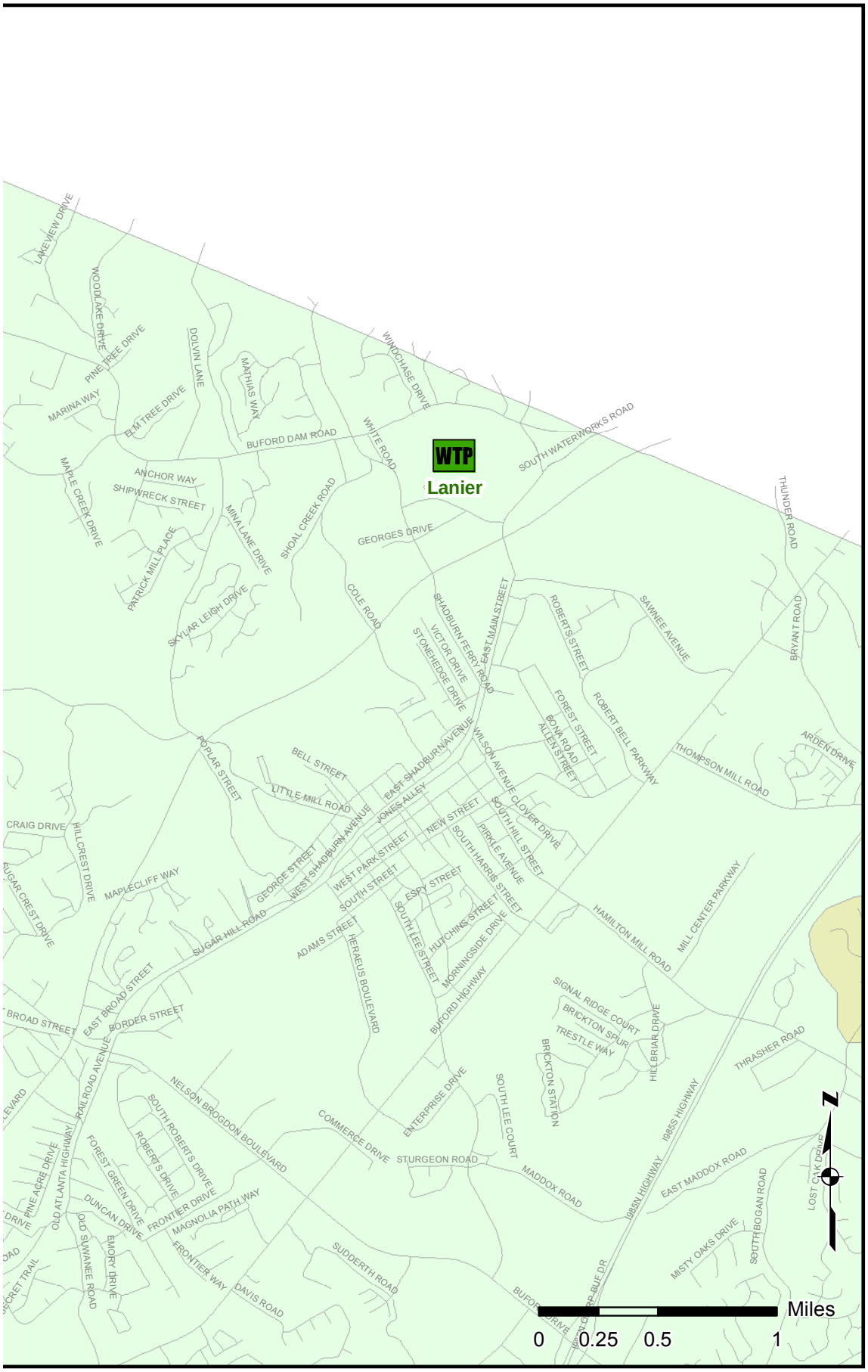


Figure TM7.A5

142 MGD Demand Scenario Proposed System Improvement

Project 1B

Legend

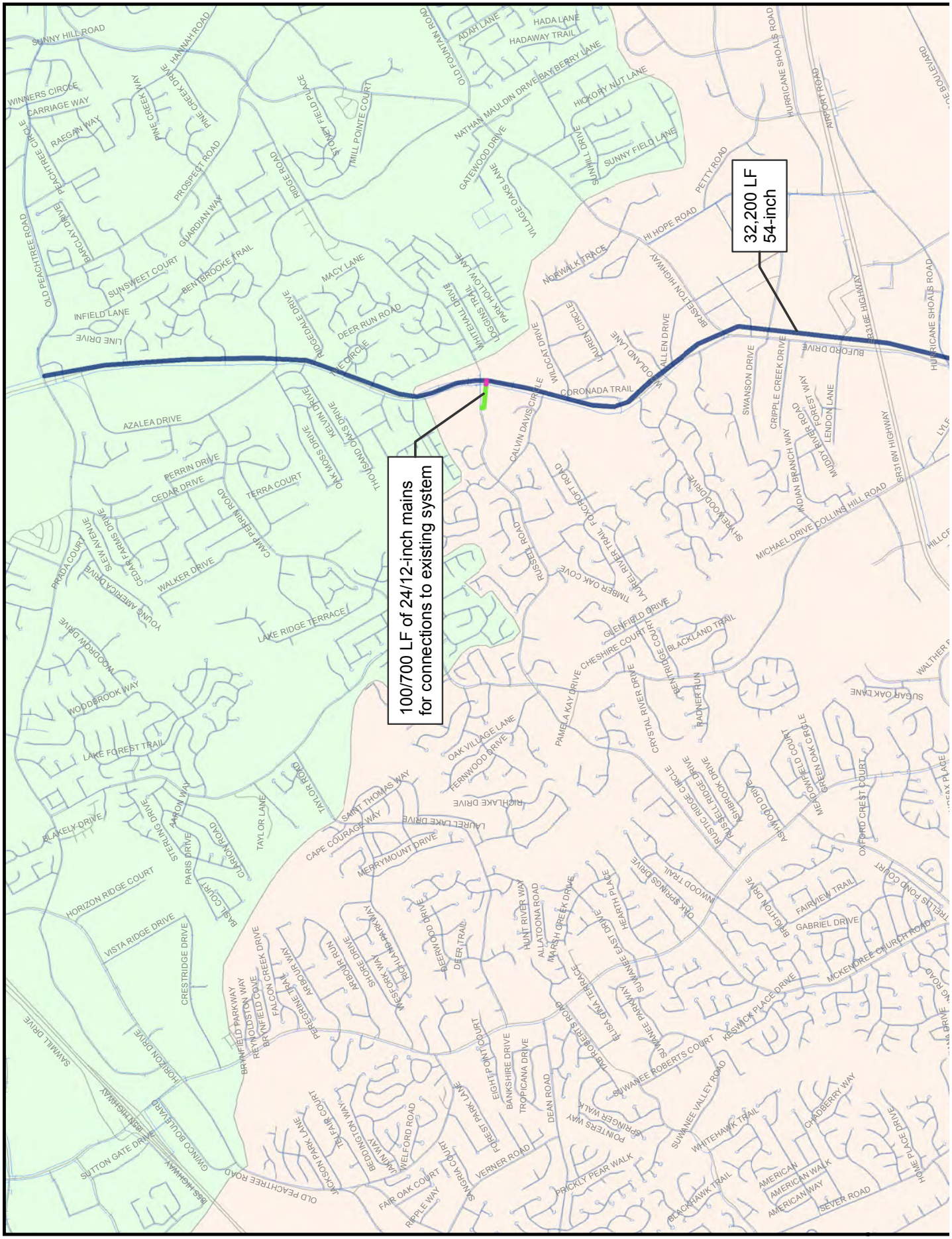
Other Proposed Projects

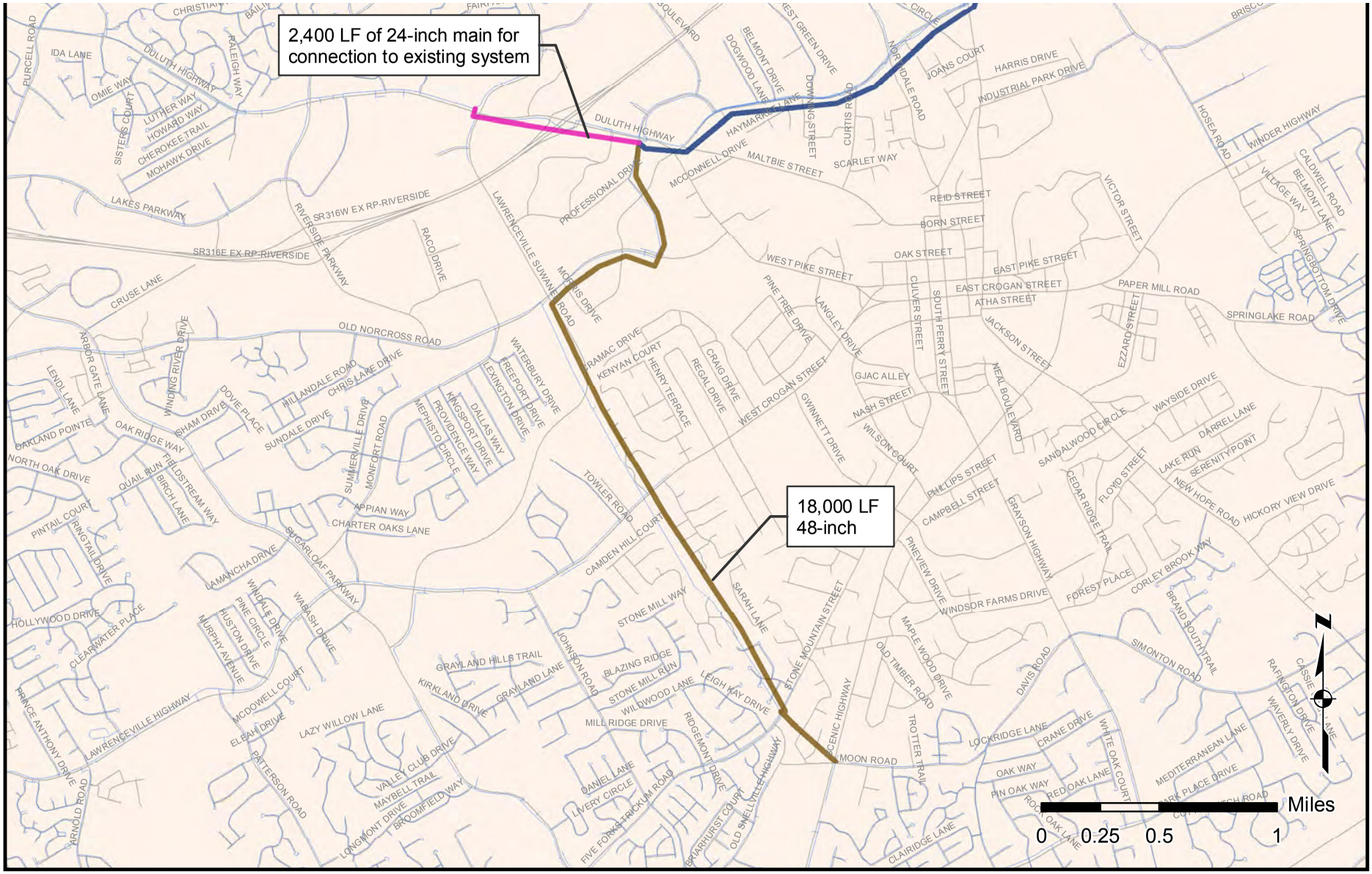
Proposed Improvements

PIPE SIZE (inch)

- 6
- 8
- 10
- 12
- 14
- 16
- 20
- 24
- 30
- 36
- 42
- 48
- 54
- 60
- 72
- 78

Gwinnett County 2030 Water & Wastewater Master Plan


100/700 LF of 24/12-inch mains
for connections to existing system
32,200 LF
54-inch
CORONADA TRAIL
HI HOPE ROAD
PETTY ROAD
HURRICANE SHOALS ROAD
AIRPORT ROAD
BUFORD DRIVE
SR316E HIGHWAY
SR316W HIGHWAY
SWANSON DRIVE
CRIPPLE CREEK DRIVE
MICHAEL DRIVE
COLLINS HILL ROAD
SUNNY HILL ROAD
HANNAH ROAD
WINNERS CIRCLE
CARRIAGE WAY
RAEGAN WAY
PINE CREEK WAY
PINE CREEK DRIVE
PROSPECT ROAD
GUARDIAN WAY
OLD PEACHTREE ROAD
SUNSWEET COURT
BENTBROOKE TRAIL
INFIELD LANE
LINE DRIVE
MACY LANE
DEER RUN ROAD
RIDGEDALE DRIVE
RIDGE ROAD
STONEFIELD PLACE
MILL POINTE COURT
OLD FOUNTAIN ROAD
ADAH LANE
HADA LANE
HADAWAY TRAIL
BAYBERRY LANE
HICKORY NUT LANE
NATHAN MAULDIN DRIVE
GATEWOOD DRIVE
VILLAGE OAKS LANE
SUNNY FIELD LANE
NORWALK TRACE
BASSETTON HIGHWAY
WILDCAT DRIVE
LAUREL CIRCLE
WOODLAND LANE
WHITEHALL DRIVE
LOGGINS TRAIL
PARK HOLLOW LANE
AZALEA DRIVE
PERRIN DRIVE
CEDAR DRIVE
TERRA COURT
CAMP PERRIN ROAD
OAK MOSS DRIVE
KELLIN DRIVE
THOUSAND OAKS DRIVE
CALVIN DAVIS CIRCLE
RUSSELL ROAD
POLCROFT ROAD
LAUREL RIVER TRAIL
TIMBER OAK COVE
SHYREWOOD DRIVE
INDIAN BRANCH WAY
MULBERRY FOREST WAY
LENDON LANE
PRADA COURT
CEDAR PARKS DRIVE
SILEW AVENUE
YOUNG AMERICA DRIVE
WALKER DRIVE
LAKE RIDGE TERRACE
WOODROW DRIVE
WODDBROOK WAY
LAKE FOREST TRAIL
GLENFIELD DRIVE
CHESHIRE COURT
BLACKLAND TRAIL
PENNBRIDGE COURT
PAMELA KAY DRIVE
CRYSTAL RIVER DRIVE
RADNER RUN
SUGAR OAK LANE
WALTHER
OAK VILLAGE LANE
FERNWOOD DRIVE
RICHLAKE DRIVE
LAUREL LAKE DRIVE
SAINT THOMAS WAY
CAPE COURAGE WAY
MERRYMOUNT DRIVE
TAYLOR ROAD
TAYLOR LANE
BLAKELY DRIVE
AARON WAY
STERLING DRIVE
PARIS DRIVE
CLARION ROAD
BASIL COURT
HORIZON RIDGE COURT
VISTA RIDGE DRIVE
CRESTRIDGE DRIVE
RUSTIC RIDGE CIRCLE
RUSSELL RIDGE DRIVE
ASHBROOK DRIVE
ASHWOOD DRIVE
MEADOWFIELD COURT
GREEN OAK CIRCLE
OXFORD CREST COURT
OAK SPRINGS DRIVE
WOOD TRAIL
BRIGHTON DRIVE
FAIRVIEW TRAIL
GABRIEL DRIVE
MCKENDREE CHURCH ROAD
KESWICK PLACE DRIVE
HUNT RIVER WAY
ALLATOONA ROAD
MARSH CREEK DRIVE
HEATH PLACE
ELISA GINA TERRACE
SUWANEE PARKWAY
SUWANEE EAST DRIVE
BEERWOOD DRIVE
DEER TRAIL
SHORE DRIVE
WESTFORK WAY
ROCKLAND PARKWAY
ABBOTT RUN
ARBOURTIME WAY
PEPPERTIME LANE
FALCON CREEK DRIVE
BRYNFIELD PARKWAY
REYNOLDSTON WAY
BRYNFIELD COVE
SAWMILL DRIVE
HORIZON DRIVE
GWINNETT BOULEVARD
SUTTON GATE DRIVE
BASS HIGHWAY
OLD PEACHTREE ROAD
JACKSON PARK LANE
TSI FAIR COURT
BEDDINGTON WAY
LAKIN WAY
WELFORD ROAD
FAIR OAK COURT
RIPPLE WAY
SANGRIA COURT
FOREST PARK LANE
VERNER ROAD
EIGHT-POINT COURT
BANKSHIRE DRIVE
TROPICANA DRIVE
DEAN ROAD
TAB ROBERTS ROAD
SUWANEE ROBERTS COURT
SUWANEE VALLEY ROAD
POINTERS WAY
SPRINGER WALK
WHITEHAWK TRAIL
PRICKLY PEAR WALK
BLACKHAWK TRAIL
CHADBERRY WAY
HOME PLACE DRIVE
AMERICAN
AMERICAN WALK
AMERICAN WAY
SEVER ROAD



Gwinnett County 2030 Water & Wastewater Master Plan

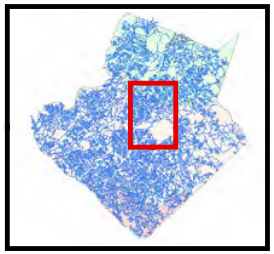


Figure TM7.A6

142 MGD Demand Scenario Proposed System Improvement

Project 5A

Legend

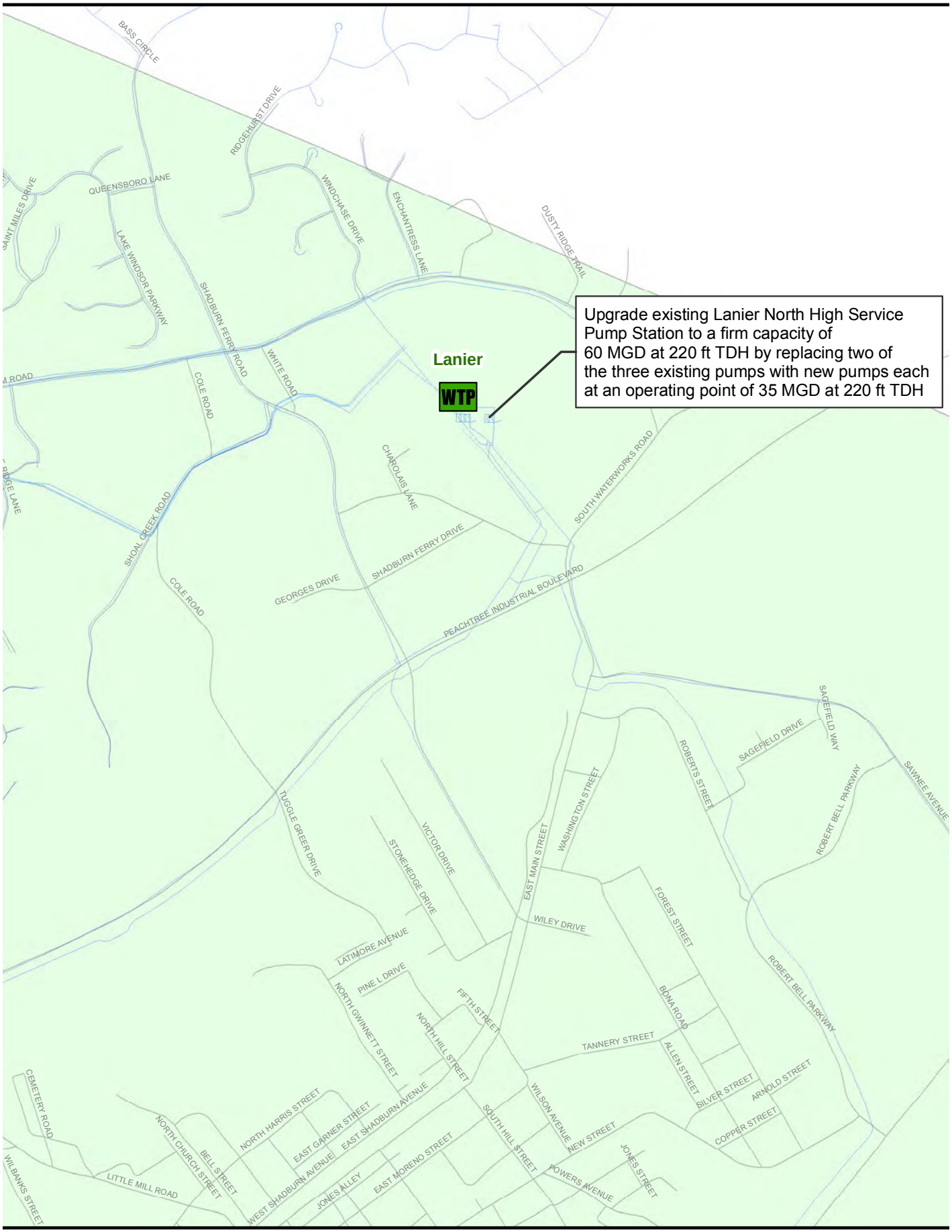
Existing Pipes

Proposed Improvements

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78

DEPARTMENT OF WATER RESOURCES
BOARD OF COMMISSIONERS OF GWINNETT COUNTY
GEORGIA


Upgrade existing Lanier North High Service Pump Station to a firm capacity of 60 MGD at 220 ft TDH by replacing two of the three existing pumps with new pumps each at an operating point of 35 MGD at 220 ft TDH
Lanier
WTP
BASS CIRCLE
RIDGEHURST DRIVE
QUEENSBORO LANE
SAINT MILES DRIVE
LAKE WINDSOR PARKWAY
WINDCHASE DRIVE
ENCHANTRESS LANE
DUSTY RIDGE TRAIL
SHADBURN FERRY ROAD
WHITE ROAD
COLE ROAD
CHAROLAIS LANE
SOUTH WATERWORKS ROAD
SHOAL CREEK ROAD
SHADBURN FERRY DRIVE
GEORGES DRIVE
PEACHTREE INDUSTRIAL BOULEVARD
SAGEFIELD WAY
SAGEFIELD DRIVE
ROBERTS STREET
SAWNEE AVENUE
ROBERT BELL PARKWAY
WASHINGTON STREET
TUGGLE GREER DRIVE
VICTOR DRIVE
STONEHEDGE DRIVE
EAST MAIN STREET
WILEY DRIVE
FOREST STREET
LATIMORE AVENUE
PINE L DRIVE
NORTH GWINNETT STREET
NORTH HILL STREET
FIFTH STREET
BONA ROAD
TANNERY STREET
ALLEN STREET
SILVER STREET
ARNOLD STREET
COPPER STREET
CEMETERY ROAD
NORTH HARRIS STREET
EAST GARNER STREET
EAST SHADBURN AVENUE
WEST SHADBURN AVENUE
NORTH CHURCH STREET
BELL STREET
LITTLE MILL ROAD
WILBANKS STREET
JONES ALLEY
EAST MORENO STREET
SOUTH HILL STREET
WILSON AVENUE
NEW STREET
POWERS AVENUE
JONES STREET

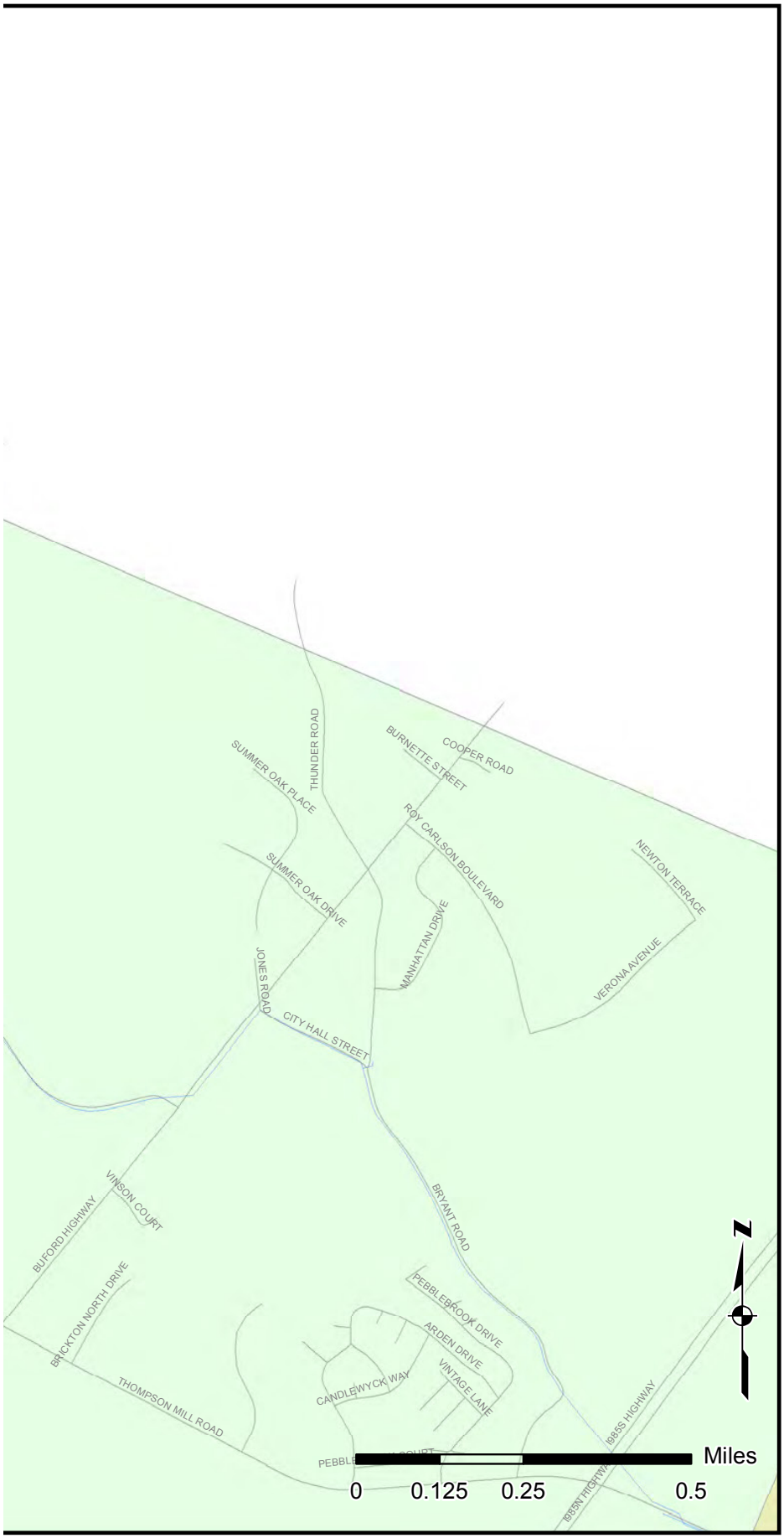


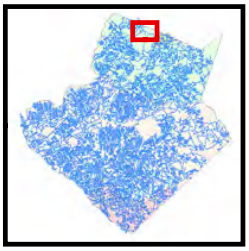
Figure TM7.A7

154 MGD Demand Scenario Proposed System Improvement

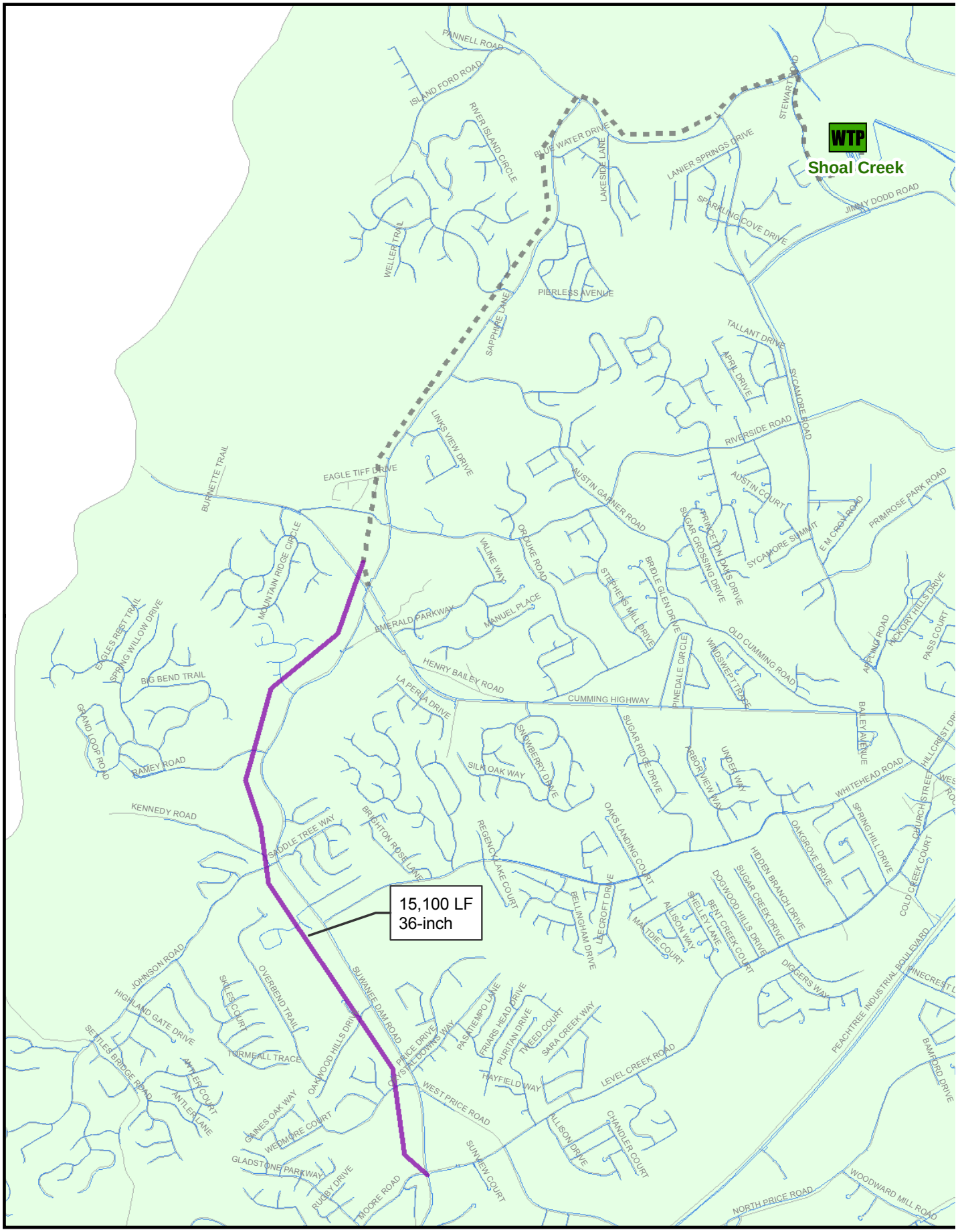
Project 6A

Legend

Existing Pipes



Gwinnett County 2030 Water & Wastewater Master Plan


WTP
Shoal Creek
15,100 LF
36-inch
PANNELL ROAD
ISLAND FORD ROAD
RIVER ISLAND CIRCLE
BLUE WATER DRIVE
LAKESIDE LANE
LANIER SPRINGS DRIVE
STEWART ROAD
SPARKLING COVE DRIVE
JIMMY DODD ROAD
WELLER TRAIL
PIERLESS AVENUE
SAPPHIRE LANE
TALLANT DRIVE
APRIL DRIVE
SYCAMORE ROAD
RIVERSIDE ROAD
LINKS VIEW DRIVE
EAGLE TIFF DRIVE
BURNETTE TRAIL
AUSTIN GARNER ROAD
AUSTIN COURT
PRINCETON DAVIS DRIVE
SUGAR CROSSING DRIVE
SYCAMORE SUMMIT
E.M. CROW ROAD
PRIMROSE PARK ROAD
MOUNTAIN RIDGE CIRCLE
VALINE WAY
ORDUKE ROAD
STEPHENS MILL DRIVE
BRIDLE GLEN DRIVE
EMERALD PARKWAY
MANUEL PLACE
EAGLES REST TRAIL
SPRING WILLOW DRIVE
BIG BEND TRAIL
HENRY BAILEY ROAD
LA PERLA DRIVE
CUMMING HIGHWAY
PINEDALE CIRCLE
WINDSWEPT TRACE
OLD CUMMING ROAD
APPLING ROAD
HICKORY HILLS DRIVE
PASS COURT
GRAND LOOP ROAD
RAMEY ROAD
SILK OAK WAY
SNOWBERRY DRIVE
SUGAR RIDGE DRIVE
ARBORVIEW WAY
UNDER WAY
BAILEY AVENUE
WHITEHEAD ROAD
KENNEDY ROAD
SADDLE TREE WAY
BRIGHTON ROSE LANE
REGENCY LAKE COURT
OAKS LANDING COURT
SPRING HILL DRIVE
OAKGROVE DRIVE
CHURCH STREET
HILLCREST DRIVE
COLD CREEK COURT
HIDDEN BRANCH DRIVE
SUGAR CREEK DRIVE
DOGWOOD HILLS DRIVE
BENT CREEK COURT
SHELLEY LANE
ALLISON WAY
MAXTIE COURT
BELLINGHAM DRIVE
LACROFT DRIVE
DIGGERS WAY
PEACHTREE INDUSTRIAL BOULEVARD
PINECREST D
BAMFORD DRIVE
JOHNSON ROAD
HIGHLAND GATE DRIVE
SKILES COURT
OVERBEND TRAIL
SUWANEE DAM ROAD
SKILES BRIDGE ROAD
TORMEALL TRACE
OAKWOOD HILLS DRIVE
PRICE DRIVE
CRYSTAL DOWNS WAY
PASATIEMPO LANE
FRIARS HEAD DRIVE
PURITAN DRIVE
TWEED COURT
SARA CREEK WAY
ANTLER COURT
ANTLER LANE
THAYFIELD WAY
LEVEL CREEK ROAD
WEST PRICE ROAD
GAINES OAK WAY
WEDMORE COURT
ALLISON DRIVE
CHANDLER COURT
GLADSTONE PARKWAY
RUGBY DRIVE
MOORE ROAD
SUNVIEW COURT
NORTH PRICE ROAD
WOODWARD MILL ROAD

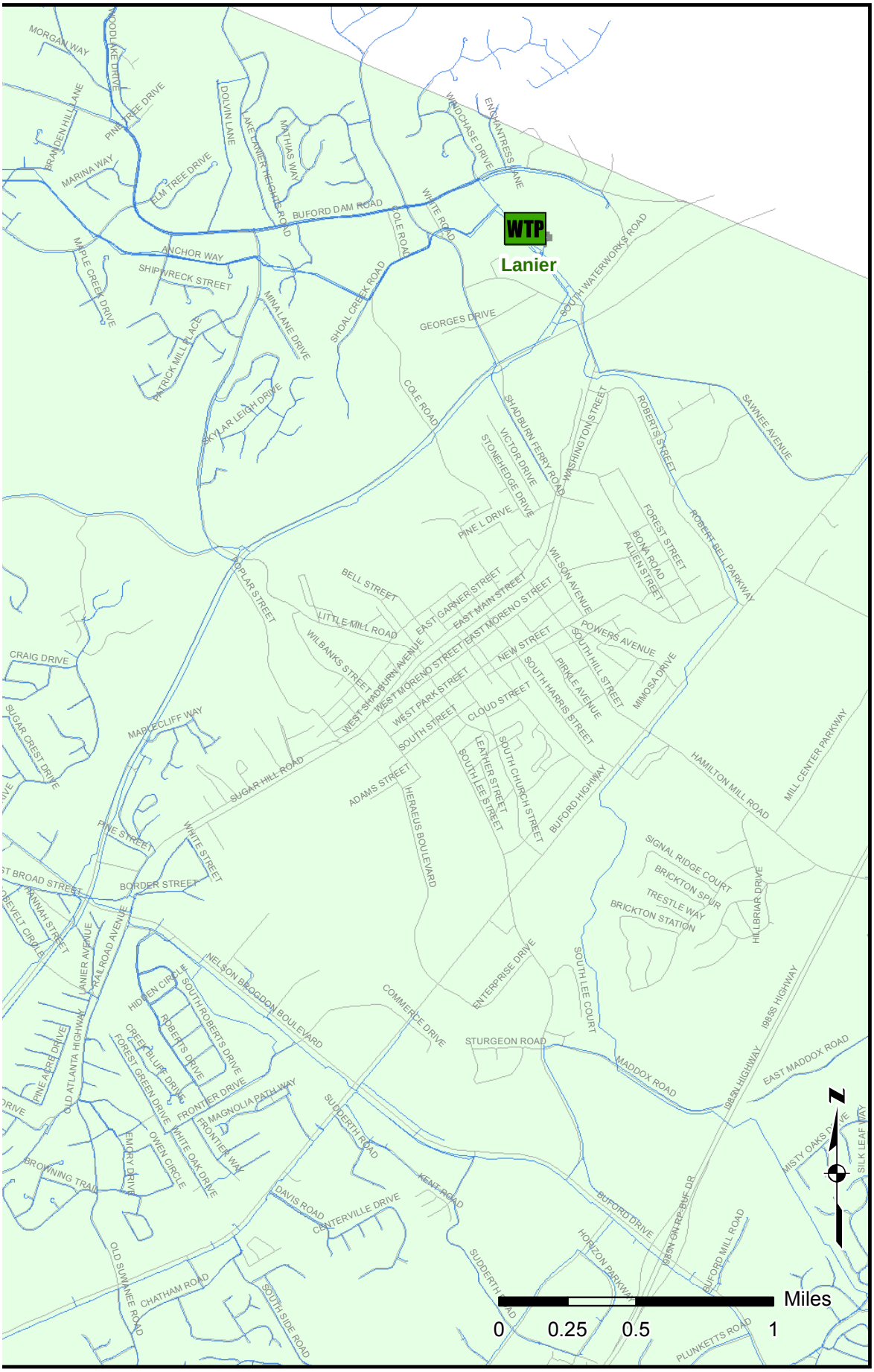


Figure TM7.A8

154 MGD Demand Scenario Proposed System Improvement

Project 1C

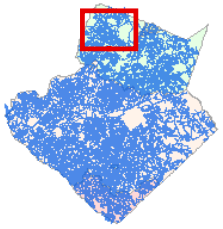
Legend

- Existing Pipes
- Other Proposed Improvements

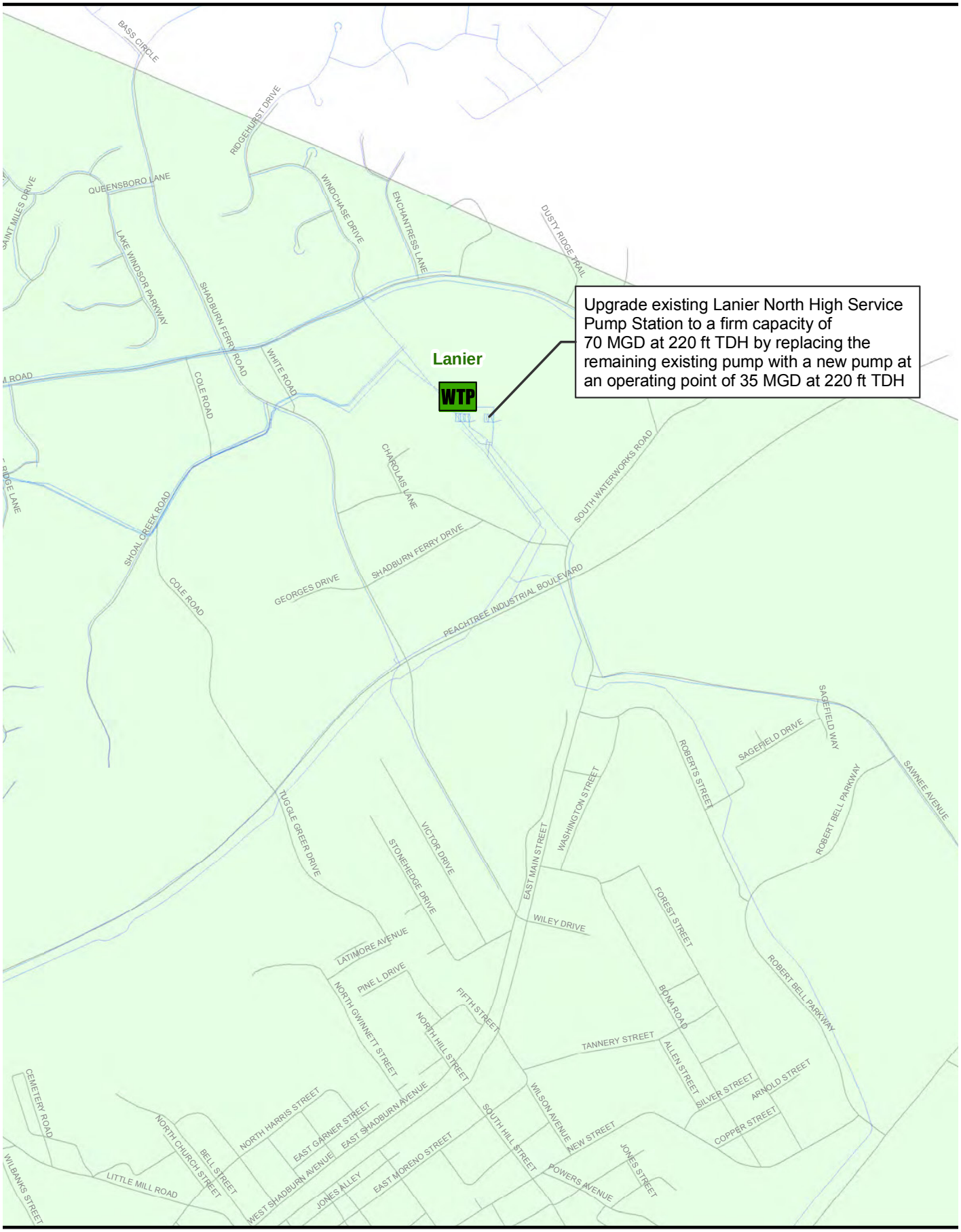
Proposed Improvements

PIPE SIZE (inch)

- 6
- 8
- 10
- 12
- 14
- 16
- 20
- 24
- 30
- 36
- 42
- 48
- 54
- 60
- 72
- 78



Gwinnett County 2030 Water & Wastewater Master Plan


Upgrade existing Lanier North High Service Pump Station to a firm capacity of 70 MGD at 220 ft TDH by replacing the remaining existing pump with a new pump at an operating point of 35 MGD at 220 ft TDH
Lanier
WTP
BASS CIRCLE
RIDGEHURST DRIVE
QUEENSBORO LANE
WINDCHASE DRIVE
ENCHANTRESS LANE
DUSTY RIDGE TRAIL
LAKE WINDSOR PARKWAY
SHADBURN FERRY ROAD
WHITE ROAD
COLE ROAD
CHAROLAIS LANE
SOUTH WATERWORKS ROAD
SHOAL CREEK ROAD
SHADBURN FERRY DRIVE
GEORGES DRIVE
PEACHTREE INDUSTRIAL BOULEVARD
SAGEFIELD WAY
SAGEFIELD DRIVE
ROBERTS STREET
ROBERT BELL PARKWAY
SAWNEE AVENUE
WASHINGTON STREET
TUGGLE GREER DRIVE
VICTOR DRIVE
STONEHEDGE DRIVE
EAST MAIN STREET
WILEY DRIVE
FOREST STREET
LATIMORE AVENUE
PINE L DRIVE
NORTH GWINNETT STREET
FIFTH STREET
NORTH HILL STREET
BOMA ROAD
TANNERY STREET
ALLEN STREET
SILVER STREET
ARNOLD STREET
COPPER STREET
CEMETERY ROAD
NORTH HARRIS STREET
EAST GARNER STREET
EAST SHADBURN AVENUE
WEST SHADBURN AVENUE
NORTH CHURCH STREET
BELL STREET
LITTLE MILL ROAD
WILBANKS STREET
JONES ALLEY
EAST MORENO STREET
SOUTH HILL STREET
WILSON AVENUE
NEW STREET
POWERS AVENUE
JONES STREET

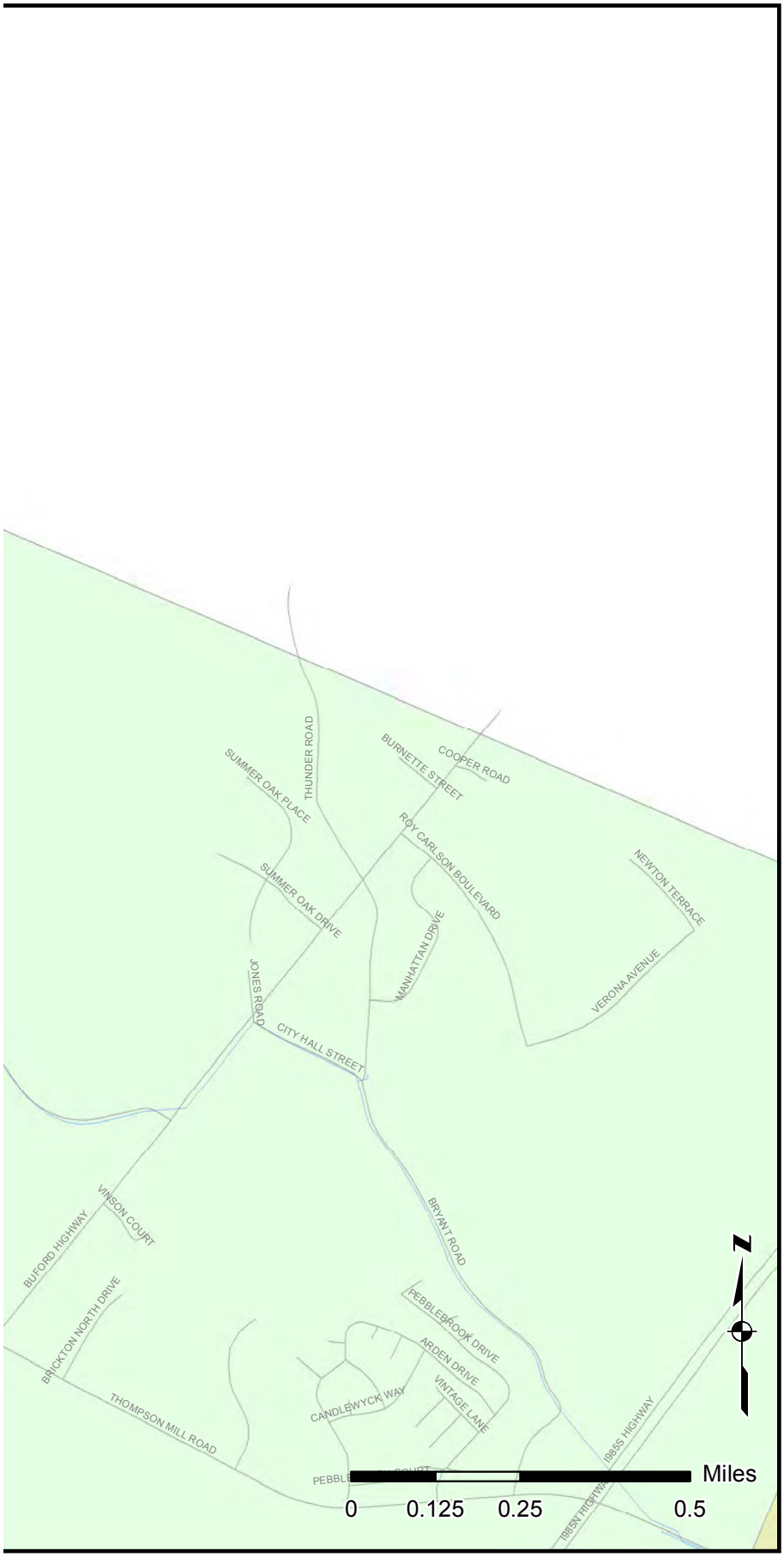


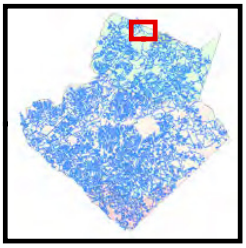
Figure TM7.A9

167 MGD Demand Scenario Proposed System Improvement

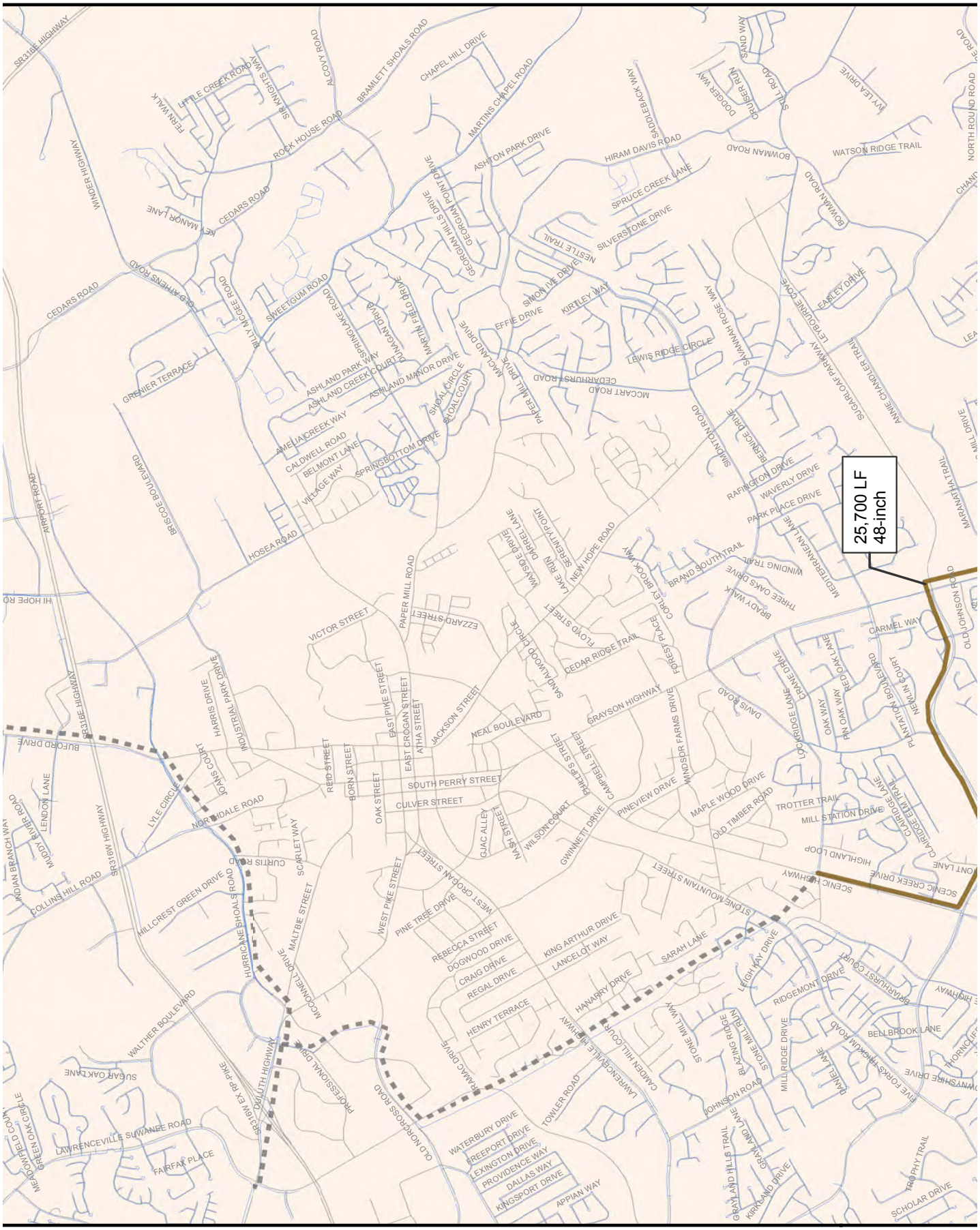
Project 6B

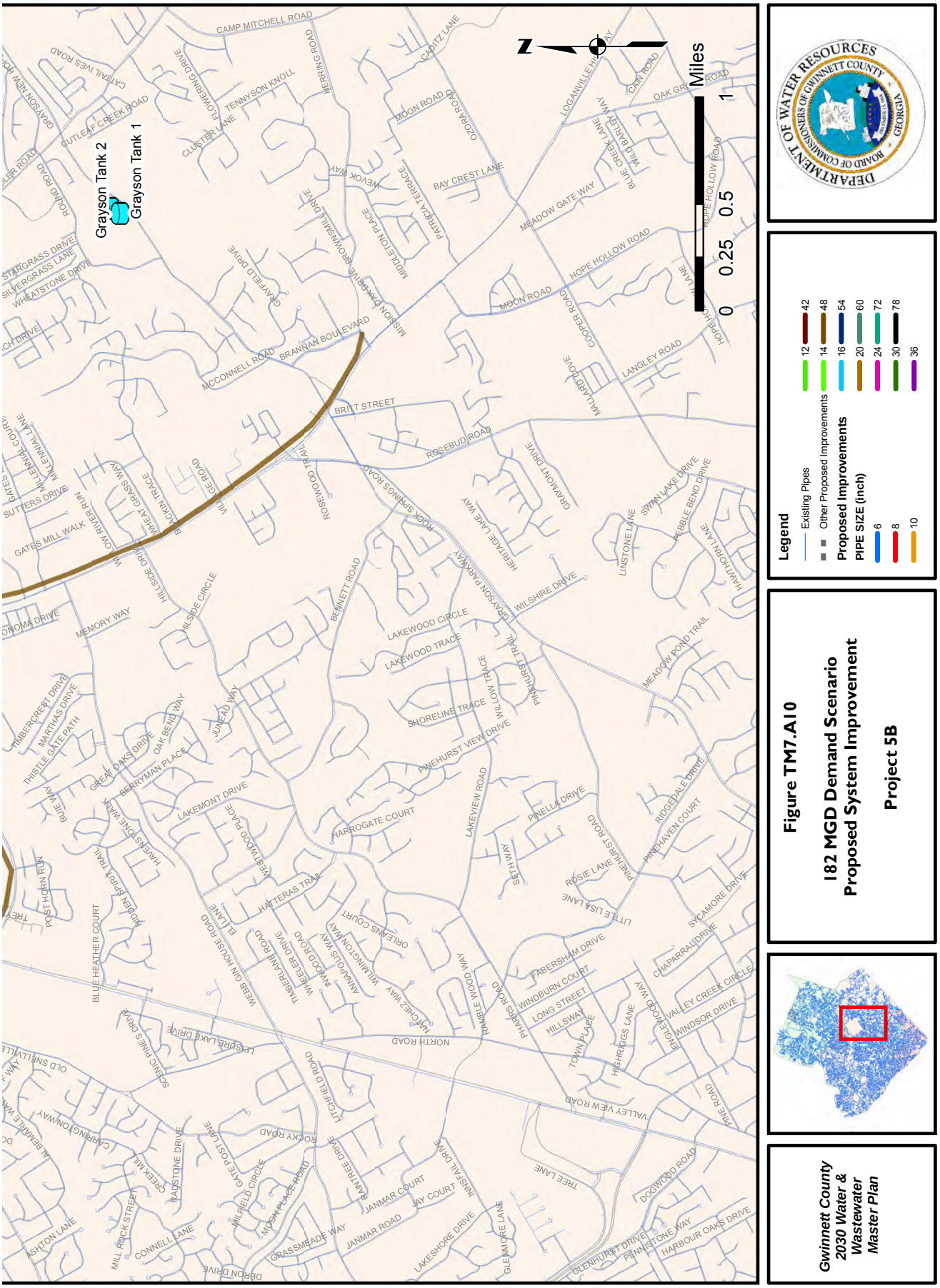
Legend

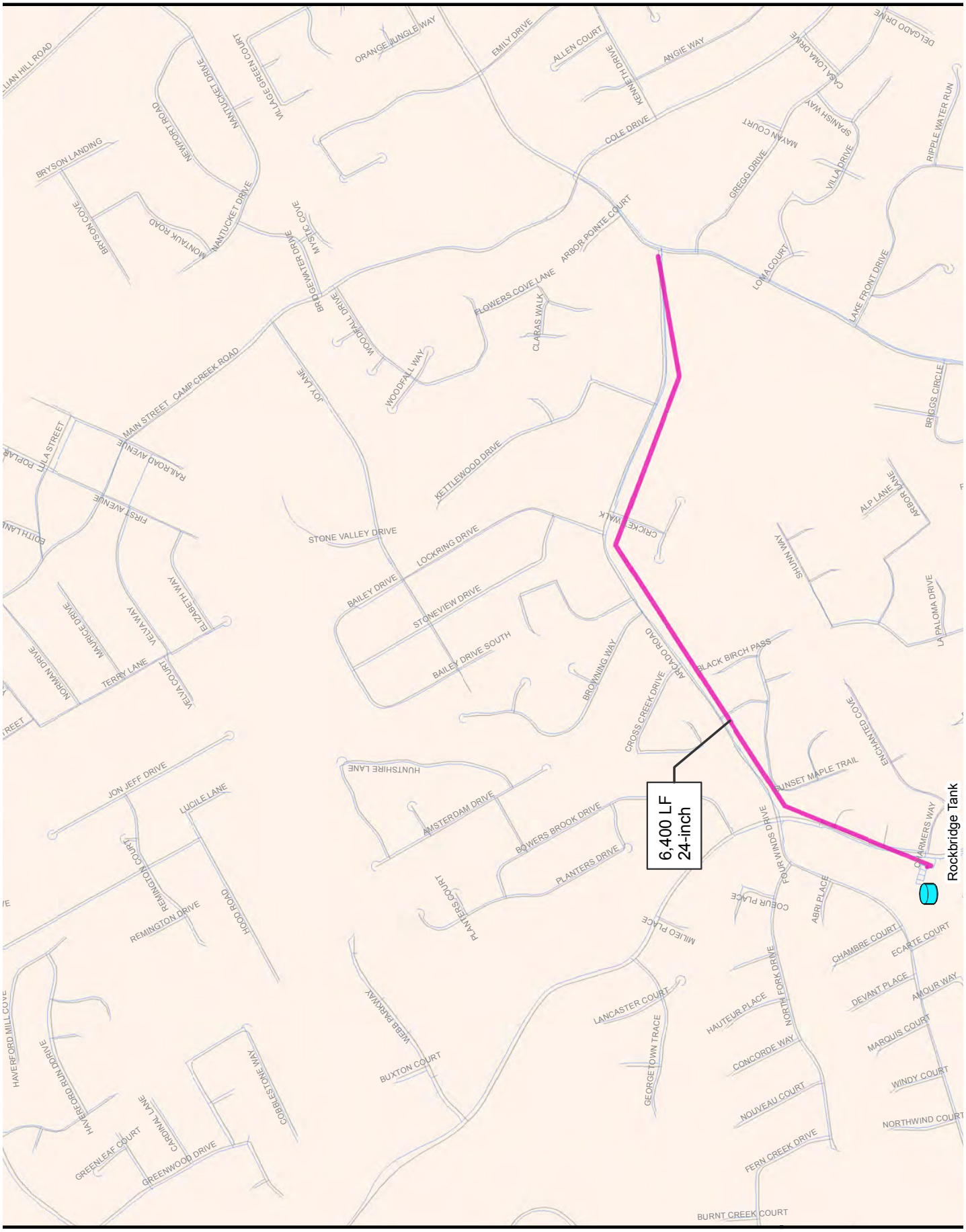
Existing Pipes

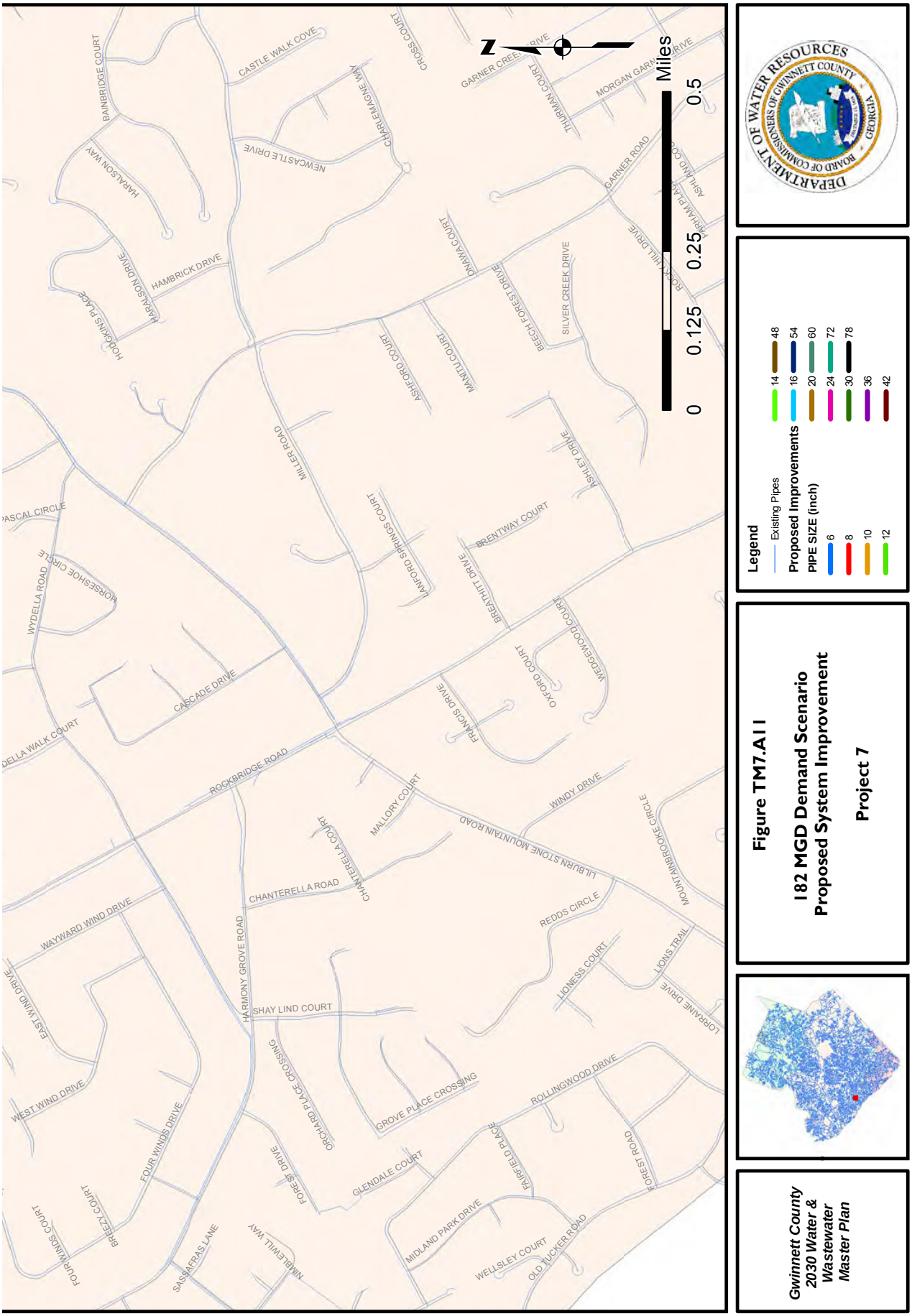


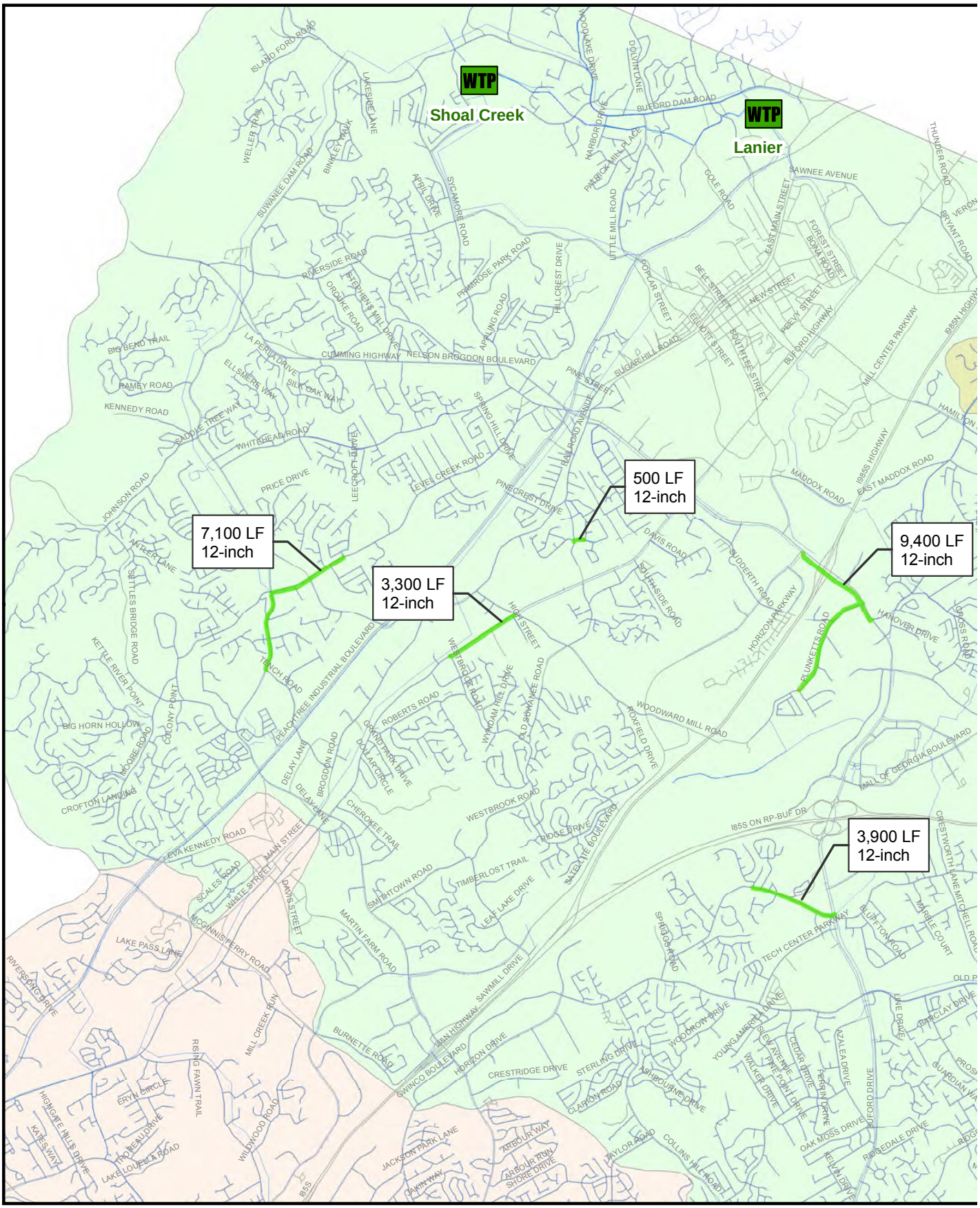
Gwinnett County 2030 Water & Wastewater Master Plan


25,700 LF
48-inch
SR316E HIGHWAY
SR316W HIGHWAY
DULUTH HIGHWAY
LAWRENCEVILLE SUWANEE ROAD
SCENIC HIGHWAY
STONE MOUNTAIN STREET
HOSEA ROAD
PAPER MILL ROAD
BRAND SOUTH TRAIL
CARMEL WAY
OLD JOHNSON ROAD
WATSON RIDGE TRAIL
HIRAM DAVIS ROAD
SPRUCE CREEK LANE
SILVERSTONE DRIVE
ASHTON PARK DRIVE
MARTINS CHAPEL ROAD
CHAPEL HILL DRIVE
BRAMLETT SHOALS ROAD
ROCK HOUSE ROAD
CEDARS ROAD
WINDER HIGHWAY
GREMIER TERRACE
ASHLAND PARK WAY
ASHLAND CREEK COURT
ASHLAND MANOR DRIVE
AMELIA CREEK WAY
CALDWELL ROAD
BELMONT LANE
VILLAGE WAY
SPRINGBOTTOM DRIVE
SHOAL CIRCLE
SHOAL COURT
EFFIE DRIVE
KIRTLEY WAY
SIMONTON ROAD
LEWIS RIDGE CIRCLE
MCCART ROAD
CEDARHURST ROAD
PAPER MILL DRIVE
RAFINGTON DRIVE
WAVERLY DRIVE
PARK PLACE DRIVE
NEW HOPE ROAD
VICTOR STREET
EZZARD STREET
FLOYD STREET
CEDAR RIDGE TRAIL
SANDALWOOD CIRCLE
GRAYSON HIGHWAY
NEAL BOULEVARD
JACKSON STREET
EAST CROGAN STREET
ATHA STREET
EAST PIKE STREET
REID STREET
BORN STREET
OAK STREET
SOUTH PERRY STREET
CULVER STREET
PHILLIPS STREET
CAMPBELL STREET
WILSON COURT
GWINNETT DRIVE
PINEVIEW DRIVE
MAPLE WOOD DRIVE
OLD TIMBER ROAD
TROTTER TRAIL
MILL STATION DRIVE
HIGHLAND LOOP
CLARIDGE LANE
PLANTATION BOULEVARD
NEELIN COURT
DAVIS ROAD
OAK WAY
PIN OAK WAY
RED OAK LANE
LOCKRIDGE LANE
CRANE RIDGE DRIVE
WINDSOR FARMS DRIVE
FOREST PLACE
CORLEY BROOK WAY
THREE OAKS DRIVE
BRADY WALK
MEDITERRANEAN LANE
WINDING TRAIL
SERVICE DRIVE
SAVANNAH ROSE WAY
SUGAR LOAF PARKWAY
LEBOURNE COVE
EARLEY DRIVE
ANNE CHANDLER TRAIL
MARANATHA TRAIL
NORTH ROUND ROAD
IVY LEA DRIVE
SAND WAY
SILL ROAD
DOGGER WAY
CRUISER RUN
SADDLEBACK WAY
BOWMAN ROAD
NESTLE TRAIL
SIMONTON DRIVE
GEORGIAN HILLS DRIVE
GEORGIAN POINT DRIVE
MARTIN FIELD DRIVE
PLANTAGAN DRIVE
SPRINGLAKE ROAD
SWEETGUM ROAD
BILLY MOSSE ROAD
OLD ATHENS ROAD
KEY MANOR LANE
FERN WALK
LITTLE CREEK ROAD
SIR KNIGHTS WAY
ACCOVA ROAD
BRISCOE BOULEVARD
AIRPORT ROAD
HI HOPE ROAD
HARRIS DRIVE
INDUSTRIAL PARK DRIVE
JONES COURT
BUFORD DRIVE
LYLE CIRCLE
NORTHDALE ROAD
LENDON LANE
MIDDLE RIVER ROAD
INDIAN BRANCH WAY
COLLINS HILL ROAD
HILLCREST GREEN DRIVE
CURTIS ROAD
SCARLET WAY
HURRICANE SHOALS ROAD
MALTBIE STREET
MCCONNELL DRIVE
WEST PIKE STREET
WEST CROGAN STREET
PINE TREE DRIVE
REBECCA STREET
DOGWOOD DRIVE
CRAIG DRIVE
REGAL DRIVE
KING ARTHUR DRIVE
LANCELOT WAY
HENRY TERRACE
HANARRY DRIVE
SARAH LANE
LEIGH WAY DRIVE
RIDGEMONT DRIVE
BRAMHURST COURT
BELLBROOK LANE
MILL RIDGE DRIVE
DANIEL LANE
FIVE FORKS TRICKUM ROAD
STONE MILL WAY
STONE MILL TRAIL
BAZING RIDGE
JOHNSON ROAD
CAMDEN HILL COURT
LAWRENCEVILLE HIGHWAY
TOWLER ROAD
PROFESSIONAL DRIVE
OLD NORCROSS ROAD
WALTHER BOULEVARD
SUGAR OAK LANE
MEADOWFIELD COURT
GREEN OAK CIRCLE
FAIRFAX PLACE
WATERBURY DRIVE
FREEPORT DRIVE
LEXINGTON DRIVE
PROVIDENCE WAY
DALLAS WAY
KINGSPORT DRIVE
APPIAN WAY
GRAYLAND HILLS TRAIL
GRAYLAND LANE
KIRKLAND DRIVE
TROPHY TRAIL
SCHOLAR DRIVE


Grayson Tank 2
Grayson Tank 1
N
0 0.25 0.5 1
Miles
Legend
Existing Pipes
Other Proposed Improvements
Proposed Improvements
PIPE SIZE (inch)
6
8
10
12
14
16
20
24
30
36
42
48
54
60
72
78
Figure TM7.A10
182 MGD Demand Scenario
Proposed System Improvement
Project 5B
Gwinnett County
2030 Water &
Wastewater
Master Plan
DEPARTMENT OF WATER RESOURCES
BOARD OF COMMISSIONERS OF GWINNETT COUNTY
GEORGIA


6,400 LF
24-inch
Rockbridge Tank
ORANGE JUNGLE WAY
EMILY DRIVE
ALLEN COURT
ANGIE WAY
DELGADO DRIVE
CASA LOMA DRIVE
KENNETH DRIVE
COLE DRIVE
SPANISH WAY
RIPPLE WATER RUN
MAYAN COURT
GREGG DRIVE
VILLA DRIVE
VILLAGE GREEN COURT
NANTUCKET DRIVE
NEWPORT ROAD
BRYSON LANDING
BRYSON COVE
MONTAUK ROAD
NANTUCKET DRIVE
MYSTIC COVE
BRIDGEWATER DRIVE
ARBOR POINTE COURT
LOMA COURT
LAKE FRONT DRIVE
FLOWERS COVE LANE
CLARAS WALK
WOODFALL DRIVE
WOODFALL WAY
BRIGGS CIRCLE
JOY LANE
MAIN STREET
CAMP CREEK ROAD
LULA STREET
RAILROAD AVENUE
KETTLEWOOD DRIVE
ARBOR LANE
ALP LANE
FIRST AVENUE
CRICKET WALK
STONE VALLEY DRIVE
LOCKRING DRIVE
SHUNN WAY
BAILEY DRIVE
STONEVIEW DRIVE
LA PALOMA DRIVE
ELIZABETH WAY
VELVA WAY
MAURICE DRIVE
BAILEY DRIVE SOUTH
BROWNING WAY
ARCADO ROAD
BLACK BIRCH PASS
NORMAN DRIVE
TERRY LANE
VELVA COURT
CROSS CREEK DRIVE
ENCHANTED COVE
HUNTSHIRE LANE
SUNSET MAPLE TRAIL
JON JEFF DRIVE
LUCILLE LANE
AMSTERDAM DRIVE
BOWERS BROOK DRIVE
PLANTERS DRIVE
FOUR WINDS DRIVE
CHARMERS WAY
REMINGTON COURT
REMINGTON DRIVE
HOOD ROAD
PLANTERS COURT
COEUR PLACE
ABRI PLACE
MILEO PLACE
CHAMBRE COURT
ECARTE COURT
DEVANT PLACE
AMOUR WAY
WEBB PARKWAY
LANCASTER COURT
HAUTEUR PLACE
NORTH FORK DRIVE
MARQUIS COURT
HAVERFORD MILL COVE
HAVERFORD RUN DRIVE
BUXTON COURT
GEORGETOWN TRACE
CONCORDE WAY
WINDY COURT
COBBLESTONE WAY
NOUVEAU COURT
NORTHWIND COURT
CARDINAL LANE
GREENLEAF COURT
GREENWOOD DRIVE
FERN CREEK DRIVE
BURNT CREEK COURT


Legend
Existing Pipes
Proposed Improvements
PIPE SIZE (inch)
6
8
10
12
14
16
20
24
30
36
42
48
54
60
72
78
0
0.125
0.25
0.5
Miles
N
Figure TM7.A11
182 MGD Demand Scenario
Proposed System Improvement
Project 7
Gwinnett County
2030 Water &
Wastewater
Master Plan
DEPARTMENT OF WATER RESOURCES
BOARD OF COMMISSIONERS OF GWINNETT COUNTY
GEORGIA
BAINBRIDGE COURT
CASTLE WALK COVE
CROSS COURT
GARNER CREEK DRIVE
THURMAN COURT
MORGAN GARNER DRIVE
HARALSON WAY
NEWCASTLE DRIVE
CHARTERMAGNE WAY
GARNER ROAD
ASHLAND COURT
FERNHAM PLACE
HAMBRICK DRIVE
HARALSON DRIVE
HOOPKINS PLACE
DUNMAC COURT
BEECH FOREST DRIVE
SILVER CREEK DRIVE
ROCKY HILL DRIVE
ASHFORD COURT
MANTUL COURT
MILLER ROAD
ASHLEY DRIVE
PASCAL CIRCLE
HORSESHOE CIRCLE
WYDELLA ROAD
LANFORD SPRINGS COURT
BRENTWAY COURT
BRAETHITT DRIVE
WEDGEWOOD COURT
OXFORD COURT
CASCADE DRIVE
FRANCIS DRIVE
WYDELLA WALK COURT
ROCKBRIDGE ROAD
MALLORY COURT
WINDY DRIVE
LILBURN STONE MOUNTAIN ROAD
MOUNTAINBROOKE CIRCLE
CHANTERELLA COURT
CHANTERELLA ROAD
WAYWARD WIND DRIVE
REDDS CIRCLE
HARMONY GROVE ROAD
LIONESS COURT
LIONS TRAIL
EAST WIND DRIVE
SHAY LIND COURT
LORRAINE DRIVE
ORCHARD PLACE CROSSING
WEST WIND DRIVE
GROVE PLACE CROSSING
ROLLINGWOOD DRIVE
FOUR WINDS DRIVE
FOREST DRIVE
GLENDALE COURT
FAIRFIELD PLACE
FOREST ROAD
BREEZY COURT
FOUR WINDS COURT
SASSAFRAS LANE
NIMBLEWILL WAY
MIDLAND PARK DRIVE
WELLSLEY COURT
OLD TUCKER ROAD


WTP
Shoal Creek
WTP
Lanier
7,100 LF
12-inch
3,300 LF
12-inch
500 LF
12-inch
9,400 LF
12-inch
3,900 LF
12-inch
BUFORD DAM ROAD
SAWNEE AVENUE
CUMMING HIGHWAY
NELSON BROGDON BOULEVARD
SUGARHILL ROAD
BUFORD HIGHWAY
MILL CENTER PARKWAY
MADDOX ROAD
EAST MADDOX ROAD
I985S HIGHWAY
I985N HIGHWAY
HANOVER DRIVE
PLUNKETTS ROAD
HORIZON PARKWAY
SUDDERTH ROAD
DAVIS ROAD
SOUTHSIDE ROAD
HIGH STREET
WESTBROOK ROAD
WOODWARD MILL ROAD
ROXFIELD DRIVE
MALL OF GEORGIA BOULEVARD
I85S ON RP-BUF DR
TECH CENTER PARKWAY
BLUFFTON ROAD
SPRIGGS ROAD
SAWMILL DRIVE
I85N HIGHWAY
BURNETTE ROAD
GWINCO BOULEVARD
HORIZON DRIVE
CRESTRIDGE DRIVE
STERLING DRIVE
CLARION ROAD
ASHBOURNE DRIVE
TAYLOR ROAD
COLLINS HILL ROAD
OAK MOSS DRIVE
BUFORD DRIVE
RIDGEDALE DRIVE
PEACHTREE INDUSTRIAL BOULEVARD
BROGDON ROAD
DELAY LANE
CHEROKEE TRAIL
SMITHTOWN ROAD
TIMBERLOST TRAIL
LEAF LAKE DRIVE
MARTIN FARM ROAD
SATELLITE BOULEVARD
RIDGE DRIVE
EVA KENNEDY ROAD
MAIN STREET
SCALES ROAD
WHITE STREET
DAVIS STREET
MCGINNIS FERRY ROAD
LAKE PASS LANE
MILL CREEK RUN
RISING FAWN TRAIL
WILDWOOD ROAD
JACKSON PARK LANE
ARBOUR WAY
ARBOUR RUN
SHORE DRIVE
OAKWAY
LAKE LOUELLA ROAD
ITOREAU DRIVE
HIGHGATE HILLS DRIVE
KATIES WAY
ERYN CIRCLE
RIVERSONG DRIVE
CROFTON LANDING
BIG HORN HOLLOW
MOORE ROAD
COLONY POINT
KETTLE RIVER POINT
SETTLES BRIDGE ROAD
ANTLER LANE
JOHNSON ROAD
PRICE DRIVE
LEECROFT DRIVE
LEVEL CREEK ROAD
PINECREST DRIVE
SPRING HILL DRIVE
RAILROAD AVENUE
PINE STREET
POPLAR STREET
LITTLE MILL ROAD
HILL CREST DRIVE
PRIMROSE PARK ROAD
APPLING ROAD
STEPHENS MILL DRIVE
ORONOKE ROAD
RIVERSIDE ROAD
STYCAMORE ROAD
APRIL DRIVE
LAKESHE LANE
BINNEY WALK
WELLER TRAIL
SUWANEE DAM ROAD
ISLAND FORD ROAD
HARBOR DRIVE
PATRICK MILL PLACE
DOLVIN LANE
WOODLAKE DRIVE
COLE ROAD
EAST MAIN STREET
FOREST STREET
BOWN ROAD
NEW STREET
PEVY STREET
BELL STREET
ELLIOTT STREET
SOUTHTREE STREET
THUNDER ROAD
BRYANT ROAD
HAMILTON
CROSS ROAD
CRESTWORTH LANE
MITCHELL ROAD
MARBLE COURT
CLARKSTON DRIVE
LINE DRIVE
AZALEA DRIVE
CEDAR DRIVE
PERRIN DRIVE
WALKER DRIVE
PINE POINT DRIVE
SALEM AVENUE
YOUNGCAMERON DRIVE
WOODROW DRIVE
GUARDIAN WAY
RIDGE
BIG BEND TRAIL
RAMEY ROAD
KENNEDY ROAD
ELLSMERE WAY
SILK OAK WAY
LA PERLA DRIVE
SADDLE TREE WAY
WHITEHEAD ROAD
ROBERTS ROAD
GRAND PARK DRIVE
DOLLAR CIRCLE
WYNCAM HILL DRIVE
OLD SUWANEE ROAD
I85S

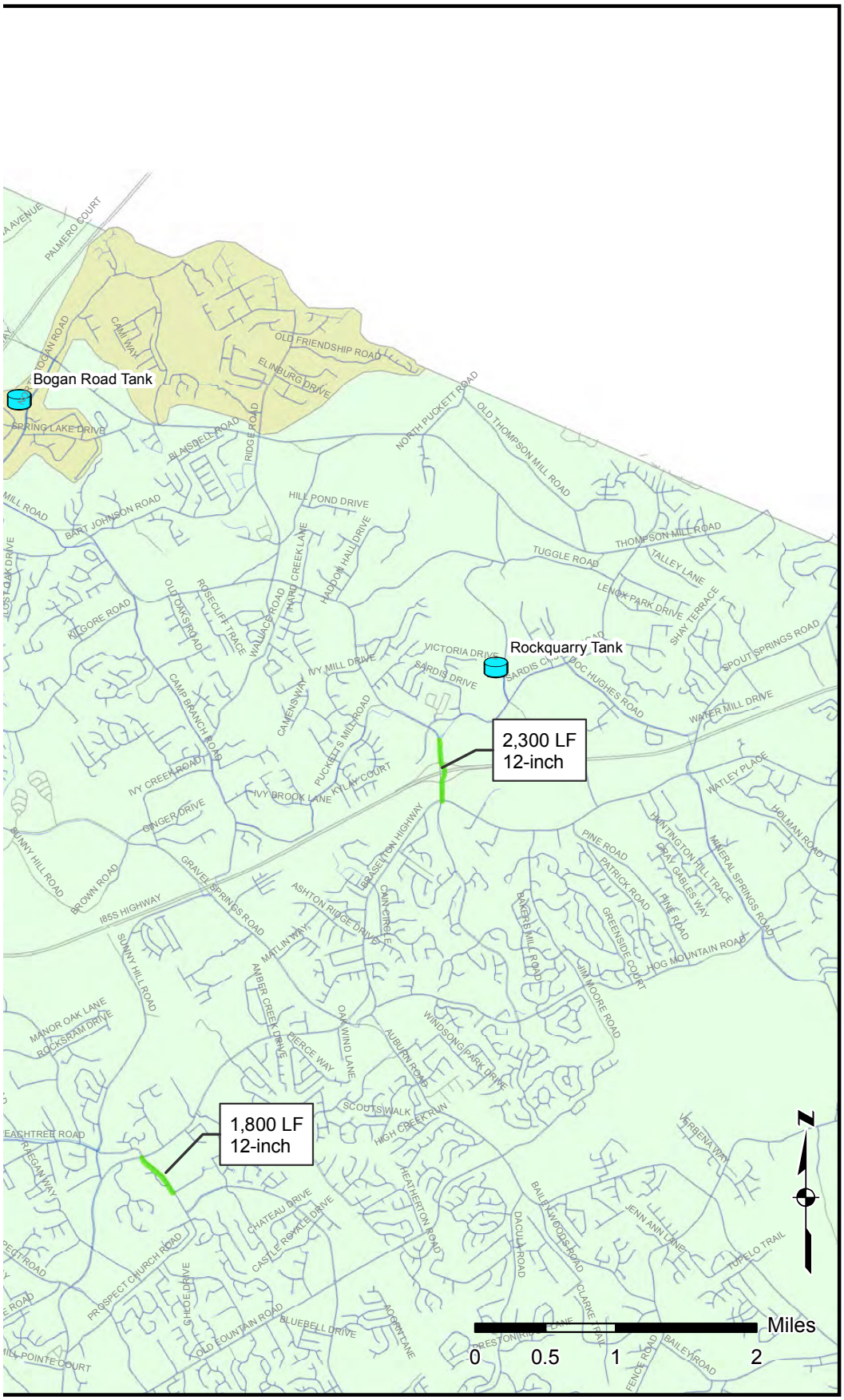


Figure TM7.A12

182 MGD Demand Scenario Proposed System Improvement

Project 8

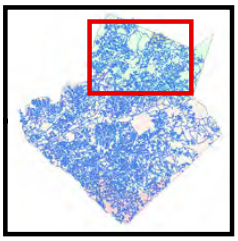
Legend

Existing Pipes

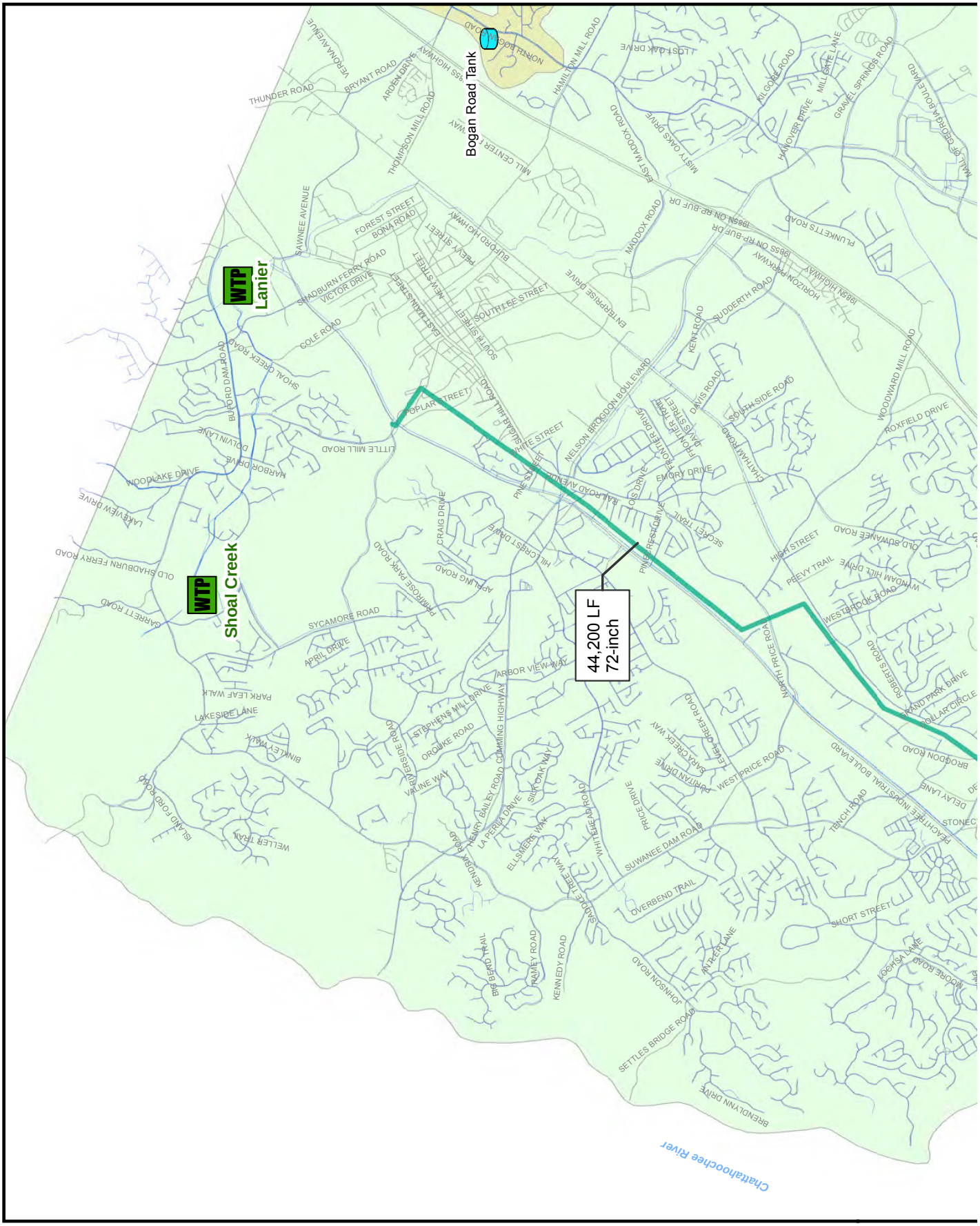
Proposed Improvements

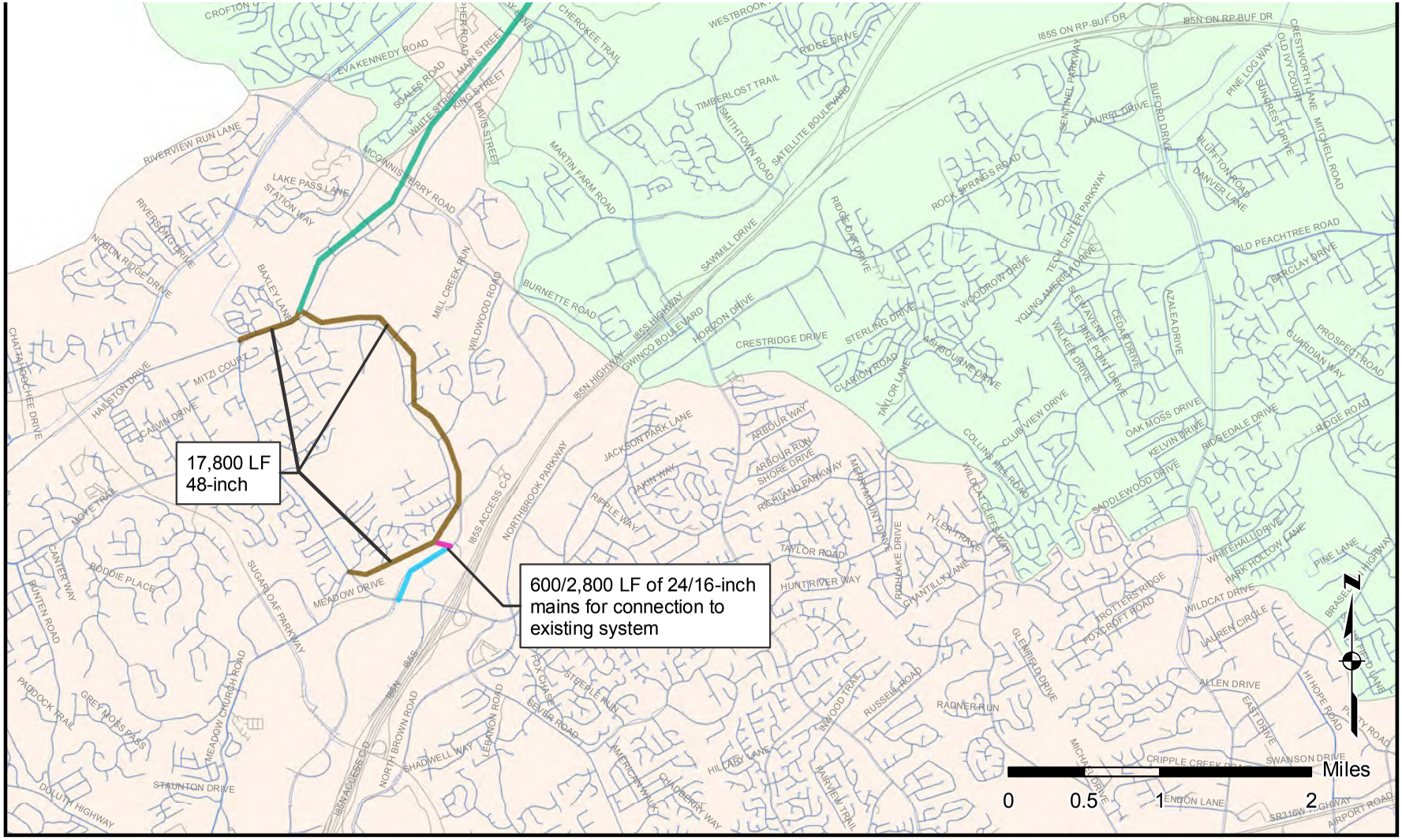
PIPE SIZE (inch)

- 6
- 8
- 10
- 12
- 14
- 16
- 20
- 24
- 30
- 36
- 42
- 48
- 54
- 60
- 72
- 78



Gwinnett County 2030 Water & Wastewater Master Plan


Bogan Road Tank
WTP
Lanier
WTP
Shoal Creek
44,200 LF
72-inch
Chattahoochee River



Gwinnett County 2030 Water & Wastewater Master Plan

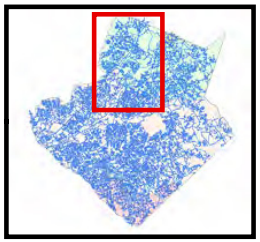


Figure TM7.A13

197 MGD Demand Scenario
Proposed System Improvement

Project 9

Legend

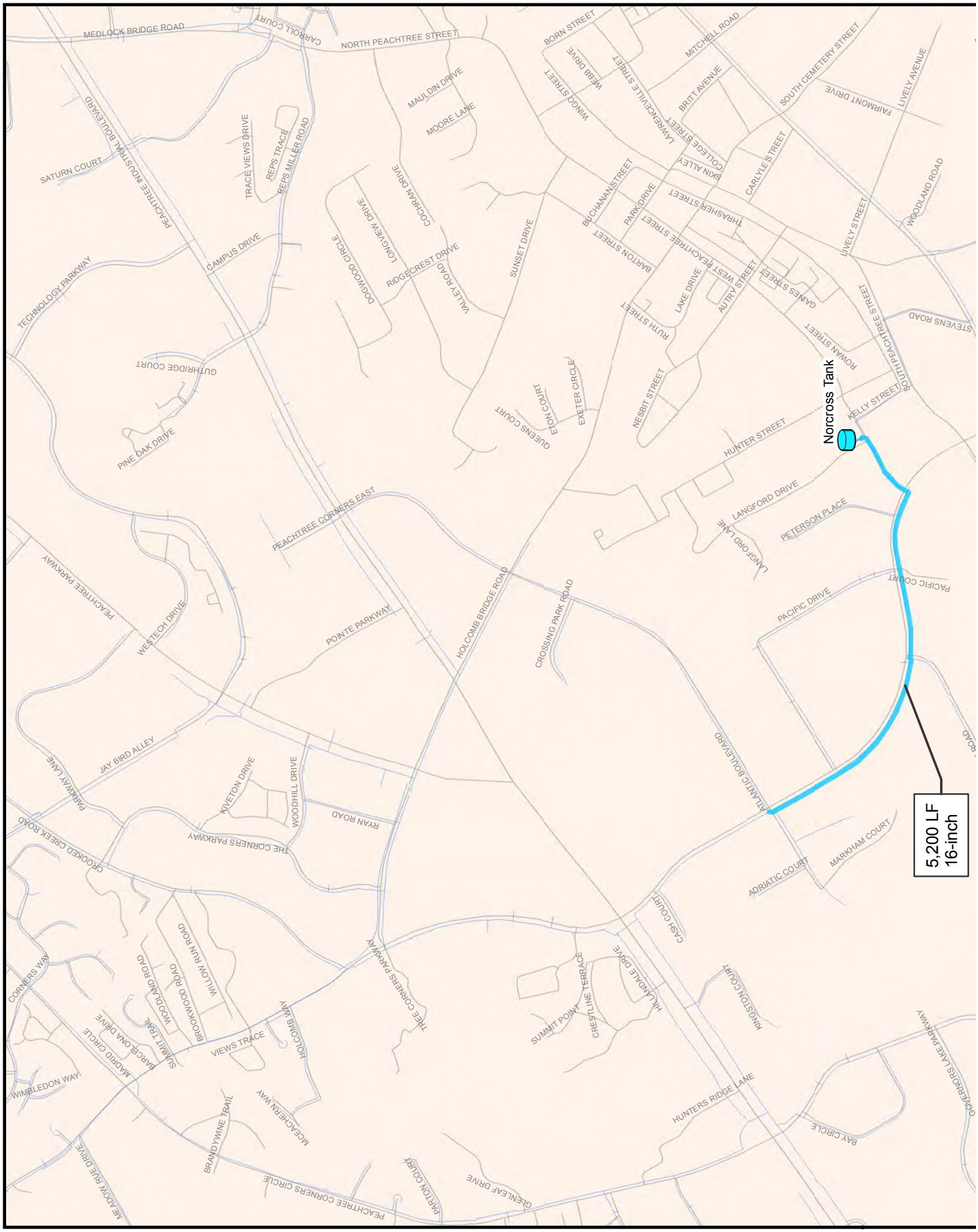
Existing Pipes

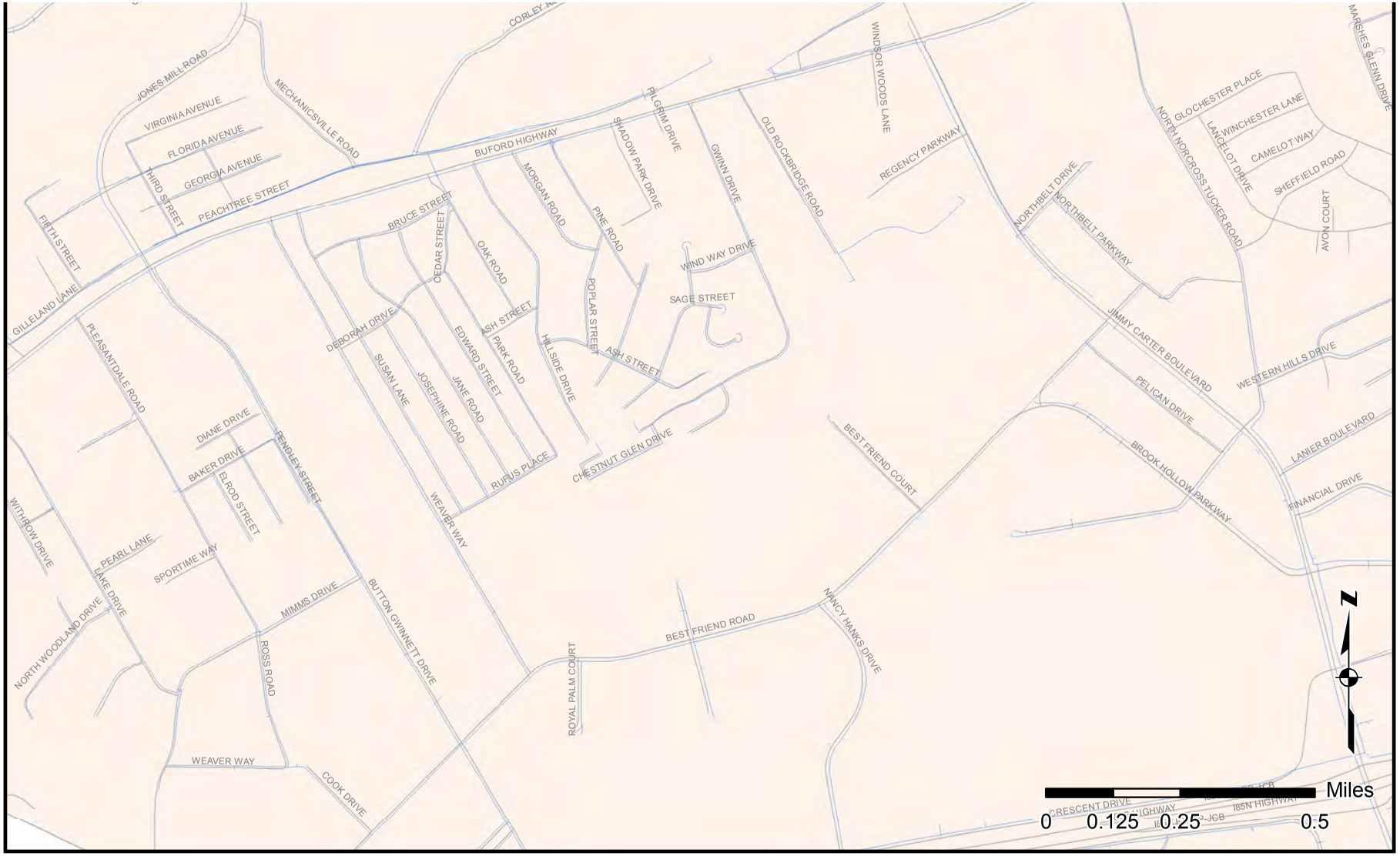
Proposed Improvements

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78

DEPARTMENT OF WATER RESOURCES
BOARD OF COMMISSIONERS OF GWINNETT COUNTY
GEORGIA


Norcross Tank
5,200 LF
16-inch
MEDLOCK BRIDGE ROAD
CARROLL COURT
NORTH PEACHTREE STREET
BORN STREET
MITCHELL ROAD
SOUTH CEMETERY STREET
LIVELY AVENUE
FAIRMONT DRIVE
WEBB DRIVE
WINGO STREET
LAWRENCEVILLE STREET
BRITT AVENUE
MAULDIN DRIVE
MOORE LANE
SATURN COURT
PEACHTREE INDUSTRIAL BOULEVARD
TRACE VIEWS DRIVE
REPS TRACE
REPS MILLER ROAD
SKIN ALLEY
COLLEGE STREET
CARLYLE STREET
WOODLAND ROAD
COCHRAN DRIVE
LONGVIEW DRIVE
DOGWOOD CIRCLE
BUCHANAN STREET
PARK DRIVE
THRASHER STREET
LIVELY STREET
CAMPUS DRIVE
RIDGECREST DRIVE
VALLEY ROAD
SUNSET DRIVE
BARTON STREET
WEST PEACHTREE STREET
GAINES STREET
AUTRY STREET
LAKE DRIVE
TECHNOLOGY PARKWAY
RUTH STREET
ROWAN STREET
SOUTH PEACHTREE STREET
STEVENS ROAD
GUTHRIDGE COURT
QUEENS COURT
EATON COURT
EXETER CIRCLE
NESBIT STREET
KELLY STREET
PINE OAK DRIVE
HUNTER STREET
LANGFORD DRIVE
PETERSON PLACE
LANGFORD LANE
PEACHTREE CORNERS EAST
PACIFIC COURT
PACIFIC DRIVE
PEACHTREE PARKWAY
WESTECH DRIVE
POINTE PARKWAY
HOLCOMB BRIDGE ROAD
CROSSING PARK ROAD
ATLANTIC BOULEVARD
JAY BIRD ALLEY
PARKWAY LANE
KIVETON DRIVE
WOODHILL DRIVE
RYAN ROAD
THE CORNERS PARKWAY
GROOVED CREEK ROAD
MARKHAM COURT
ADRIATIC COURT
CASH COURT
CORNERS WAY
WILLOW RUN ROAD
BROOKWOOD ROAD
WOODLAND ROAD
TREE CORNERS PARKWAY
SUMMIT POINT
CRESTLINE TERRACE
HILLANDALE DRIVE
KINGSTON COURT
SUMMIT TRAIL
PARCEL ONA DRIVE
MADRID CIRCLE
VIEWS TRACE
HOLCOMB WAY
WIMBLEDON WAY
MCEACHERN WAY
HUNTERS RIDGE LANE
GOVERNORS LAKE PARKWAY
BAY CIRCLE
BRANDYWINE TRAIL
MEADOW RUE DRIVE
PEACHTREE CORNERS CIRCLE
PARTON COURT
GLENLEAF DRIVE



Gwinnett County 2030 Water & Wastewater Master Plan

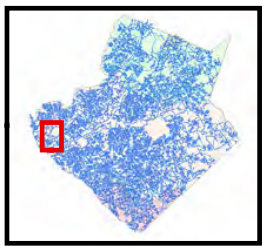


Figure TM7.A14

197 MGD Demand Scenario Proposed System Improvement

Project 10

Legend

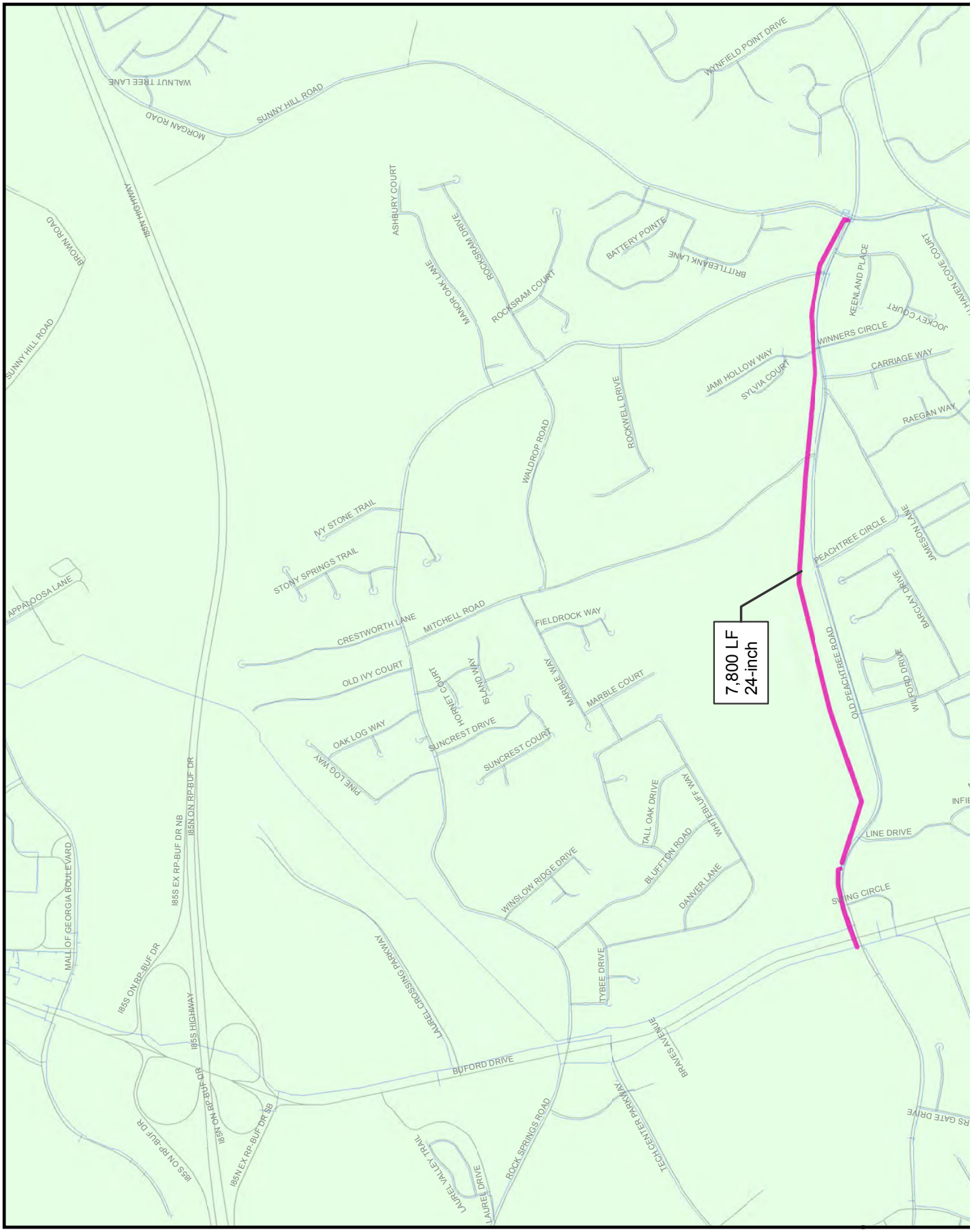
Existing Pipes

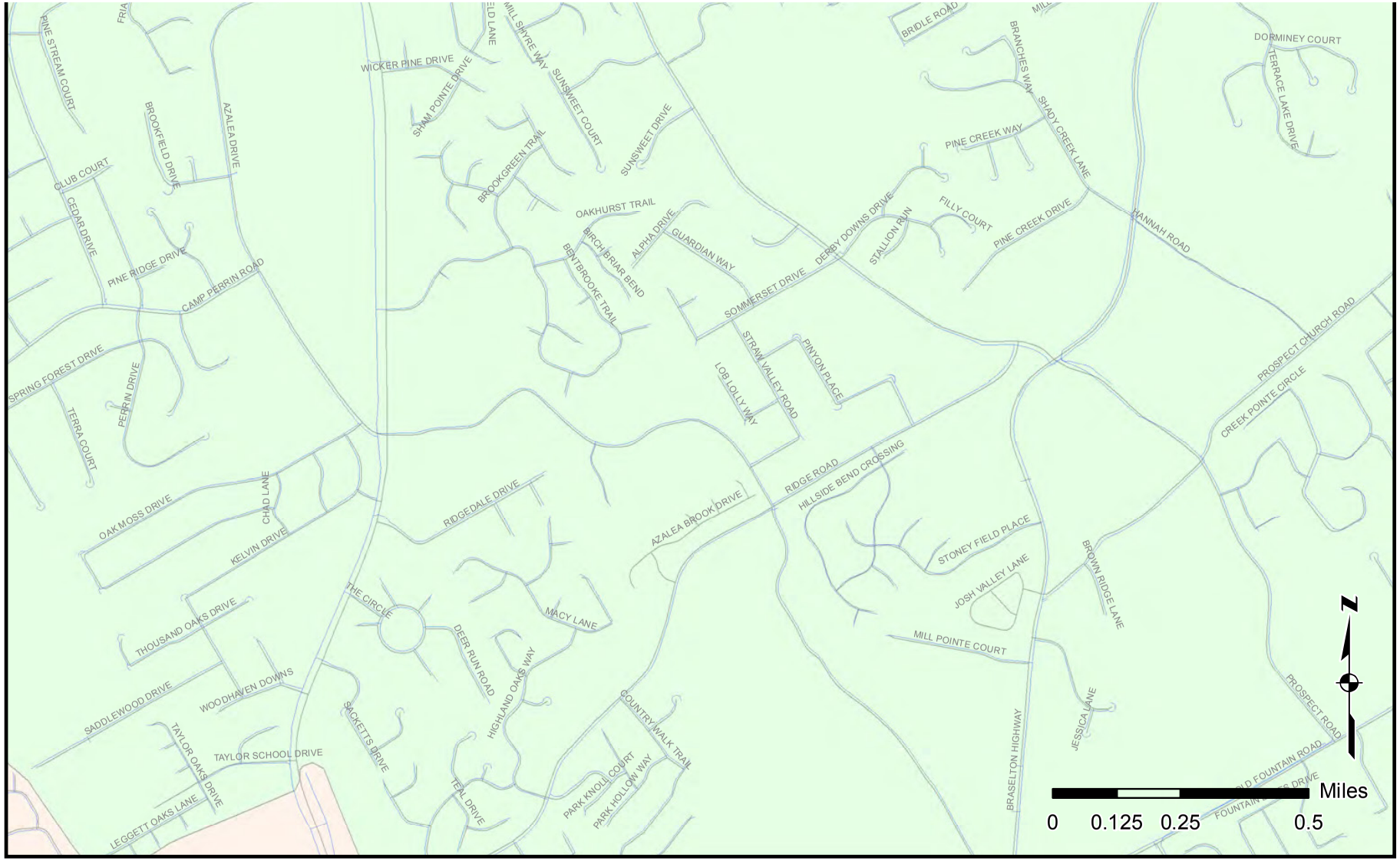
Proposed Improvements

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78

DEPARTMENT OF WATER RESOURCES
BOARD OF COMMISSIONERS OF GWINNETT COUNTY
GEORGIA


7,800 LF
24-inch
WALNUT TREE LANE
MORGAN ROAD
SUNNY HILL ROAD
WYNFIELD POINT DRIVE
BROWN ROAD
I85NT HIGHWAY
ASHBURY COURT
ROCKSRAM DRIVE
MANOR OAK LANE
ROCKSRAM COURT
BATTERY POINTE
BRITTLEBANK LANE
KEENLAND PLACE
JOCKEY COURT
WINNERS CIRCLE
CARRIAGE WAY
JAMI HOLLOW WAY
SYLVIA COURT
RAEGAN WAY
ROCKWELL DRIVE
WALDROP ROAD
IVY STONE TRAIL
STONY SPRINGS TRAIL
APPALOOSA LANE
PEACHTREE CIRCLE
JAMESON LANE
BARCLAY DRIVE
CRESTWORTH LANE
MITCHELL ROAD
FIELDROCK WAY
OLD IVY COURT
ISLAND WAY
HORNET COURT
MARBLE WAY
MARBLE COURT
OAK LOG WAY
SUNCREST DRIVE
SUNCREST COURT
PINE LOG WAY
OLD PEACHTREE ROAD
WILFORD DRIVE
LINE DRIVE
SWING CIRCLE
TALL OAK DRIVE
WHITEBLUFF WAY
BLUFFTON ROAD
DANVER LANE
WINSLOW RIDGE DRIVE
MALL OF GEORGIA BOULEVARD
I85S EX RP-BUF DR NB
I85N ON RP-BUF DR
I85S ON RP-BUF DR
I85S HIGHWAY
LAUREL CROSSING PARKWAY
TYBEE DRIVE
BRAVES AVENUE
BUFORD DRIVE
I85N ON RP-BUF DR
I85N EX RP-BUF DR SB
I85S ON RP-BUF DR
LAUREL VALLEY TRAIL
LAURE DRIVE
ROCK SPRINGS ROAD
TECHCENTER PARKWAY



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.A15

215 MGD Demand Scenario
Proposed System Improvement

Project 11

Legend

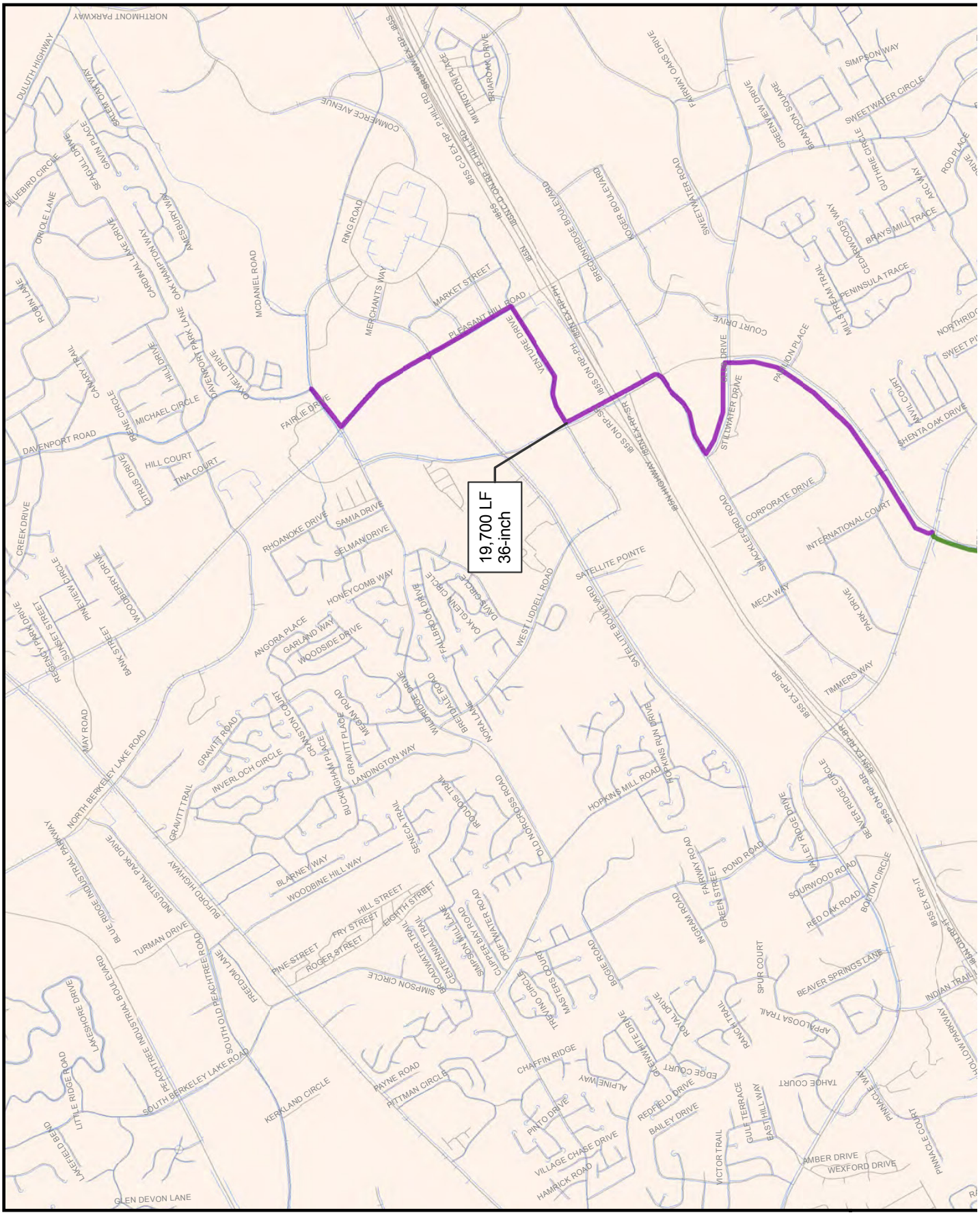
Existing Pipes

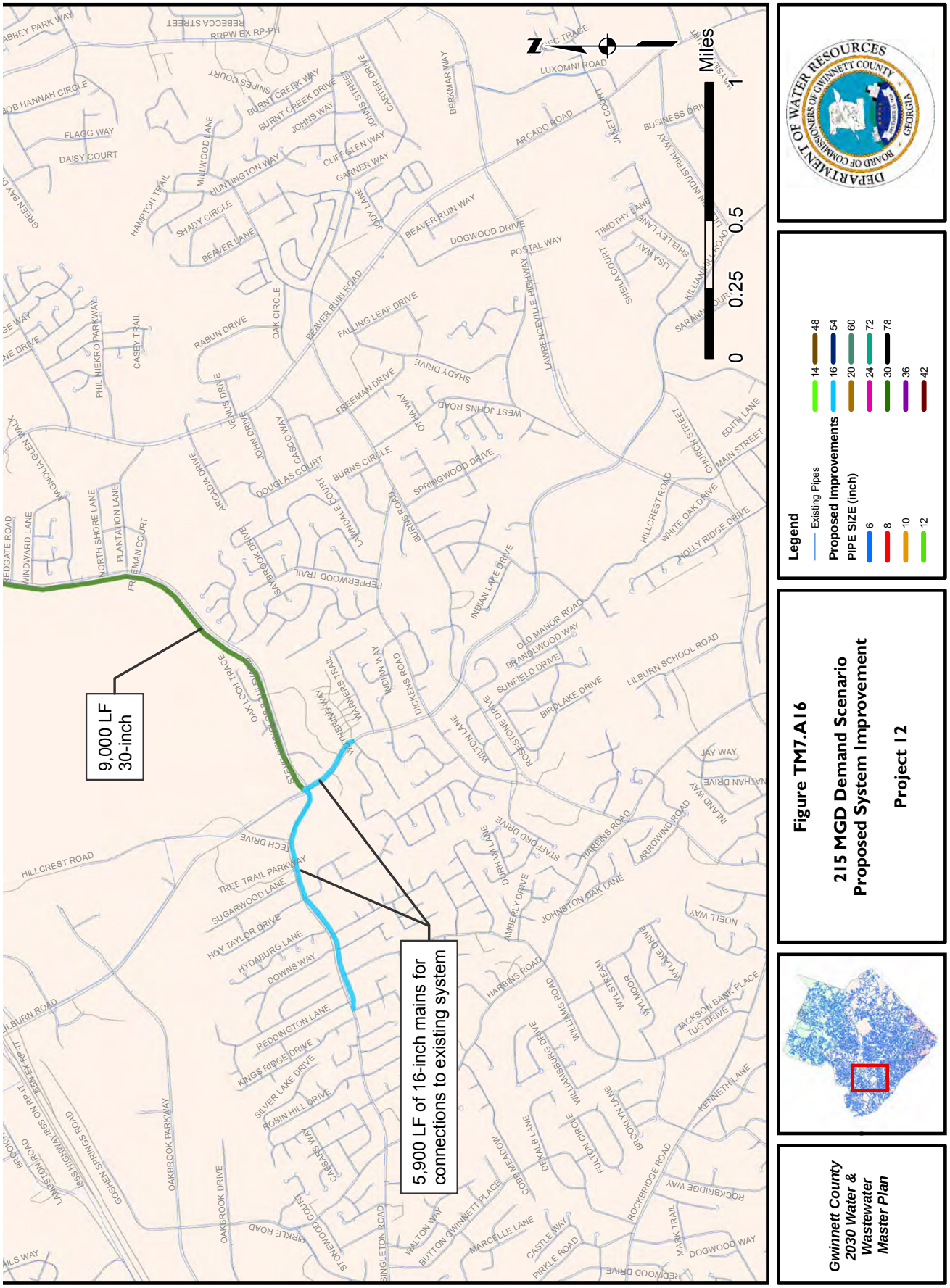
Proposed Improvements

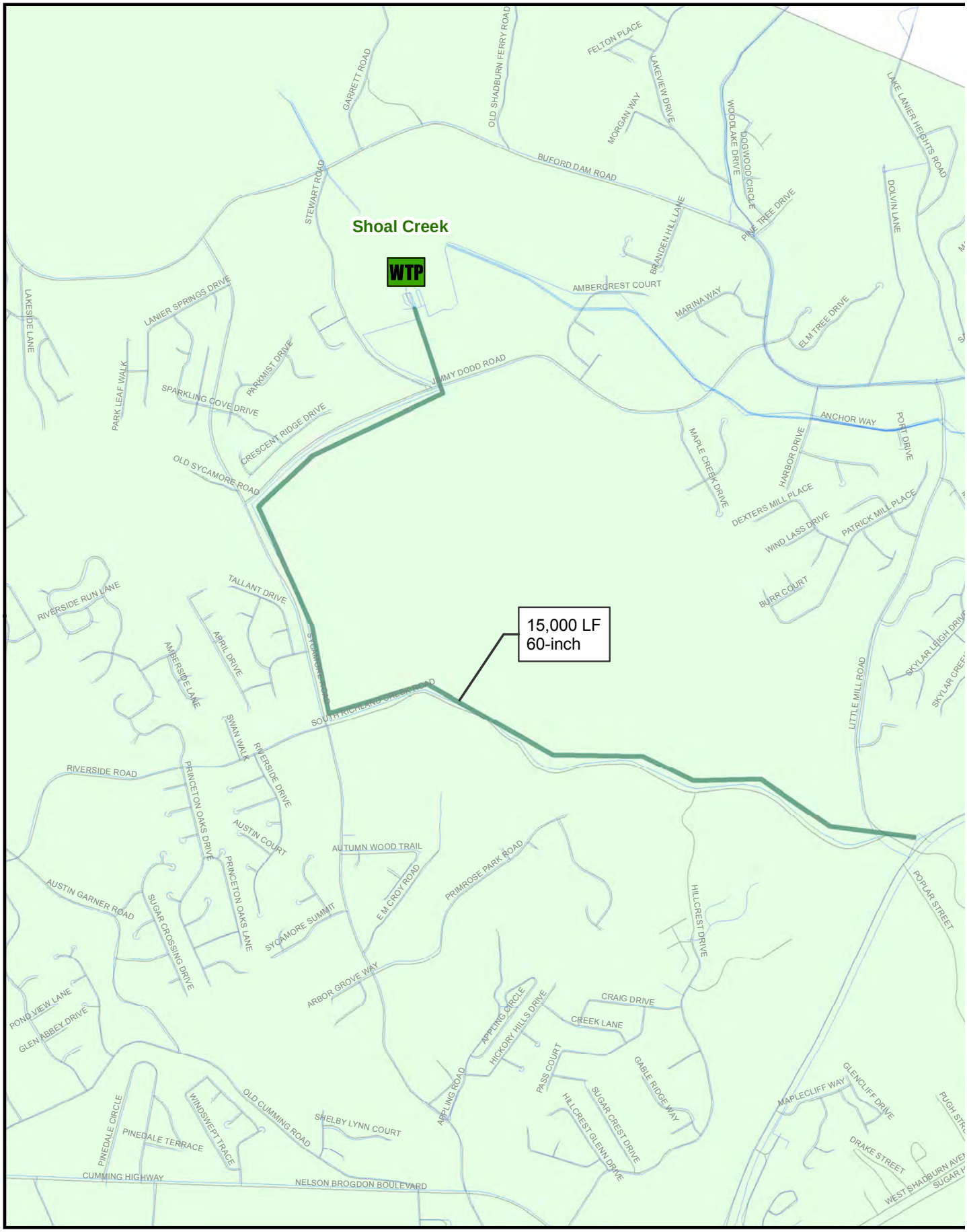
PIPE SIZE (inch)

- 6
- 8
- 10
- 12
- 14
- 16
- 20
- 24
- 30
- 36
- 42
- 48
- 54
- 60
- 72
- 78

DEPARTMENT OF WATER RESOURCES
BOARD OF COMMISSIONERS OF GWINNETT COUNTY
GEORGIA


19,700 LF
36-inch
PLEASANT HILL ROAD
VENTURE DRIVE
FAIRLIE DRIVE
MARKET STREET
MERCHANTS WAY
RING ROAD
MCDANIEL ROAD
COMMERCE AVENUE
MILTNGTON PLACE
BRIAROAK DRIVE
BRECKINRIDGE BOULEVARD
ROGER BOULEVARD
SWEETWATER ROAD
FAIRWAY OAKS DRIVE
GREENVIEW DRIVE
BRANDON SQUARE
SIMPSON WAY
SWEETWATER CIRCLE
GUTTIRIE CIRCLE
ARC WAY
ROD PLACE
BRAYS MILL TRACE
CEDARWOODS WAY
MILL STREAM TRAIL
PENINSULA TRACE
COURT DRIVE
PAVILION PLACE
STILLWATER DRIVE
ANVIL COURT
SHENTA OAK DRIVE
CORPORATE DRIVE
INTERNATIONAL COURT
SHACKLEFORD ROAD
MECA WAY
PARK DRIVE
TIMMERS WAY
SATELLITE POINTE
SATELLITE BOULEVARD
WEST LIDDELL ROAD
HOPKINS MILL ROAD
HOPKINS RUN DRIVE
OLD NORCROSS ROAD
SENECA TRAIL
ROBOLDS TRAIL
BRETDALE ROAD
NORA LANE
WILDRIDGE DRIVE
FALLBROOK DRIVE
OAK GLEN CIRCLE
DAVIS CIRCLE
HONEYCOMB WAY
SELMAN DRIVE
SAMIA DRIVE
RHOANOKE DRIVE
ANGORA PLACE
GARLAND WAY
WOODSIDE DRIVE
LANDINGTON WAY
GRAVITT PLACE
MEGAN ROAD
CRANSTON COURT
BUCKINGHAM PLACE
INVERLOCH CIRCLE
GRAVITT ROAD
GRAVITT TRAIL
NORTH BERKELEY LAKE ROAD
WOODBINE HILL WAY
BLARNEY WAY
HILL STREET
FRY STREET
EIGHTH STREET
ROGER STREET
PINE STREET
SIMPSON CIRCLE
BROADWATER TRAIL
CENTENNIAL TRAIL
SIMPSON MILL LANE
CLIFFER BAY ROAD
DRIFTWATER ROAD
MASTERS COURT
TRYMO CIRCLE
BOGIE ROAD
FAIRWAY ROAD
INGRAM ROAD
GREEN STREET
POND ROAD
VALLEY RIDGE DRIVE
BENTLEY RIDGE CIRCLE
SOURWOOD ROAD
RED OAK ROAD
BOSTON CIRCLE
SPUR COURT
BEAVER SPRINGS LANE
INDIAN TRAIL
APPALOOSA TRAIL
RANCH TRAIL
ROYAL DRIVE
QUEENWITT DRIVE
EDGE COURT
TAHOE COURT
PINNACLE WAY
PINNACLE COURT
HOLLOW PARKWAY
CHAFFIN RIDGE
ALPINE WAY
REDFIELD DRIVE
BAILEY DRIVE
PINTO DRIVE
VILLAGE CHASE DRIVE
HAMRICK ROAD
PITTMAN CIRCLE
PAYNE ROAD
KERKLAND CIRCLE
SOUTH BERKELEY LAKE ROAD
PEACHTREE INDUSTRIAL BOULEVARD
SOUTH OLD PEACHTREE ROAD
FREEDOM LANE
TURMAN DRIVE
BUFORD HIGHWAY
INDUSTRIAL PARK DRIVE
INDUSTRIAL PARKWAY
BLUE RIDGE INDUSTRIAL BOULEVARD
LAKESHORE DRIVE
LITTLE RIDGE ROAD
LAKEFIELD BEND
GLEN DEVON LANE
VICTOR TRAIL
GULF TERRACE
EAST HILL WAY
AMBER DRIVE
WEXFORD DRIVE
NORTHMONT PARKWAY
DULUTH HIGHWAY
BLUEBIRD CIRCLE
ORIOLE LANE
SEAGULL DRIVE
GAVIN PLACE
GOLDEN OAK WAY
ROBIN LANE
CARDINAL LAKE DRIVE
OAK HAMPTON WAY
AMESBURY WAY
CALVARY TRAIL
HILL DRIVE
OAKEMORT PARK LANE
OTWELL DRIVE
MICHAEL CIRCLE
PRINE CIRCLE
DAVENPORT ROAD
HILL COURT
TINA COURT
CITRUS DRIVE
CREEK DRIVE
WOODBERRY DRIVE
PINEVIEW CIRCLE
ISLANDS STREET
BANK STREET
RESIDENCY PARK DRIVE
MAY ROAD
85S CD EX RP PHILLIPS RD
85S CD RP PHILLIPS RD
85S EX RP-BR
85S ON RP-BR
85S ON RP-PH
85S EX RP-PH
85S ON RP-SR
85S EX RP-SR
85S HIGHWAY
85N


9,000 LF
30-inch
5,900 LF of 16-inch mains for connections to existing system
0 0.25 0.5 1
Miles
Legend
Existing Pipes
Proposed Improvements
PIPE SIZE (inch)
6
8
10
12
14
16
20
24
30
36
42
48
54
60
72
78
Figure TM7.A16
215 MGD Demand Scenario
Proposed System Improvement
Project I2
Gwinnett County
2030 Water &
Wastewater
Master Plan


Shoal Creek
WTP
15,000 LF
60-inch
GARRETT ROAD
OLD SHADBURN FERRY ROAD
FELTON PLACE
LAKEVIEW DRIVE
MORGAN WAY
WOODLAKE DRIVE
DOGWOOD CIRCLE
LAKE LANIER HEIGHTS ROAD
BUFORD DAM ROAD
STEWART ROAD
BRANDEN HILL LANE
PINE TREE DRIVE
DOLVIN LANE
AMBERCREST COURT
MARINA WAY
ELM TREE DRIVE
LAKESIDE LANE
LANIER SPRINGS DRIVE
PARK LEAF WALK
PARKMIST DRIVE
SPARKLING COVE DRIVE
CRESCENT RIDGE DRIVE
JIMMY DODD ROAD
ANCHOR WAY
PORT DRIVE
MAPLE CREEK DRIVE
HARBOR DRIVE
OLD SYCAMORE ROAD
DEXTERS MILL PLACE
WIND LASS DRIVE
PATRICK MILL PLACE
BURR COURT
RIVERSIDE RUN LANE
TALLANT DRIVE
APRIL DRIVE
AMBERSIDE LANE
SKYLAR LEIGH DRIVE
LITTLE MILL ROAD
SOUTH RICHLAND CREEK ROAD
SWAN WALK
RIVERSIDE DRIVE
RIVERSIDE ROAD
PRINCETON OAKS DRIVE
AUSTIN COURT
AUTUMN WOOD TRAIL
PRIMROSE PARK ROAD
AUSTIN GARNER ROAD
SUGAR CROSSING DRIVE
PRINCETON OAKS LANE
SYCAMORE SUMMIT
E M CROY ROAD
HILLCREST DRIVE
POPLAR STREET
ARBOR GROVE WAY
POND VIEW LANE
GLEN ABBEY DRIVE
APPLING CIRCLE
HICKORY HILLS DRIVE
CRAIG DRIVE
CREEK LANE
PASS COURT
GABLE RIDGE WAY
APPLING ROAD
SUGAR CREST DRIVE
HILLCREST GLENN DRIVE
MAPLECLIFF WAY
GLENCLIFF DRIVE
PINEDALE CIRCLE
PINEDALE TERRACE
WINDSWEPT TRACE
OLD CUMMING ROAD
SHELBY LYNN COURT
DRAKE STREET
CUMMING HIGHWAY
NELSON BROGDON BOULEVARD
WEST SHADBURN AVE

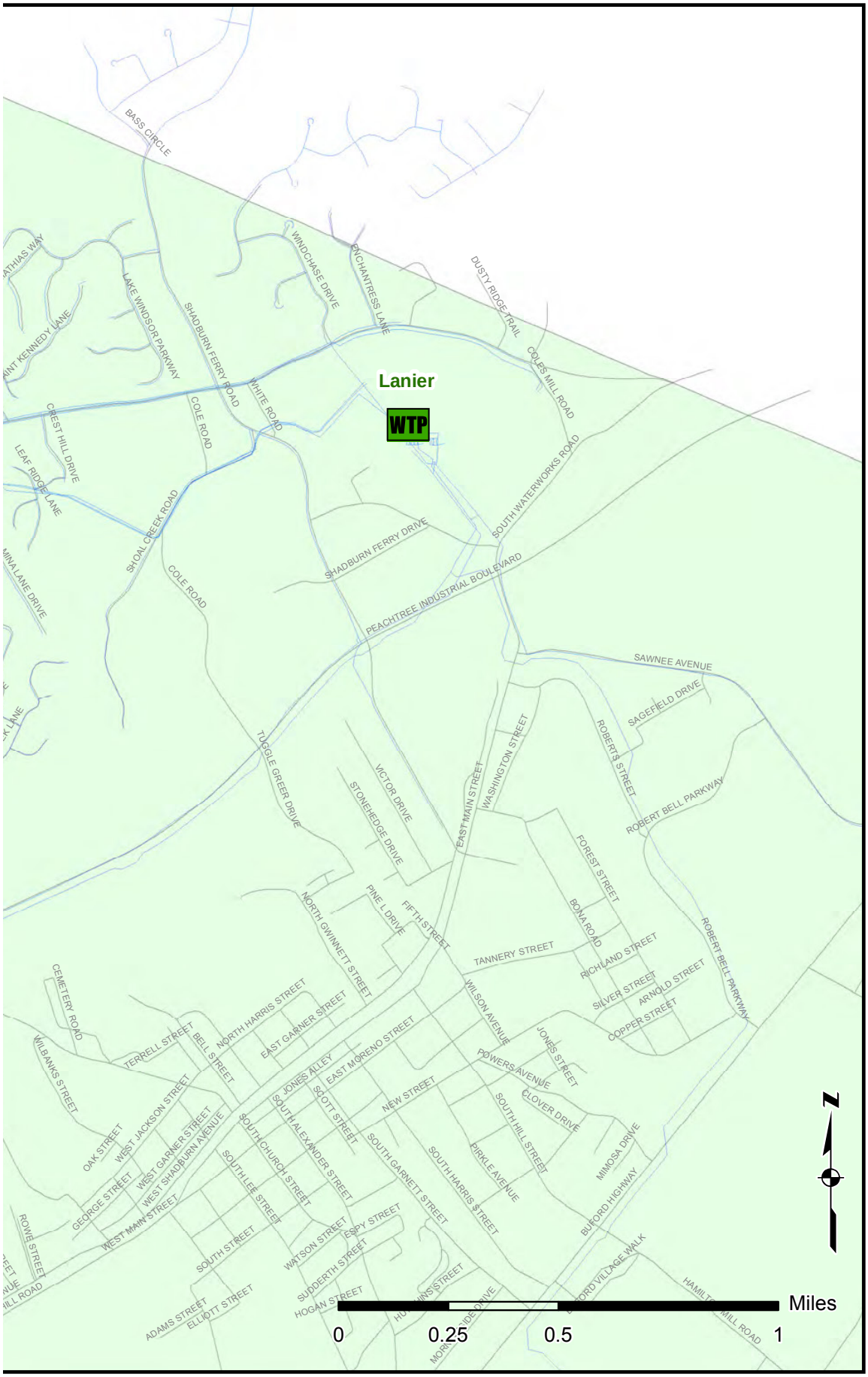


Figure TM7.A17

215 MGD Demand Scenario Proposed System Improvement

Project 13

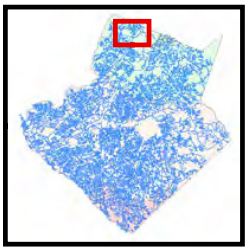
Legend

Existing Pipes

Proposed Improvements

PIPE SIZE (inch)

- 6
- 8
- 10
- 12
- 14
- 16
- 20
- 24
- 30
- 36
- 42
- 48
- 54
- 60
- 72
- 78



Gwinnett County 2030 Water & Wastewater Master Plan

Shoal Creek
WTP
OLD GARRETT ROAD
GARRETT ROAD
BUFORD DAM ROAD
BLUE WATER DRIVE
BLUE LAKE COURT
LAKESIDE LANE
WHISPER COVE DRIVE
SUNSHINE COVE LANE
SUWANEE DAM ROAD
PARK LEAF WALK
LANIER SPRINGS DRIVE
SPARKLING COVE LANE
SYCAMORE ROAD
PARKMIST COURT
PARKMIST DRIVE
COVE PARK DRIVE
STEWART RIDGE WALK
STEWART ROAD
SPARKLING COVE DRIVE
JIMMY DODD ROAD
PIERLESS LANDING
BINKLEY TRAIL
BINKLEY WALK
BARLEY HILL LANE
PIERLESS AVENUE
OLD SYCAMORE ROAD
TALLANT DRIVE
SADIE COURT
RIVERSIDE RUN LANE
RIVERSIDE WALK CROSSING
MARSH HILL TRAIL
LAUREL GREEN LANE
AMBERSIDE LANE
APRIL DRIVE
RICHLAND CREEK TRAIL
MILLARD DUNCAN ROAD
BARKER STATION WALK
BARKER LANDING
AUSTIN GARNER ROAD
TRAIL HIKES DRIVE
RIVER RIDGE LANE
SWAN WALK
RIVERSIDE ROAD
SOUTH RICHLAND CREEK ROAD

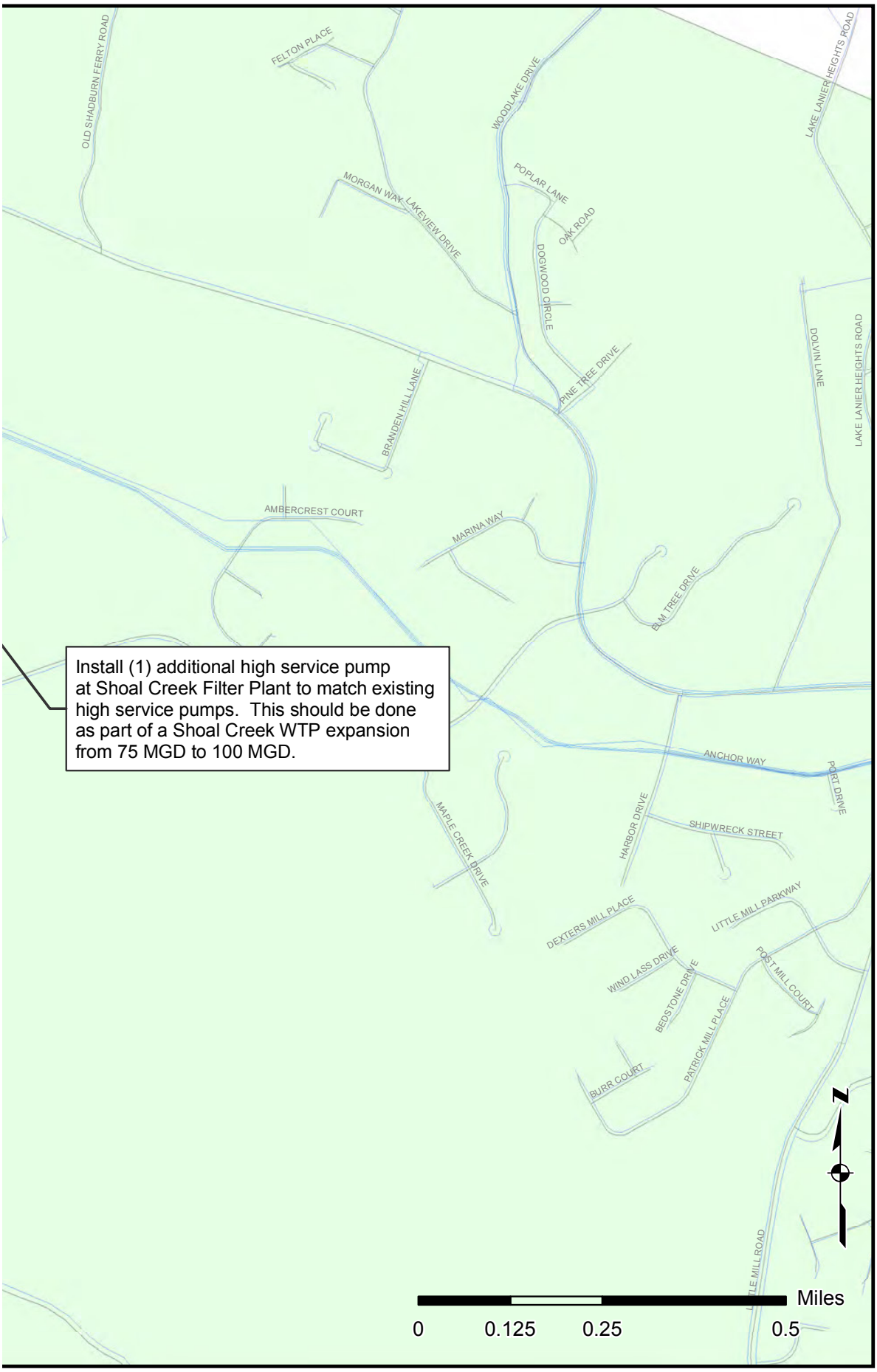


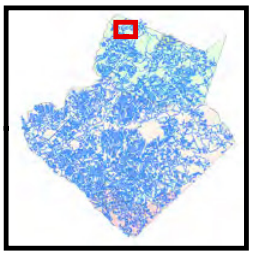
Figure TM7.A18

231 MGD Demand Scenario Proposed System Improvement

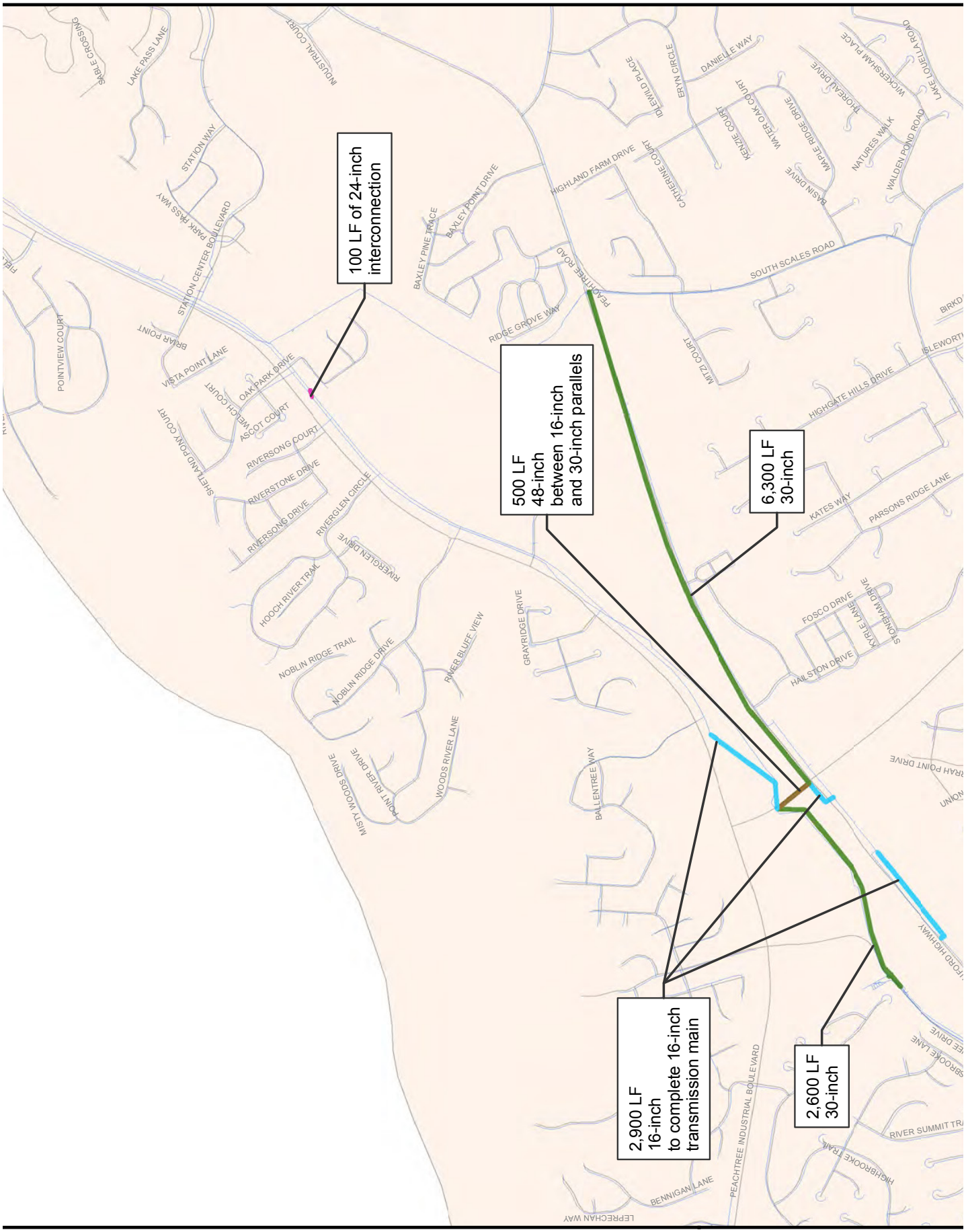
Project 14

Legend

Existing Pipes



Gwinnett County 2030 Water & Wastewater Master Plan


100 LF of 24-inch interconnection
500 LF 48-inch between 16-inch and 30-inch parallels
6,300 LF 30-inch
2,900 LF 16-inch to complete 16-inch transmission main
2,600 LF 30-inch
PEACHTREE ROAD
SOUTH SCALES ROAD
HIGHLAND FARM DRIVE
BAXLEY POINT DRIVE
BAXLEY PINE TRACE
RIDGE GROVE WAY
STATION CENTER BOULEVARD
STATION WAY
PARK PASS WAY
LAKE PASS LANE
INDUSTRIAL COURT
POINTVIEW COURT
BRIAR POINT
VISTA POINT LANE
OAK PARK DRIVE
MEECH COURT
ASCOT COURT
RIVERSONG COURT
RIVERSTONE DRIVE
RIVERSONG DRIVE
RIVERGLEN CIRCLE
RIVERGLEN DRIVE
SHETLAND PONY COURT
HOOCH RIVER TRAIL
NOBLIN RIDGE TRAIL
NOBLIN RIDGE DRIVE
RIVER BLUFF VIEW
GRAYRIDGE DRIVE
WOODS RIVER LANE
POINT RIVER DRIVE
MISTY WOODS DRIVE
BALLENTREE WAY
PEACHTREE INDUSTRIAL BOULEVARD
BENNIGAN LANE
LEPRECHAN WAY
HIGHBROOKE TRAIL
RIVER SUMMIT TRAIL
HIGHGATE HILLS DRIVE
KATES WAY
PARSONS RIDGE LANE
FOSCO DRIVE
KYRLE LANE
STONEHAM DRIVE
HAILSTON DRIVE
MITZI COURT
CATHERINE COURT
KENNIE COURT
WATER OAK COURT
MAPLE RIDGE DRIVE
BASIN DRIVE
THOREAU DRIVE
NATURES WALK
WALDEN POND ROAD
WICKERSHAM PLACE
LAKE LOUELLA ROAD
DANIELLE WAY
ERYN CIRCLE
IDLEWILD PLACE
SABLE CROSSING

Gwinnett County 2030 Water & Wastewater Master Plan

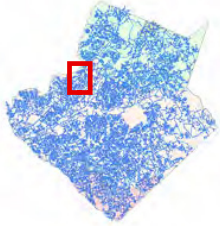


Figure TM7.A19

231 MGD Demand Scenario Proposed System Improvement

Project 15

Legend

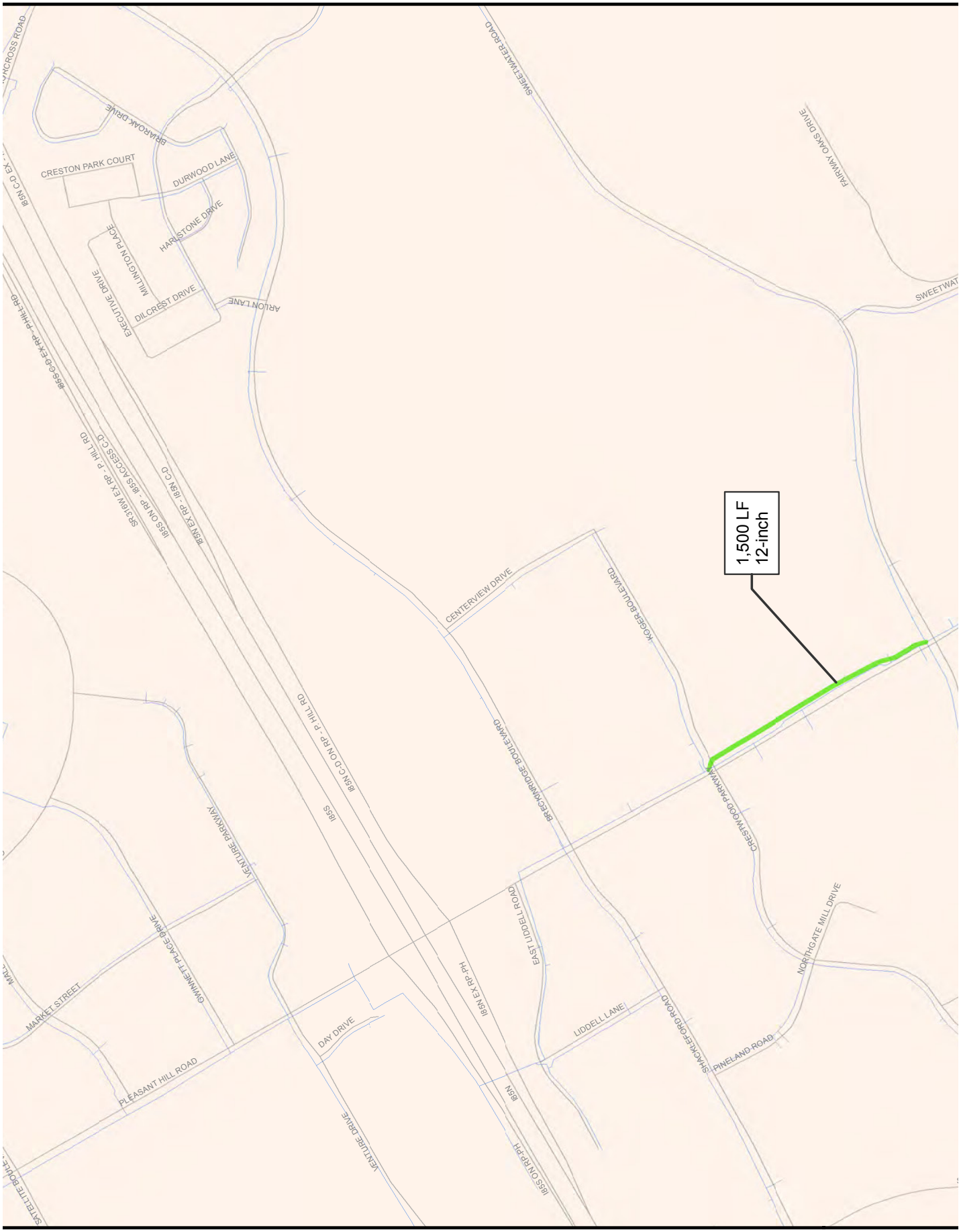
Existing Pipes

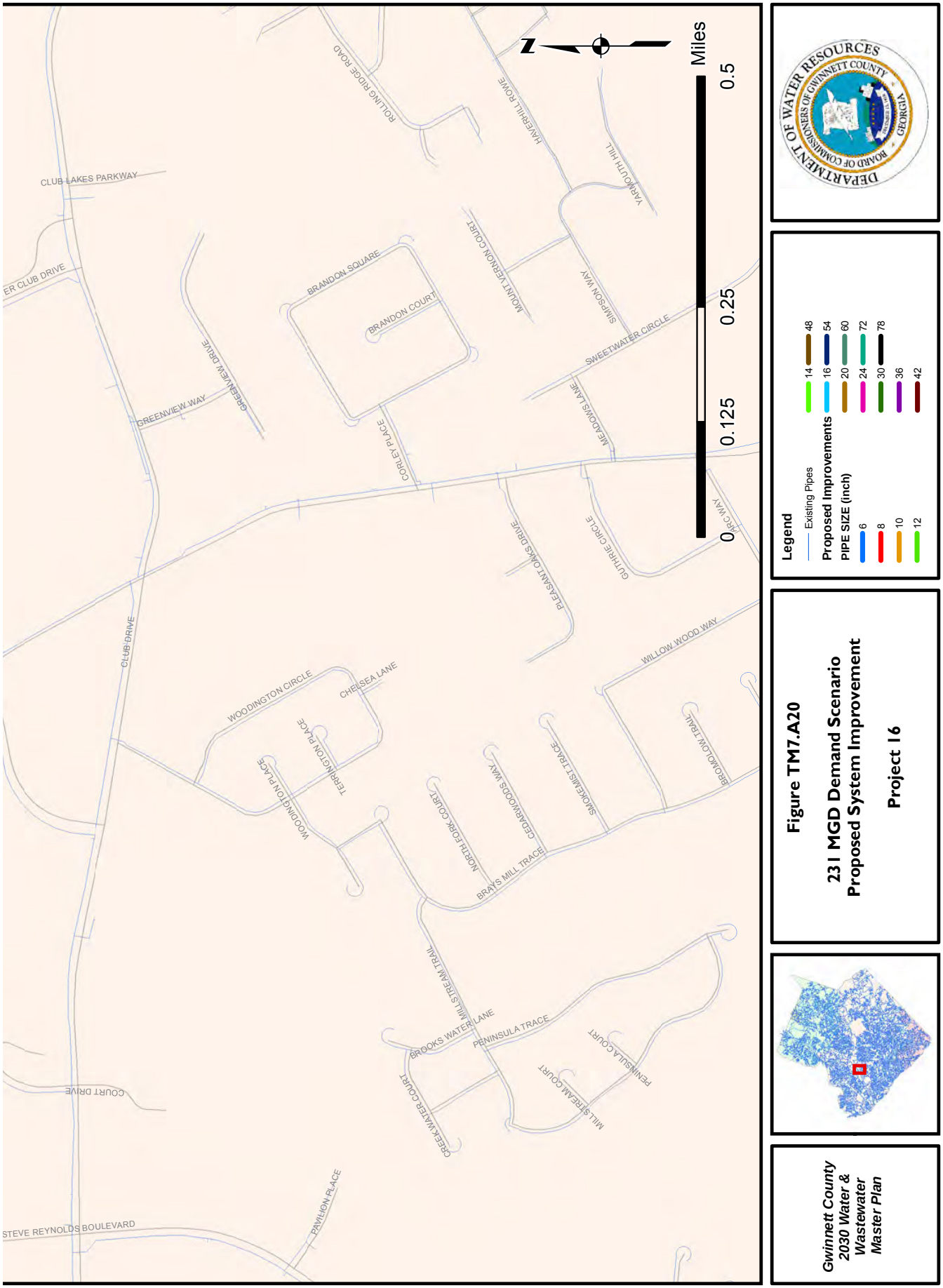
Proposed Improvements

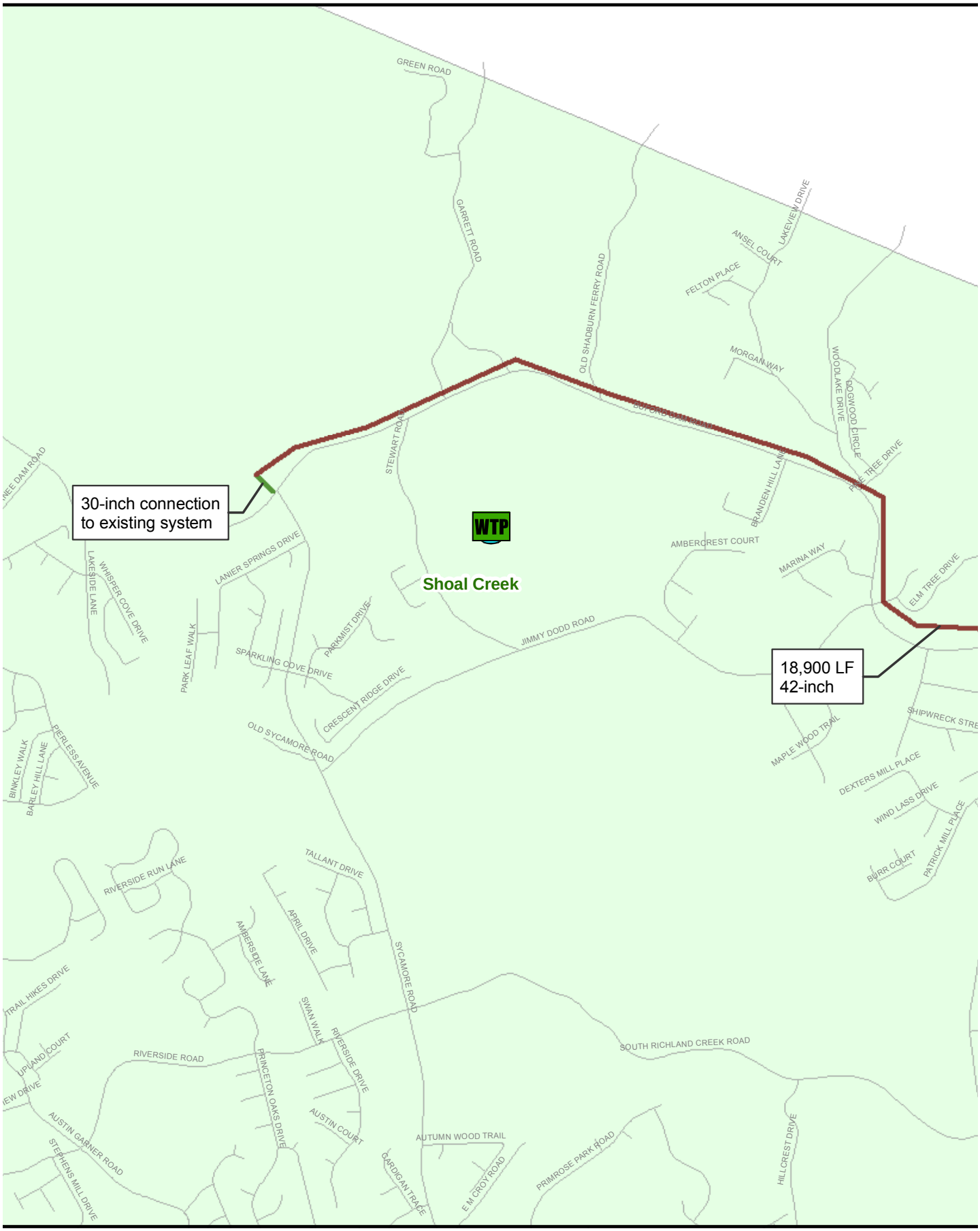
PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78

DEPARTMENT OF WATER RESOURCES
BOARD OF COMMISSIONERS OF GWINNETT COUNTY
GEORGIA


1,500 LF
12-inch
SWEETWATER ROAD
FAIRWAY OAKS DRIVE
SWEETWAT
CRESTON PARK COURT
DURWOOD LANE
BRIAROAK DRIVE
HARLSTONE DRIVE
MILLINGTON PLACE
EXECUTIVE DRIVE
DILCREST DRIVE
ARLON LANE
CENTERVIEW DRIVE
ROGER BOULEVARD
BRECKINRIDGE BOULEVARD
CRESTWOOD PARKWAY
NORTHGATE MILL DRIVE
EAST LIDDELL ROAD
LIDDELL LANE
SHACKLEFORD ROAD
PINELAND ROAD
VENTURE PARKWAY
GWINNETT PLACE DRIVE
MARKET STREET
PLEASANT HILL ROAD
DAY DRIVE
VENTURE DRIVE
SATELLITE BOULE
185S
185S ON RP - P. HILL RD
185S ON RP
185S EX RP PH
185S C-D EX RP - PHILL RD
SR316W EX RP - P. HILL RD
185S ACCESS C-D
185N EX RP - 185N C-D
185N C-D ON RP - P. HILL RD
185N EX RP PH
185N
185N C-D EX RP


Miles
0
0.125
0.25
0.5
N
Legend
Existing Pipes
Proposed Improvements
PIPE SIZE (inch)
6
8
10
12
14
16
20
24
30
36
42
48
54
60
72
78
Figure TM7.A20
231 MGD Demand Scenario
Proposed System Improvement
Project 16
Gwinnett County
2030 Water &
Wastewater
Master Plan
DEPARTMENT OF WATER RESOURCES
BOARD OF COMMISSIONERS OF GWINNETT COUNTY
GEORGIA
CLUB LAKES PARKWAY
ER CLUB DRIVE
GREENVIEW WAY
GREENVIEW DRIVE
CLUB DRIVE
COURT DRIVE
STEVE REYNOLDS BOULEVARD
PAVILION PLACE
ROLLING RIDGE ROAD
HAVERHILL ROWE
YARMOUTH HILL
BRANDON SQUARE
BRANDON COURT
MOUNT VERNON COURT
SIMPSON WAY
SWEETWATER CIRCLE
MEADOWS LANE
CORLEY PLACE
ARC WAY
GUTHRIE CIRCLE
PLEASANT OAKS DRIVE
WILLOW WOOD WAY
WOODINGTON CIRCLE
CHELSEA LANE
TERRINGTON PLACE
WOODINGTON PLACE
NORTH FORK COURT
CEDARWOODS WAY
BRAYS MILL TRACE
SMOKEMIST TRACE
BROMOLOW TRAIL
MILL STREAM TRAIL
BROOKS WATER LANE
PENINSULA TRACE
PENINSULA COURT
MILL STREAM COURT
CREEKWATER COURT


30-inch connection to existing system
WTP
Shoal Creek
18,900 LF 42-inch
GREEN ROAD
GARRETT ROAD
OLD SHADBURN FERRY ROAD
ANSEL COURT
LAKEVIEW DRIVE
FELTON PLACE
MORGAN WAY
WOODLAKE DRIVE
DOGWOOD CIRCLE
PINE TREE DRIVE
STEWART ROAD
BRANDEN HILL LANE
AMBERCREST COURT
MARINA WAY
ELM TREE DRIVE
LANIER SPRINGS DRIVE
LAKESIDE LANE
WHISPER COVE DRIVE
PARK LEAF WALK
PARKMIST DRIVE
SPARKLING COVE DRIVE
CRESCENT RIDGE DRIVE
JIMMY DODD ROAD
OLD SYCAMORE ROAD
MAPLE WOOD TRAIL
SHIPWRECK STRE
DEXTERS MILL PLACE
WIND LASS DRIVE
PATRICK MILL PLACE
BURR COURT
BINKLEY WALK
BARLEY HILL LANE
PIERLESS AVENUE
RIVERSIDE RUN LANE
TALLANT DRIVE
APRIL DRIVE
AMBERSIDE LANE
SYCAMORE ROAD
TRAIL HIKES DRIVE
UPLAND COURT
RIVERSIDE ROAD
SWAN WALK
RIVERSIDE DRIVE
PRINCETON OAKS DRIVE
SOUTH RICHLAND CREEK ROAD
AUSTIN GARNER ROAD
AUSTIN COURT
STEPHENS MILL DRIVE
AUTUMN WOOD TRAIL
GARDIGAN TRACE
E M CROY ROAD
PRIMROSE PARK ROAD
HILLCREST DRIVE

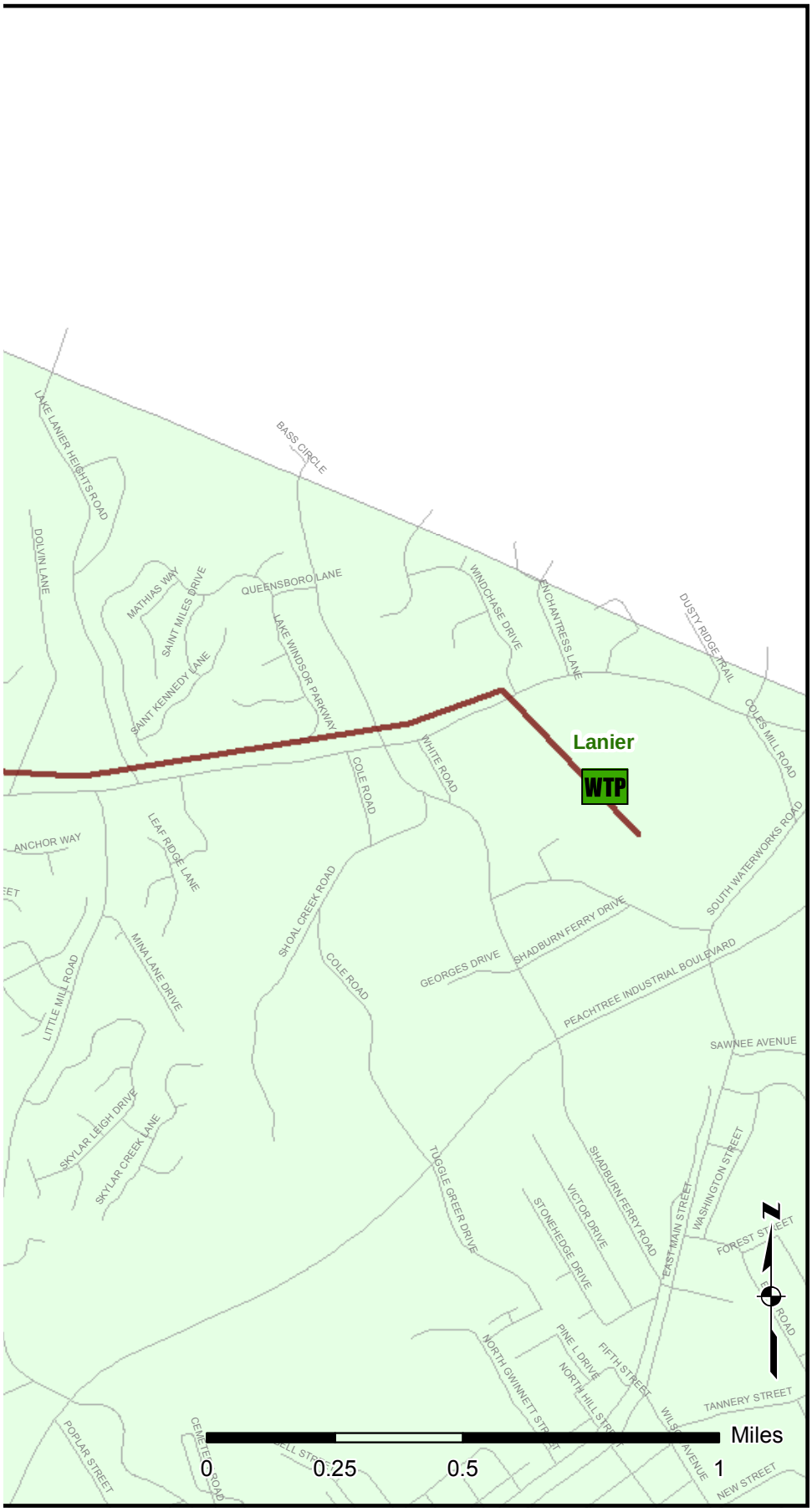


Figure TM7.A21

131 MGD Demand Scenario Proposed System Improvement

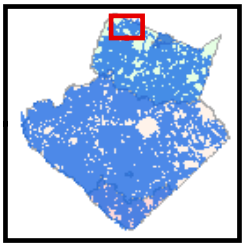
Project A1A (1A ALTERNATIVE)

Legend

Proposed Improvements

PIPE SIZE (inch)

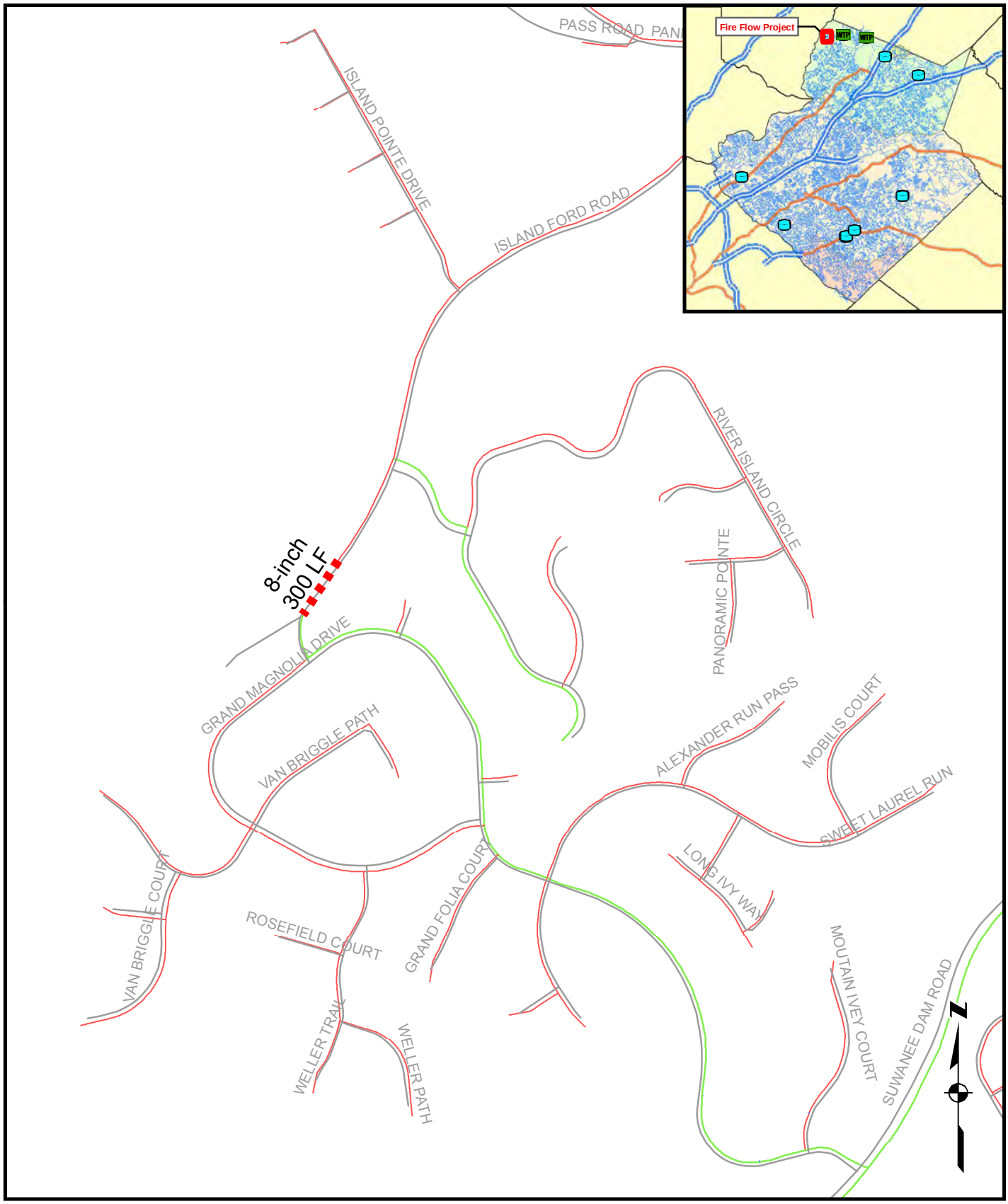
- 6
- 8
- 10
- 12
- 14
- 16
- 20
- 24
- 30
- 36
- 42
- 48
- 54
- 60
- 72
- 78



Gwinnett County 2030 Water & Wastewater Master Plan

APPENDIX B:

Recommended Supply Loop Improvement and Fire Flow Projects



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B1

Fire Flow Project FF.1

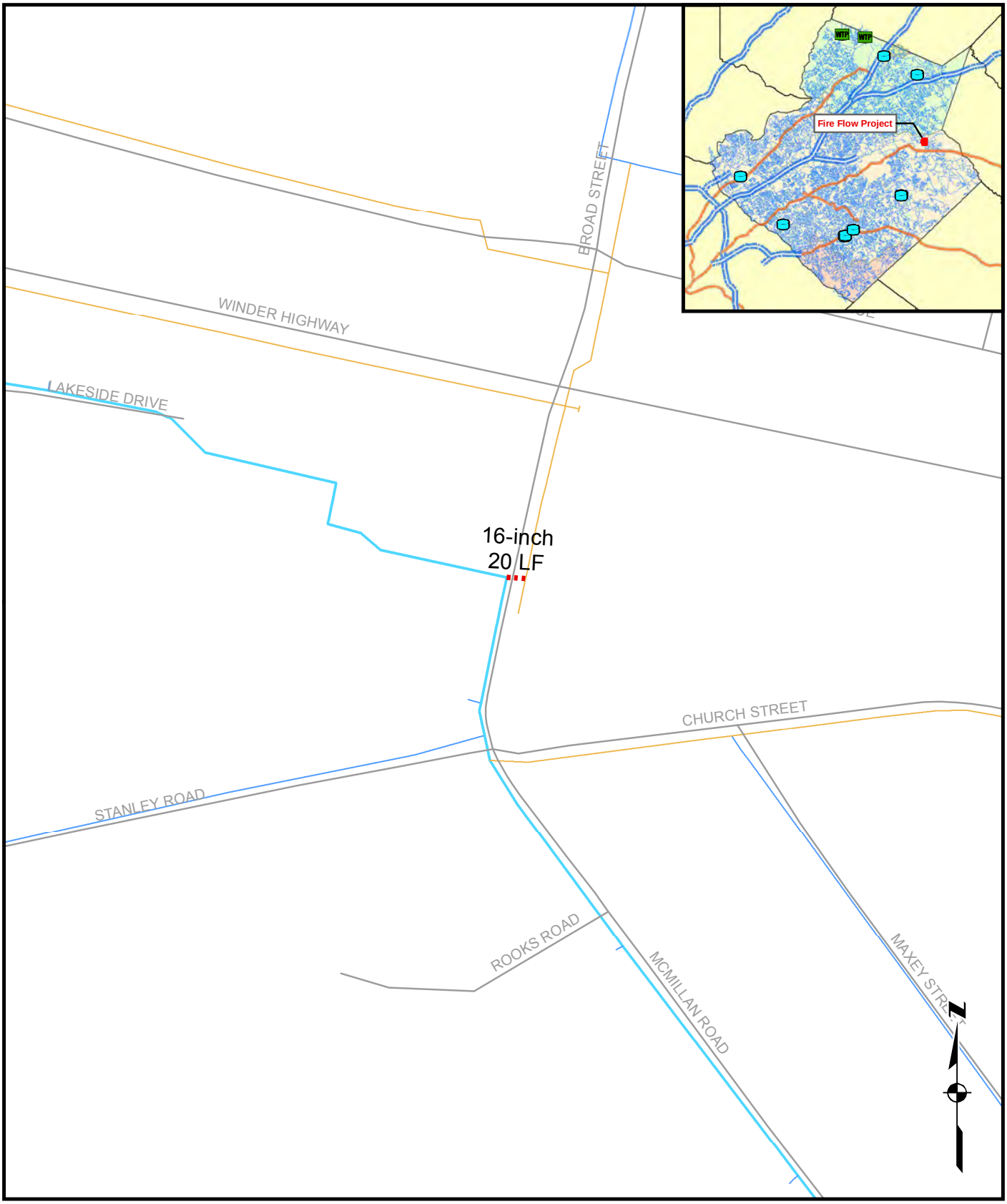
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

FigureTM7.B2:

Fire Flow Project FF.2

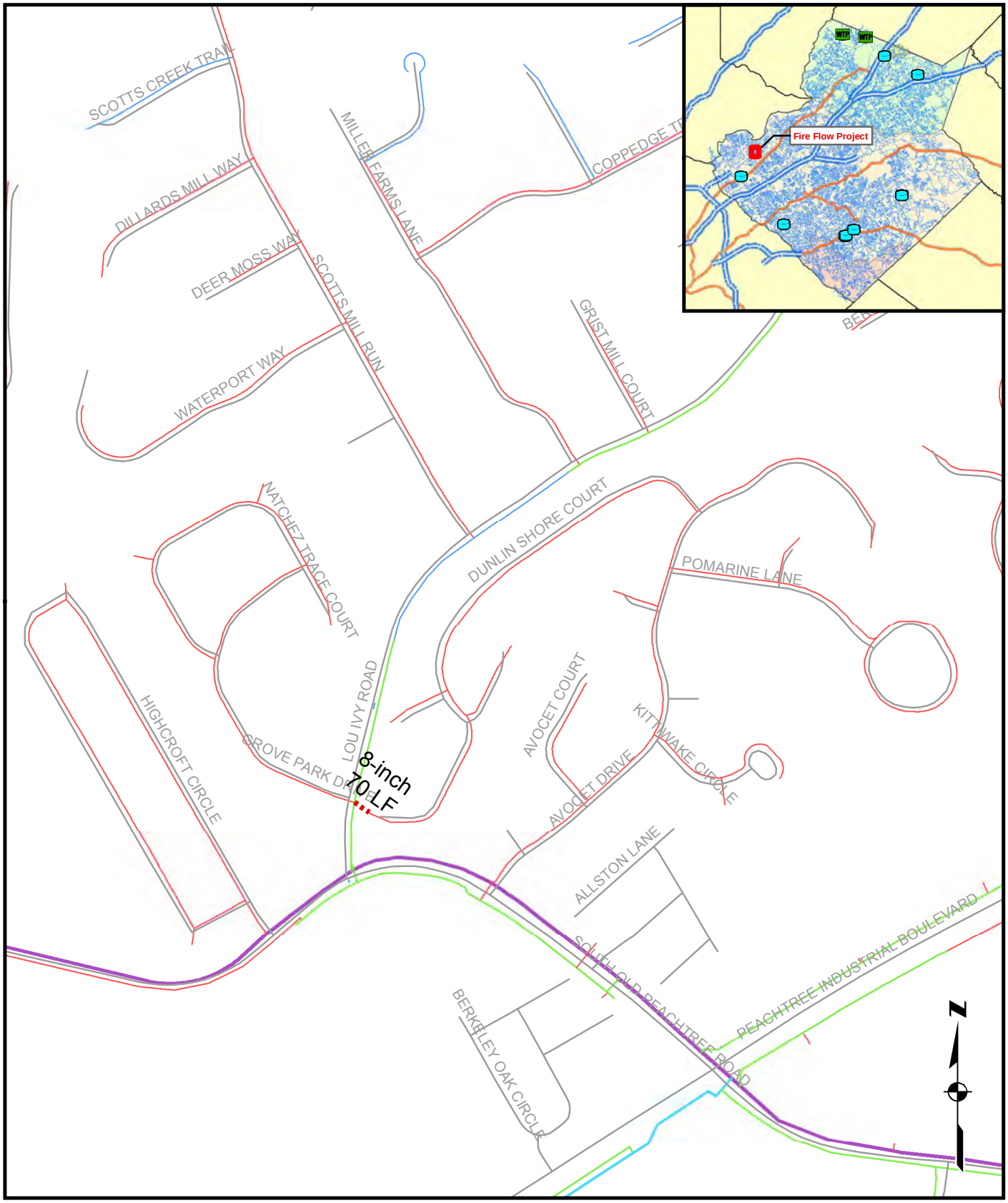
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B3

Fire Flow Project FF.3

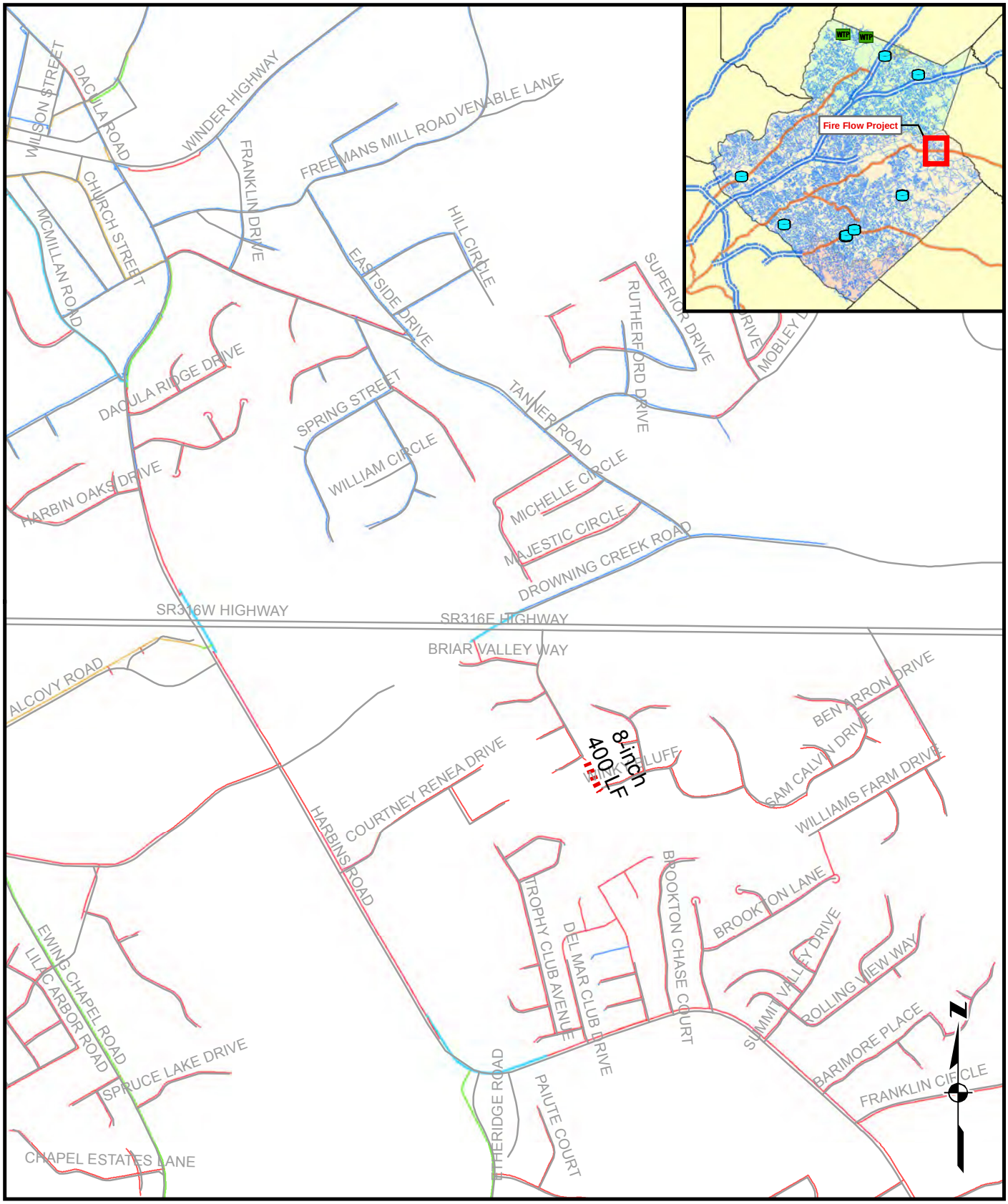
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B4

Fire Flow Project FF.4

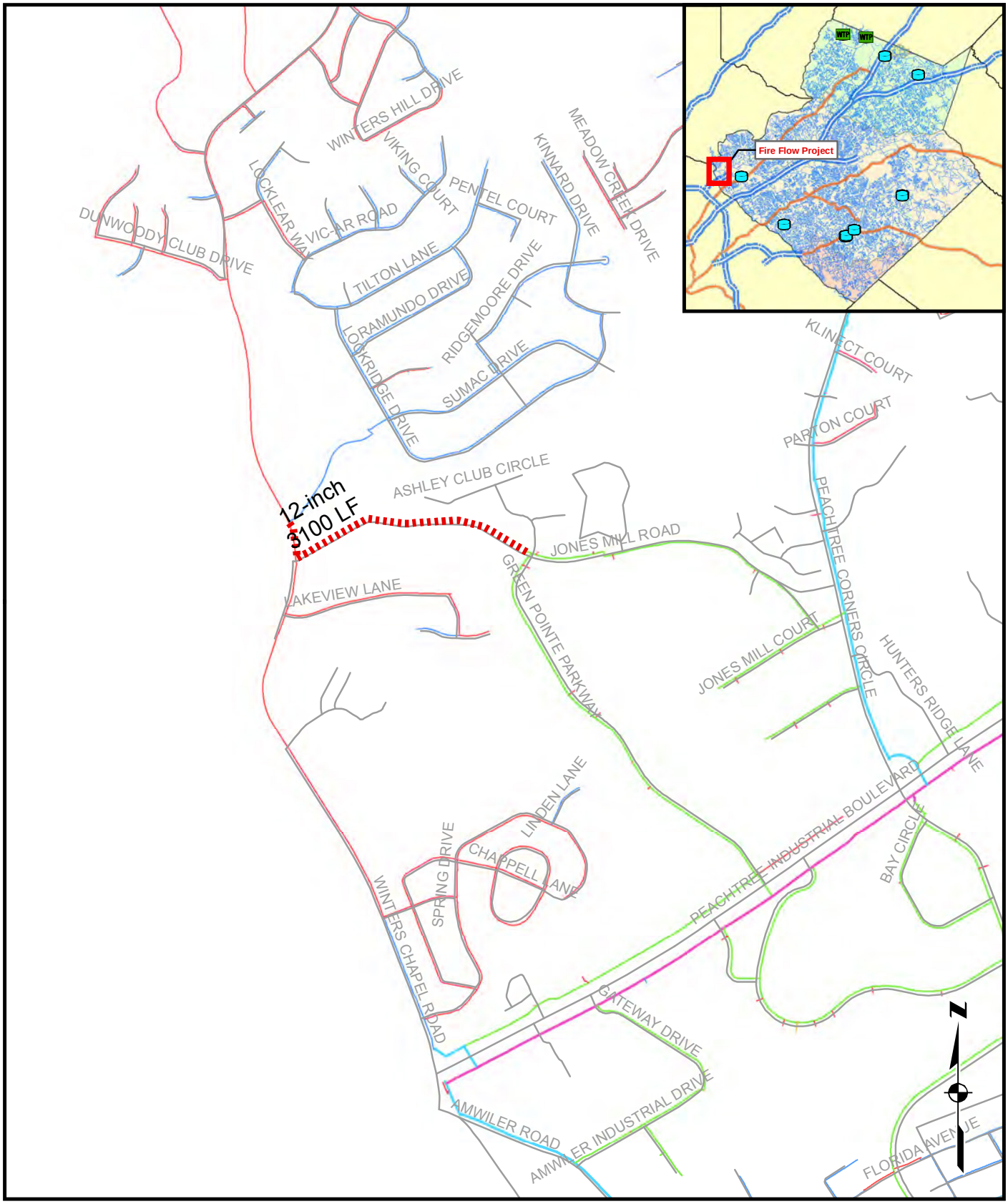
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B5

Fire Flow Project FF.5

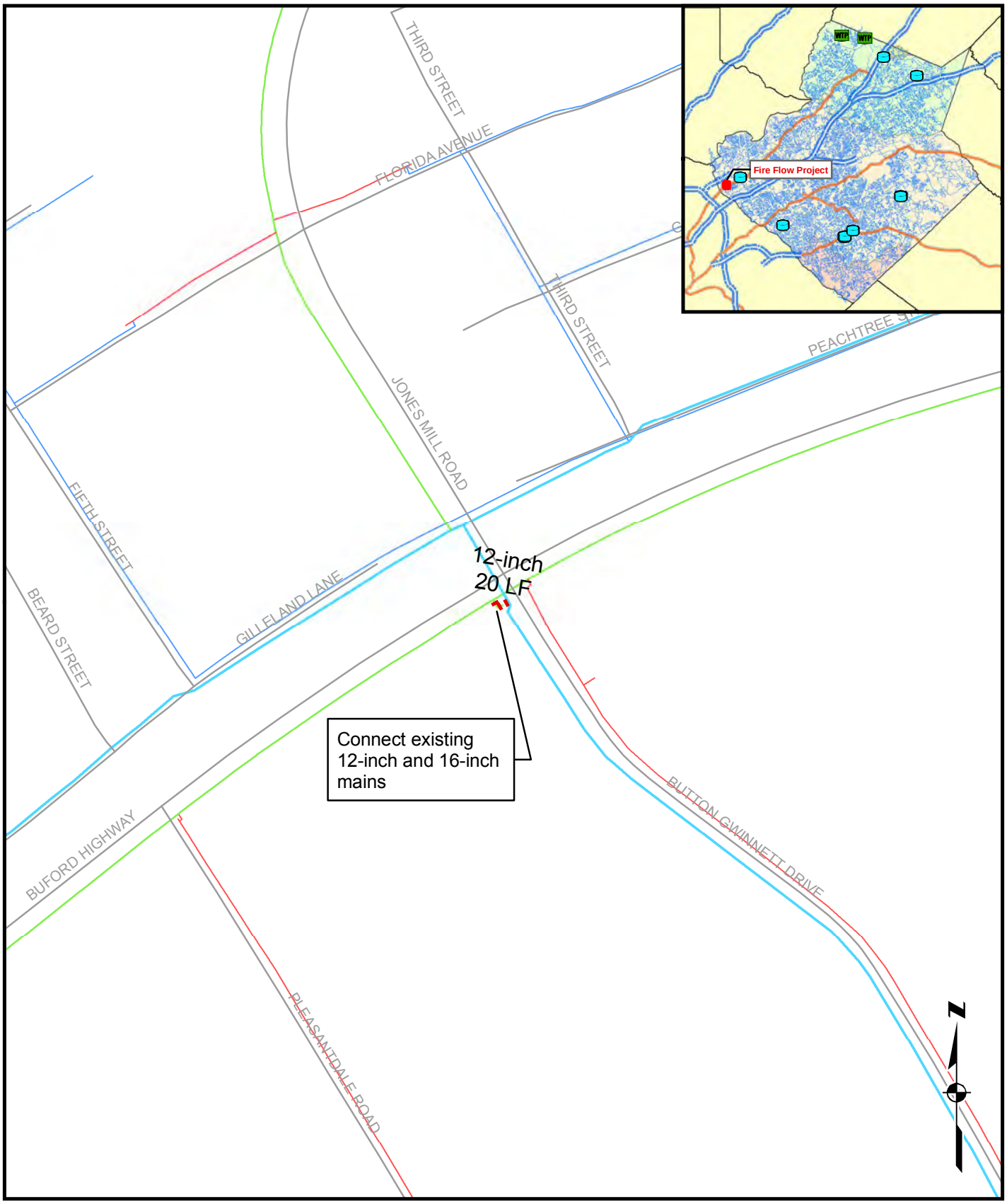
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B6

Fire Flow Project FF.6

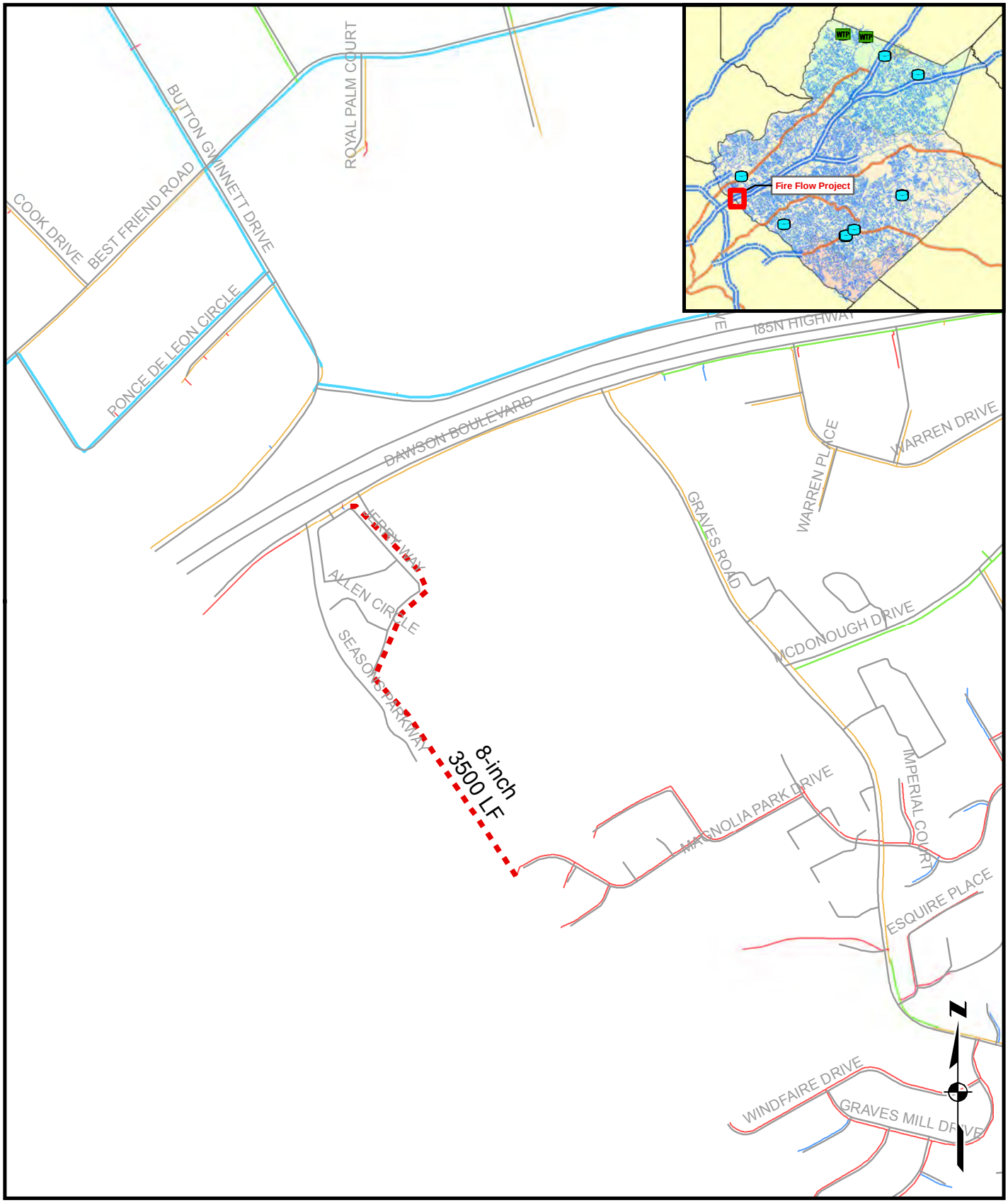
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B7

Fire Flow Project FF.7

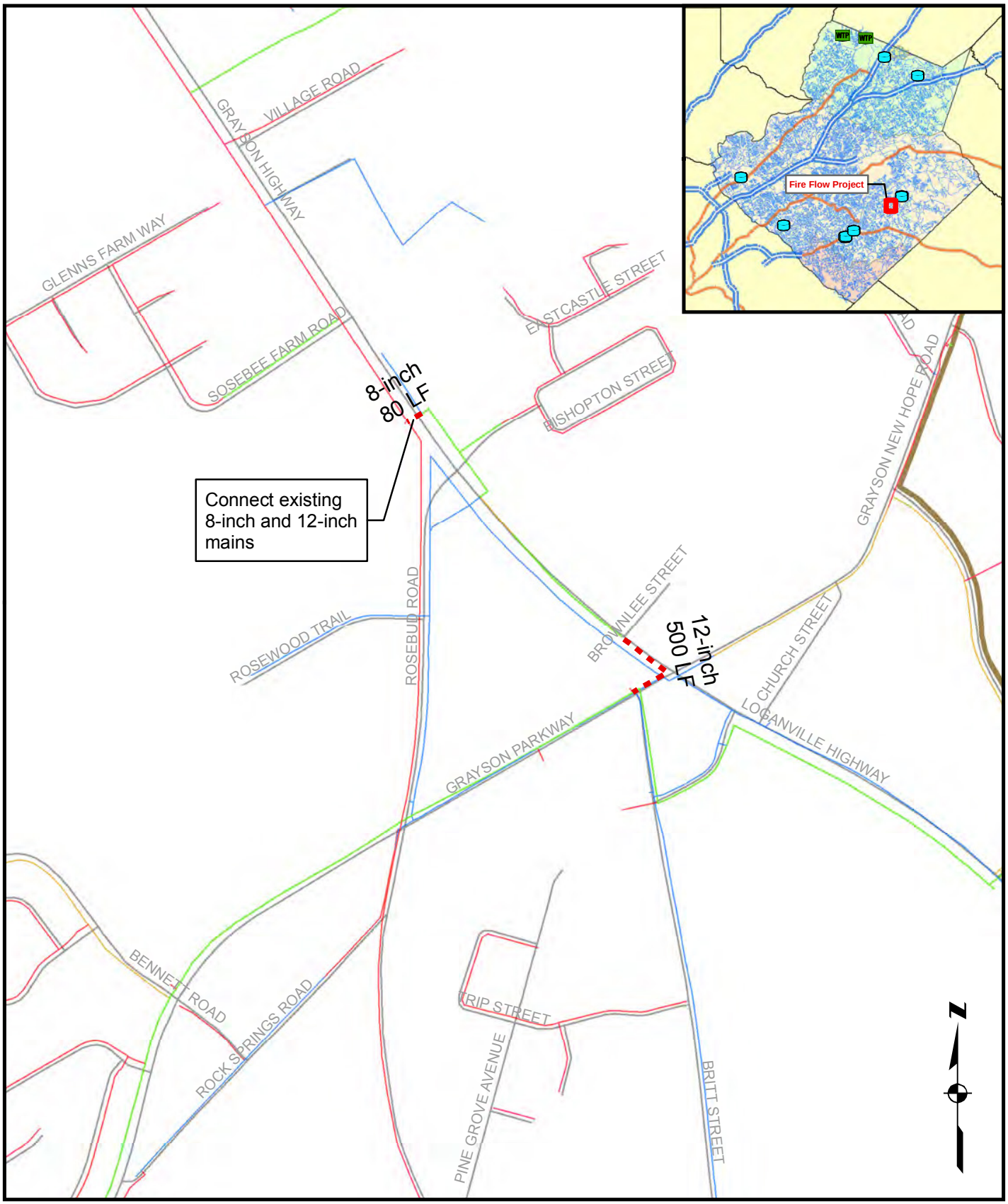
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B8

Fire Flow Project FF.8

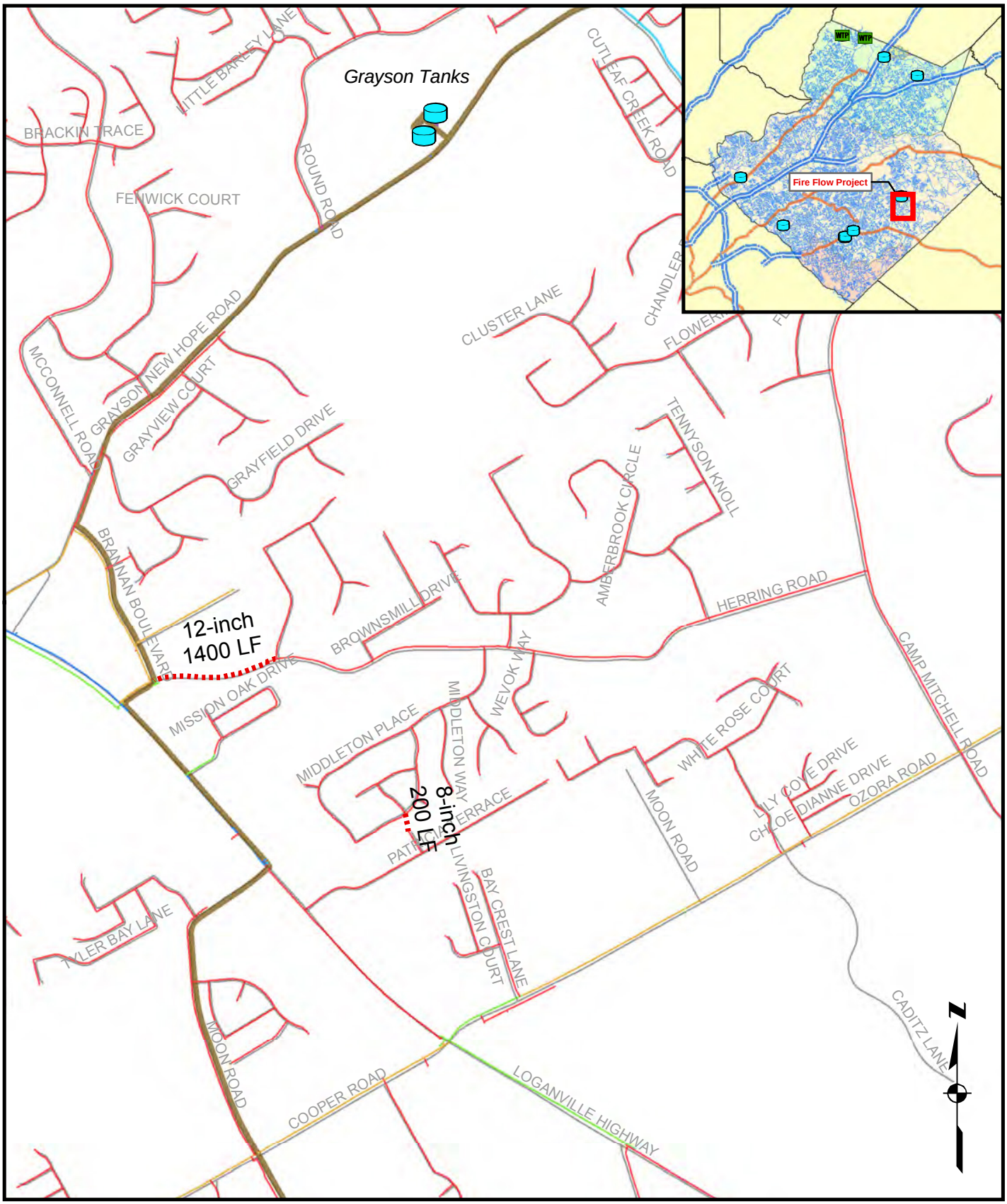
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B9

Fire Flow Project FF.9

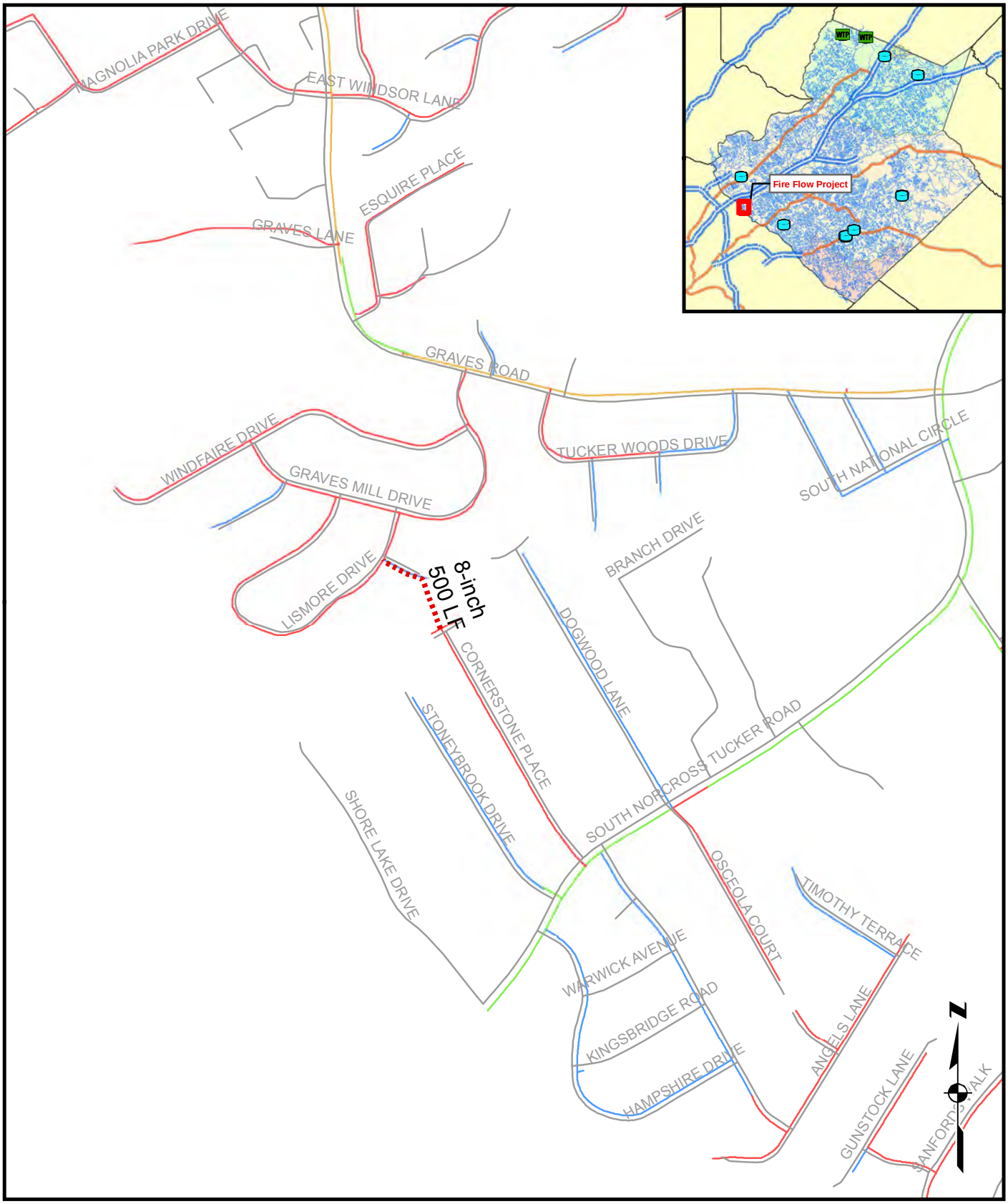
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B10

Fire Flow Project FF.10

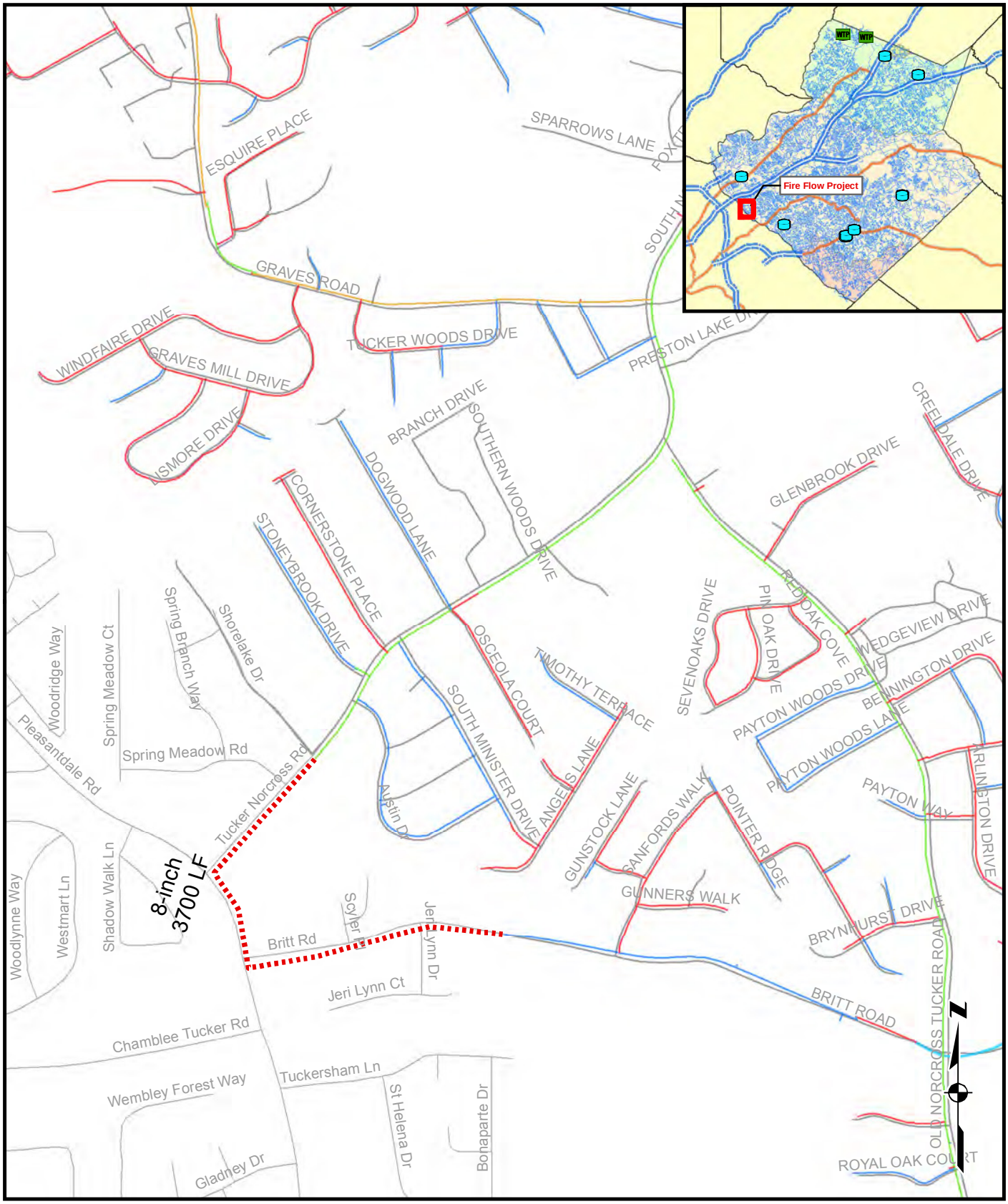
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B11

Fire Flow Project FF.11

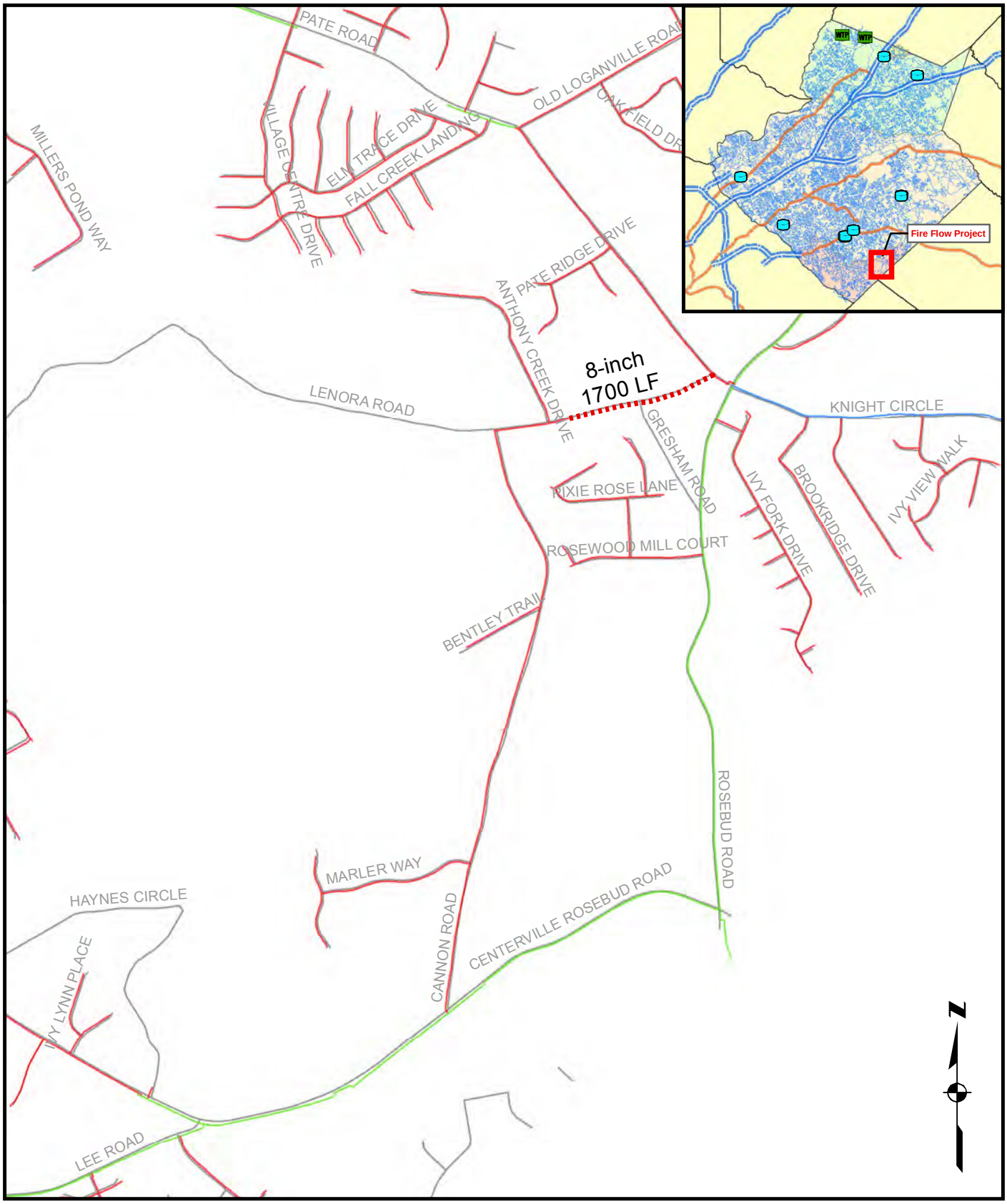
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B12

Fire Flow Project FF.12

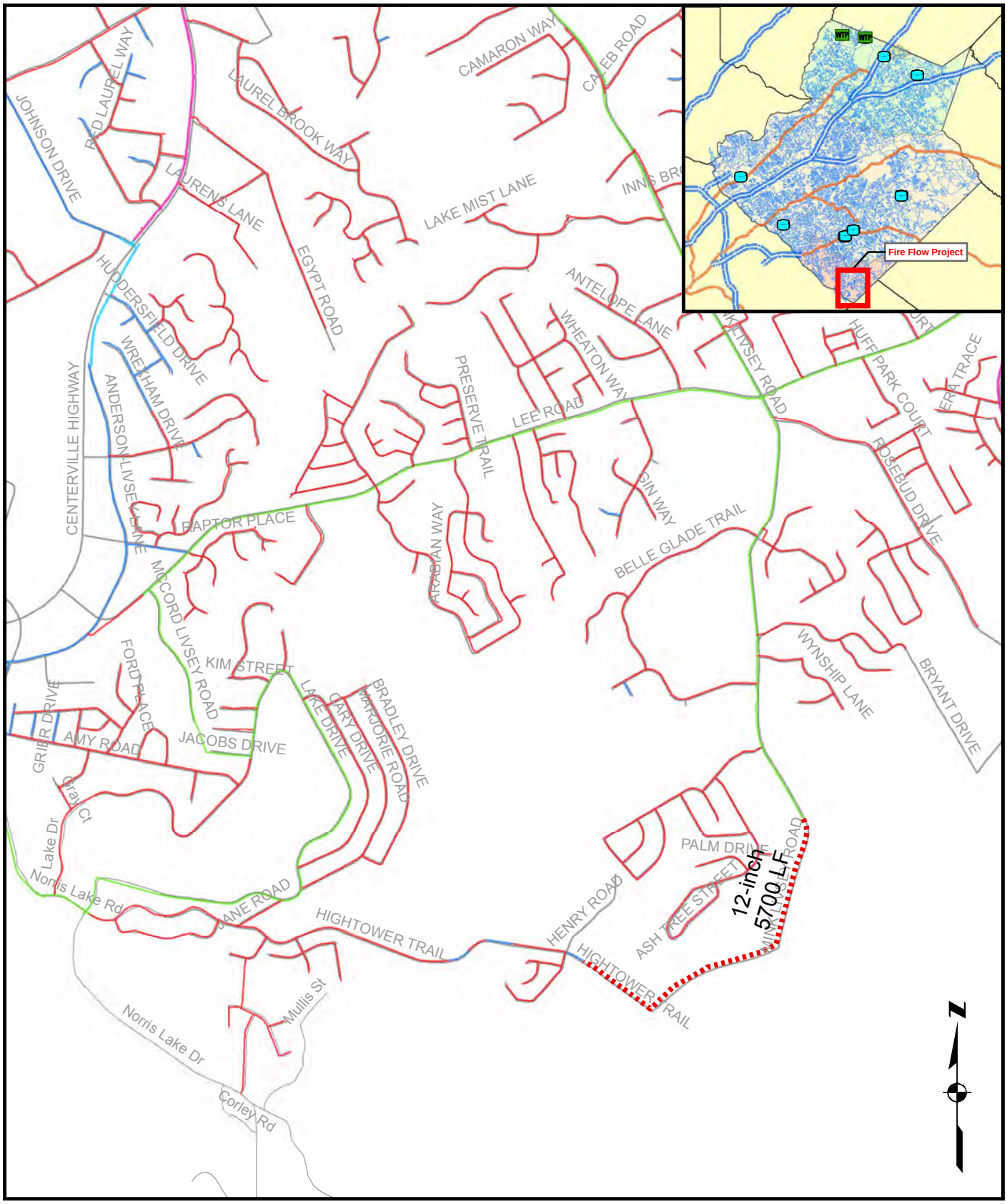
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B13

Fire Flow Project FF.13

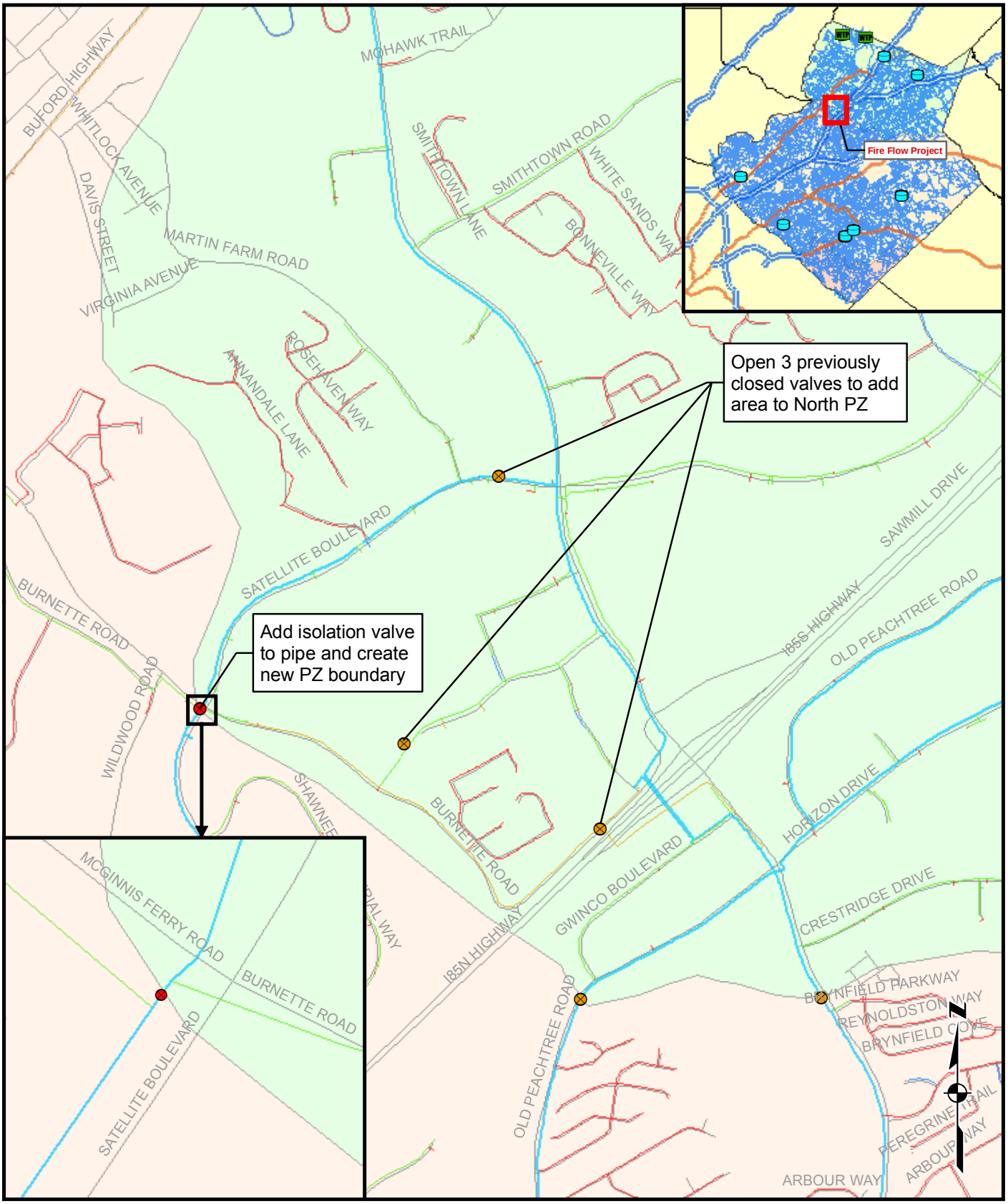
Legend

Fire Flow Project

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78



Gwinnett County 2030 Water & Wastewater Master Plan

Figure TM7.B14

Fire Flow Project FF.14

Legend

Existing Closed Valves

Proposed Closed Valves

Existing Pipes

PIPE SIZE (inch)

6, 8, 10, 12, 14, 16, 20, 24, 30, 36, 42, 48, 54, 60, 72, 78

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AECOM Water
In association with: **JJG & PPI**

Gwinnett County 2030 Water & Wastewater Master Plan

Technical Memorandum 8

Wastewater Collection and Pumping Evaluation and Recommendations

TO:	Todd Cleaver - Gwinnett County Planning & Development	PAGES:	29
SUBJECT:	Gwinnett County 2030 Water & Wastewater Master Plan Technical Memorandum 8 – Wastewater Collection and Pumping Evaluation and Recommendations		
FROM:	Kim Shorter, AECOM		
BY:	Stephanie Gardner		
DATE:	May 11, 2011		

SUMMARY

This Technical Memorandum presents an evaluation of Gwinnett County's wastewater collection and pumping system for the planning period ending in 2030. The evaluation summarizes the existing conditions and key policies for the collection system and provides recommendations to address future flows based on the wastewater modeling and alternatives analysis.

Gwinnett County provides wastewater service to over 146,000 customers and 2 wholesale customers (DeKalb County and the City of Norcross) through a wastewater collection system which includes over 2,600 miles of sanitary sewers, over 250 miles of pressurized force mains, over 200 pump stations and four water reclamation facilities (WRFs). In 2010, the wastewater facilities treated 52.8 MGD on an annual average daily (AAD) basis of which approximately 2 MGD was treated at the DeKalb County Pole Bridge WRF. After decommissioning the Jackson Creek WRF by 2012, Gwinnett County will operate three WRFs and the permitted treatment capacity in 2012 will be a total of 98 MGD in maximum monthly flow (MMF).

The existing wastewater collection system was analyzed using Gwinnett County's hydraulic model, assessing eight wastewater flow scenarios ranging from approximately 55 MGD to104 MGD on an annual average basis, as outlined in TM5 – Distribution and Collection System Models. The model results for each of these scenarios were used to identify system improvements needed to meet the future wastewater flow scenarios. The implementation of recommendations for each projected flow scenario should be supported by actual system data that will "trigger" implementation actions at the appropriate time, rather than a projected year. These data-based triggers will allow Gwinnett County to more accurately plan, design, and implement infrastructure projects.

The models show that there are no major infrastructure improvements needed until flows reach 94 MGD (maximum monthly flow basis). A total of 15 projects, with some projects developed in phases, are

recommended to meet the projected 2030 flow of 104 MGD (maximum monthly flow basis). Two alternative scenarios (six additional projects) that evaluated flow management options are also presented. These system improvements are outlined in more detail in this technical memorandum.

INTRODUCTION

Technical Memorandum 8 (TM8), as part of the Gwinnett County 2030 Water and Wastewater Master Plan, presents a summary of the wastewater collection and pumping system for the 20-year planning horizon and an evaluation of the ability of the system to meet future flows. The evaluation was accomplished using Gwinnett County's SewerGEMS hydraulic model. This TM also presents a list of the projects that will be needed as the system flows increase over the planning period.

This Technical Memorandum is organized in the following sections:

- Existing Wastewater Collection System – This section provides a description of the existing collection and pumping system throughout Gwinnett County and how flows are transported to the WRFs.
- Model Analysis – This section describes the hydraulic model used to evaluate the collection system performance under increasing future wastewater flow scenarios. TM 5 - Distribution and Collection System Modeling provides more details on the wastewater modeling analysis.
- Wastewater Collection System Evaluation – This section presents the performance standards used to evaluate the collection system.
- Proposed Hydraulic Improvement Projects (Flow-based) – This section summarizes recommendations and improvements to meet future flows for the forecasted scenarios.
- Cost Estimate for Recommendations – This section presents the cost estimates for recommendations and the basis for the estimates.
- Conclusion – This section summarizes the wastewater collection system recommendations.

EXISTING WASTEWATER COLLECTION SYSTEM

Gwinnett County provides wastewater service through a system of gravity collection lines, gravity interceptors, pressurized force mains, pump stations and water reclamation facilities (WRFs). As of 2008, the system had over 146,000 customers and 2 wholesale customers (DeKalb County and the City of Norcross). In 2010, the wastewater facilities treated 52.8 MGD on an annual average daily (AAD) basis of which approximately 2 MGD was treated at the DeKalb County Pole Bridge WRF. Figure TM8.1 shows the existing WRFs, wastewater collection interceptors, force mains and key regional pump stations. Figure TM8.2 shows the modeled wastewater collection system and sub-basins in the county.

Gwinnett County provides sewer service to the majority of the County, with the exception of service to the Cities of Braselton and Loganville, and a portion of the City of Buford. The City of Norcross is a wholesale customer of Gwinnett County. The City of Norcross is responsible for maintaining the collection system pipes but pays Gwinnett County for treatment of the collected wastewater.

Figure TM 8.1: Existing Gwinnett County Wastewater Collection System (2012)

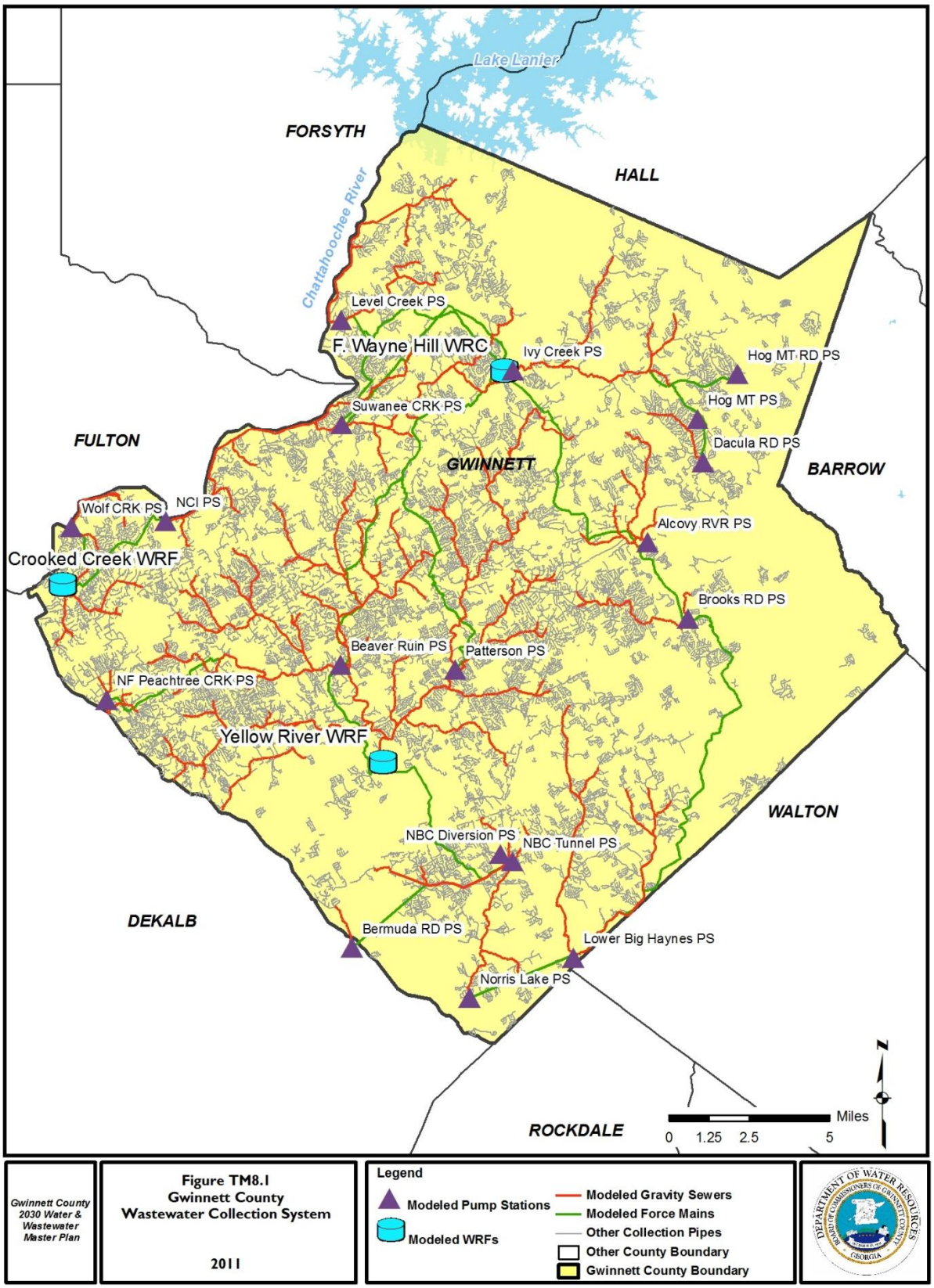
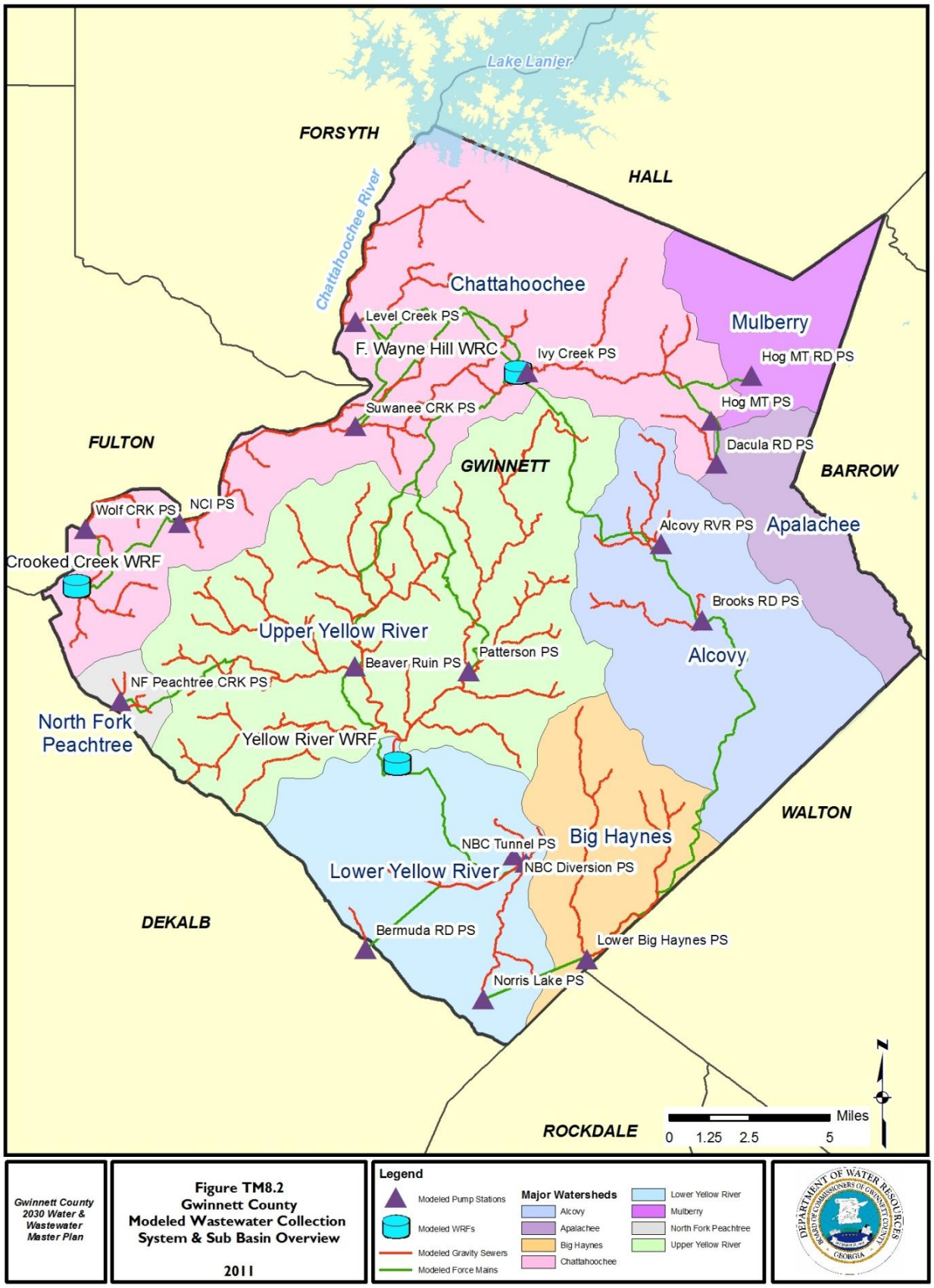


Figure TM 8.2: Modeled Wastewater Collection System and Sub Basin Overview



INTERCEPTORS, COLLECTION LINES, AND FORCE MAINS

The Gwinnett County Department of Water Resources (DWR) maintains over 2,600 miles of sanitary sewers that range from 8 to 72 inches in diameter. These sanitary sewers collect and transfer wastewater to large gravity interceptors which then convey flow to the WRFs. Pump stations and over 250 miles of pressurized force mains, are used as necessary when gravity flow is not enabled by topography. In addition to the sewers and force mains, Gwinnett County completed construction of the No Business Creek (NBC) tunnel in 2010. The NBC Tunnel provides storage and equalization during peak flows which helps to prevent sanitary sewer overflows. The NBC Tunnel is approximately 12 feet in diameter, 3 miles in length, and reaches depths up to 200 feet. The system-wide model includes the interceptor sewer network consisting of approximately 276 miles of gravity pipes 10 inches in diameter and greater, 131 miles of pressurized force mains 14 inches in diameter and greater, and 20 regional pump stations. The systemwide model was limited to this extent was appropriate for this long-range Master Plan and improved the model run time.

PUMP STATIONS

Gwinnett County operates more than 200 active wastewater pump stations and performs regular and preventive maintenance of the wastewater pump stations to reduce the likelihood of a pump failure. Of the total pump stations, 16 pump stations are considered regional pump stations and shown in Table TM8.1. These regional pump stations were the focus of the modeling efforts as part of this Master Plan.

Table TM8.1: Regional Pump Station Details

Pump Station (PS)	Number of Pumps[1]	Simulated Number of Pumps[2]	Simulated Firm Capacity (MGD)[3]	Normal Operation (to this facility)	Alternate Operation (to this facility)	Additional Modeling Information
Alcovy River	3	2	7.3	FWHWRC	YRWRF	During normal operation, the PS pumps through a 36-inch FM to FWHWRC with 1 pump lead, 1 pump lag, and 1 standby pump. Station can pump through 16-inch FM through Patterson PS or to YRWRF.
Beaver Ruin	4 pair (8)	3 pair (6)	30.0	FWHWRC	YRWRF	Station operates on variable frequency drive (VFD) mode holding a wet level of 10-feet. The lead pump runs 24 hours, with the station running a second pump 19 hours a day. Each pump is rated for 10 MGD. Total average daily flow is 14 MGD. All pumps will operate as the flow increases during wet weather events.
Brooks Road	4	2	13.0	FWHWRC		Normal operation is to pump through the booster station[4]. The station is able to pump directly to the plant without using the booster. The model cannot explicitly simulate a booster station; therefore the Brooks Road Booster Station was modeled by adding the booster pump curve to the Brooks Road pump curves (in series).

Table TM8.1: Regional Pump Station Details

Pump Station (PS)	Number of Pumps[1]	Simulated Number of Pumps[2]	Simulated Firm Capacity (MGD)[3]	Normal Operation (to this facility)	Alternate Operation (to this facility)	Additional Modeling Information
Hog Mountain Road	2	2	9.6	CCWRF	-	Pumps to Ivy Creek Interceptor. Normal operation is 1 pump lead, 1 pump lag.
Hog Mountain 1&2	2	2	Unknown	CCWRF	-	Hog Mountain 1 and 2 are two pump stations that act as a single station by pumping in series. Normal operation with 1 pump lead, 1 pump lag. Unknown firm capacity. Pump curves used in the model were supplied by Gwinnett DWR.
Ivy Creek	3	2	15.5	FWHWRC	CCWRF	Pumps to FWHWRC. The PS will bypass to CCWRF if not running. Normal operation is 1 pump lead, 1 pump lag.
Level Creek	4	2	20.0	FWHWRC	CCWRF	Two sets of pumps in series. 1 pump lead, 1 pump lag. Station can pump to FWHWRC using 36-inch FM, also can pump to Suwanee Creek PS using 16-inch FM. Station has VFD on pumps 2 and 3, but not currently used due to low flow. VFD not installed on pumps 1 & 4.
Lower Big Haynes	3 pair (6)	2 pair (4)	12.0	FWHWRC		Normal operation is to pump through the Brooks Road Booster Station. The station is able to pump directly to F. Wayne Hill WRC without the booster. The model cannot explicitly simulate the booster station. Therefore, the Brooks Road Booster Station pump curves were added to the Lower Big Haynes pump curves (in series).
No Business Creek (NBC) Diversion	4	3	11.0	FWHWRC	YRWRF	Pumps to Beaver Ruin. Station has VFD.
NBC Tunnel Pumps	2	2	Unknown	FWHWRC	YRWRF	1 pump lead, 1 pump lag. Specific pump information not available. Pump curves used in the model were supplied by Gwinnett DWR.
Norris Lake	4	3	15.0	FWHWRC (by 2012)		Norris Lake PS currently pumps to DeKalb, but will soon be redirected to Lower Big Haynes pump station.

Table TM8.1: Regional Pump Station Details

Pump Station (PS)	Number of Pumps[1]	Simulated Number of Pumps[2]	Simulated Firm Capacity (MGD)[3]	Normal Operation (to this facility)	Alternate Operation (to this facility)	Additional Modeling Information
North Chatta-hoochee (NCI)	4	3	14.0	CCWRF		Pumps to CCWRF.
North Fork Peachtree Creek	4	3	9.0	FWHWRC	YRWRF	1 pump lead, 1 pump lag. Pumps to Beaver Ruin PS.
Patterson	4	3	16.5	FWHWRC	CCWRF	Patterson PS has a dedicated force main to FWHWRC. Valves in the force main will allow Patterson PS to divert to Suwanee Creek PS.
Suwanee Creek	3 pair (6)	2 pair (4)	12.8	FWHWRC	CCWRF	Suwanee Creek PS pumps to FWHWRC. When it is turned off, flow bypass to the CCWRF via the North Chattahoochee Interceptor (NCI). Station has VFD.
Wolf Creek	4	3	2.5	CCWRF		Pumps to CCWRF.

Source: Based on information provided by Gwinnett DWR, received February 14, 2011.
Note: Gwinnett County's water resource facilities (WRFs) are F. Wayne Hill Water Resource Center (FWHWRC), Yellow River WRF (YRWRF), and Crooked Creek WRF (CCWRF).

1. The number of pumps reflects existing conditions based on information provided by Gwinnett DWR.
2. The model considered one pump or one pair of pumps at each station to be a standby pump.
3. The model considered one pump or one pair of pumps at each station to be a standby pump and therefore the simulated firm capacity does not include the standby pump.
4. For Brooks Road, the booster station provides additional pumping capacity that is needed to address the friction losses in the long forcemain from the Lower Big Haynes pump station.

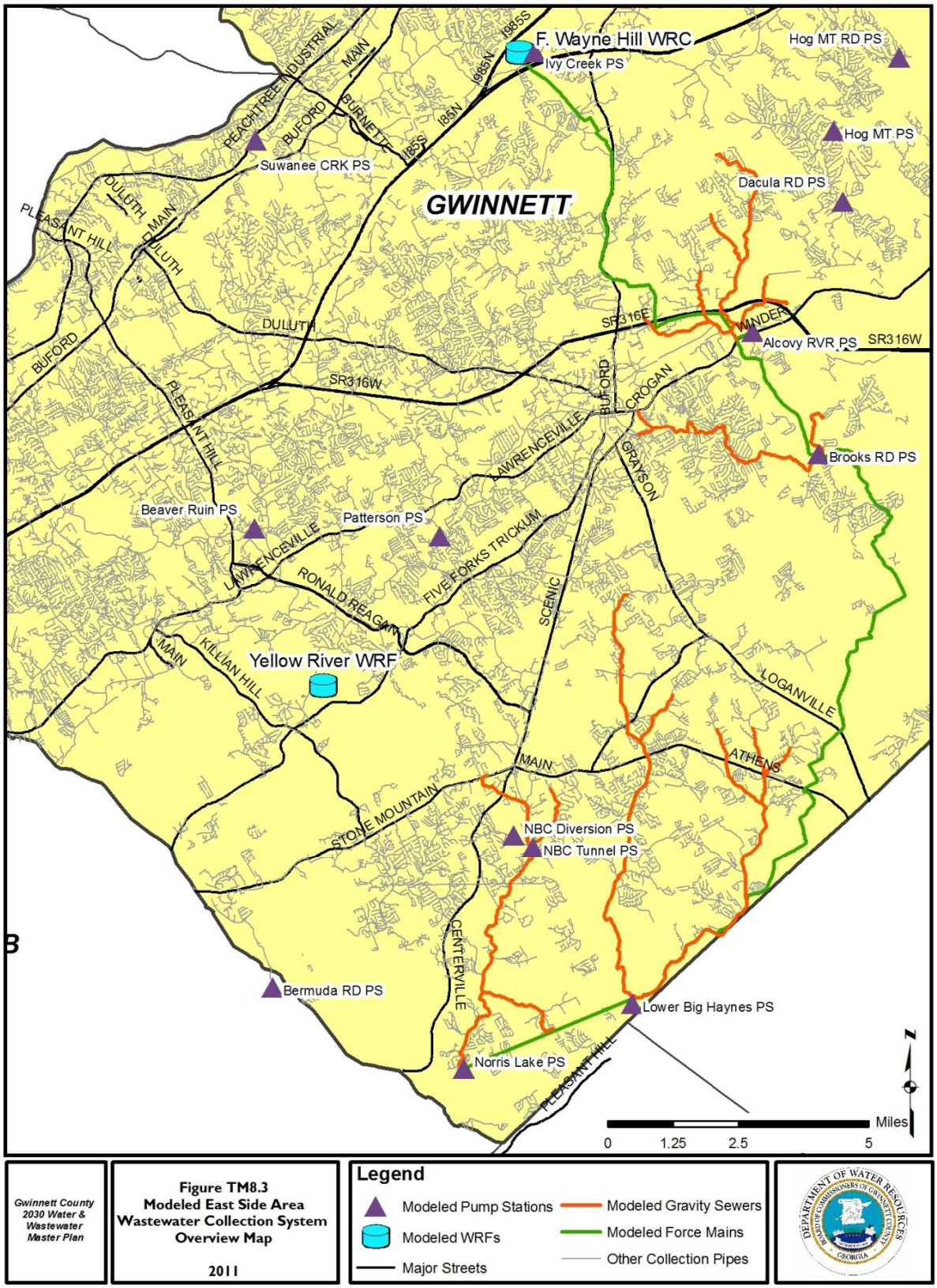
Gwinnett County performs regular and preventive maintenance of the wastewater pump stations to reduce the likelihood of a pump failure. All regional pump stations are connected to the Gwinnett County Supervisory Control and Data Acquisition (SCADA) system and are remotely monitored. Almost all (including all large) pump stations have dual electrical service or standby generators for emergency use. Gwinnett County also maintains small portable generators that can be transported to smaller pump stations during power outages.

COLLECTION SYSTEM

The entire Gwinnett County collection system was modeled using four smaller subareas: East Side Area, West Side Area, South Gwinnett Area, and Central Area. A description and figure for each of these areas are shown below.

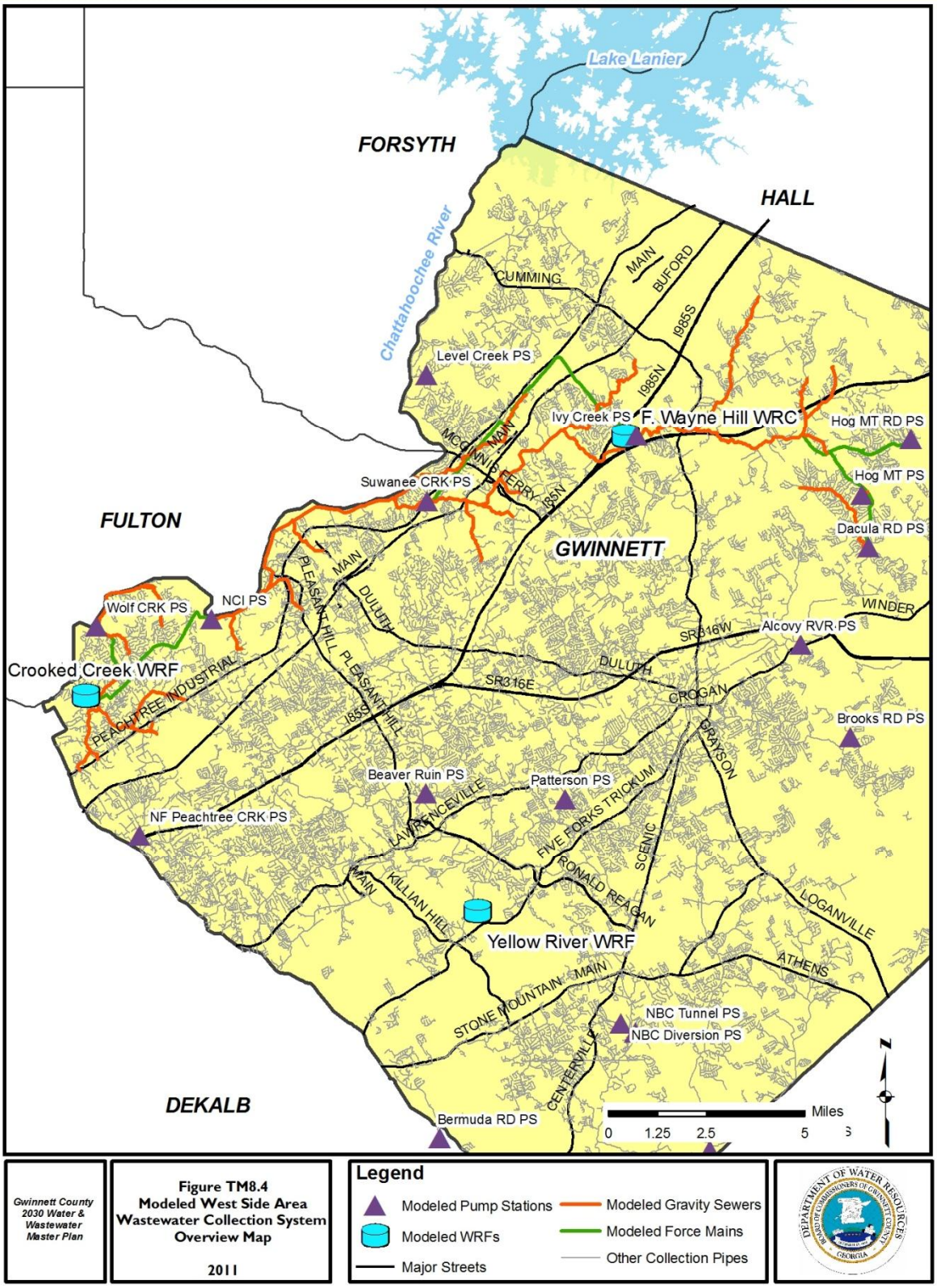
East Side Area: Flows from parts of the Lower Yellow River, Big Haynes and Alcovy sub basins make up the modeled East Side Area of the collection system. Local flows from southern Gwinnett County and flows that bypass the NBC PS are collected at the Norris Lake PS and sent to the Lower Big Haynes PS. Lower Big Haynes also collects local flows from Big Haynes Creek and Brushy Fork and sends flows northeast to the Brooks Road PS. The Brooks Road PS also collects local gravity flows and transfers these flows to the Alcovy River PS, which then collects local flows and sends flows to the F. Wayne Hill WRC. The modeled collection system for the East Side Area can be seen in Figure TM8.3.

Figure TM8.3: Modeled East Side Area Wastewater Collection System Overview Map



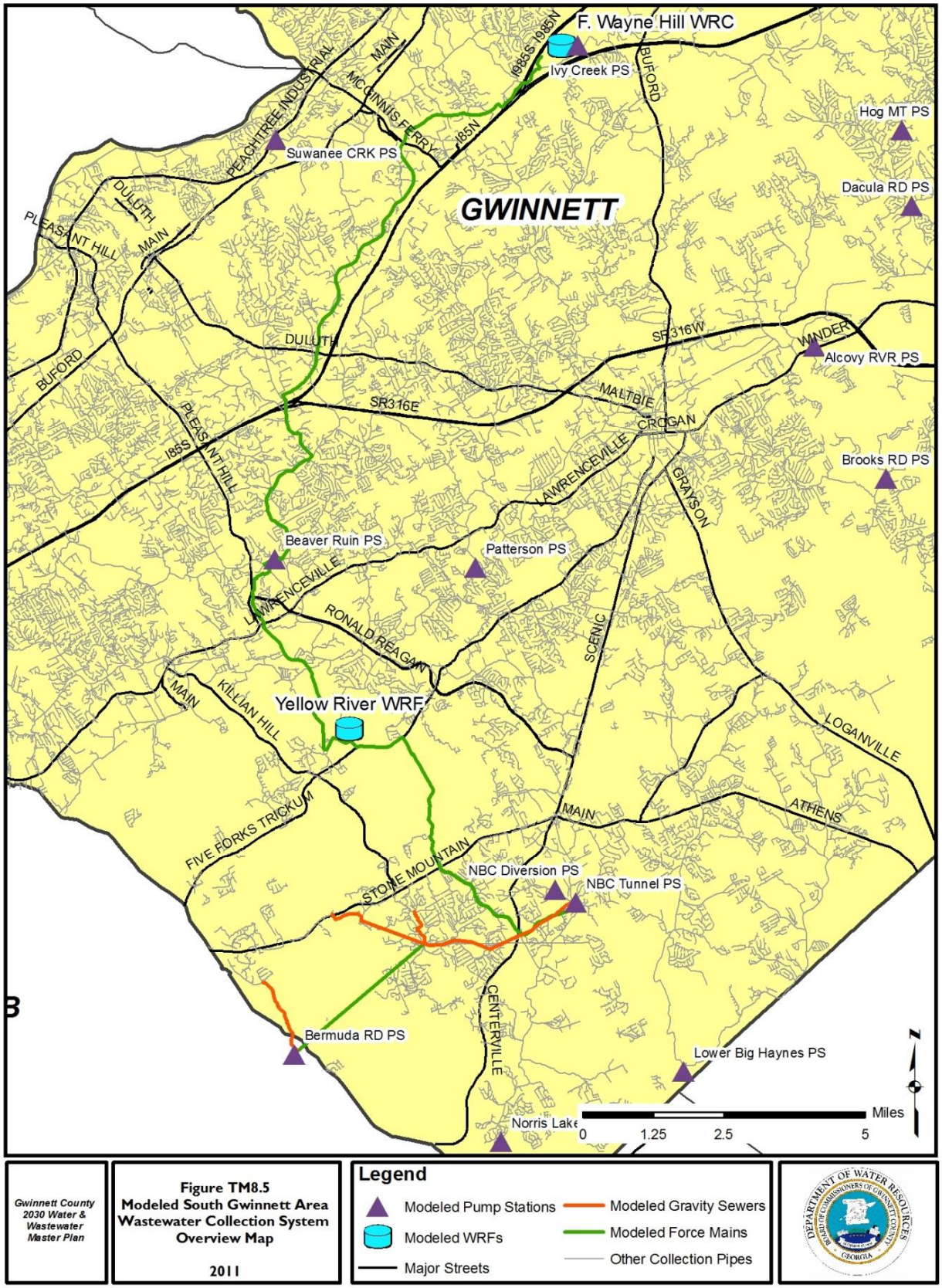
West Side Area: Flows from parts of the Chattahoochee, Mulberry and Apalachee sub basins, shown in Figure TM8.2, make up the modeled West Side Area of the collection system. Local flows in the northern part of Gwinnett County from Hog Mountain PS, Hog Mountain Road PS, Ivy Creek PS (the bypass portion to Suwanee Creek) and Suwanee Creek (the bypass portion to Crooked Creek WRF) are collected at the North Chattahoochee Interceptor (NCI) PS via the NCI. These flows and local flows received at the NCI PS are sent to the Crooked Creek WRF. Wolf Creek PS local flows and local flows that drain into the Crooked Creek WRF are also sent to the Crooked Creek WRF. Local flows from Ivy Creek PS and Suwanee Creek PS are sent to F. Wayne Hill WRC. The modeled collection system for the West Side Area is shown in Figure TM8.4.

Figure TM8.4: Modeled West Side Area Wastewater Collection System Overview Map



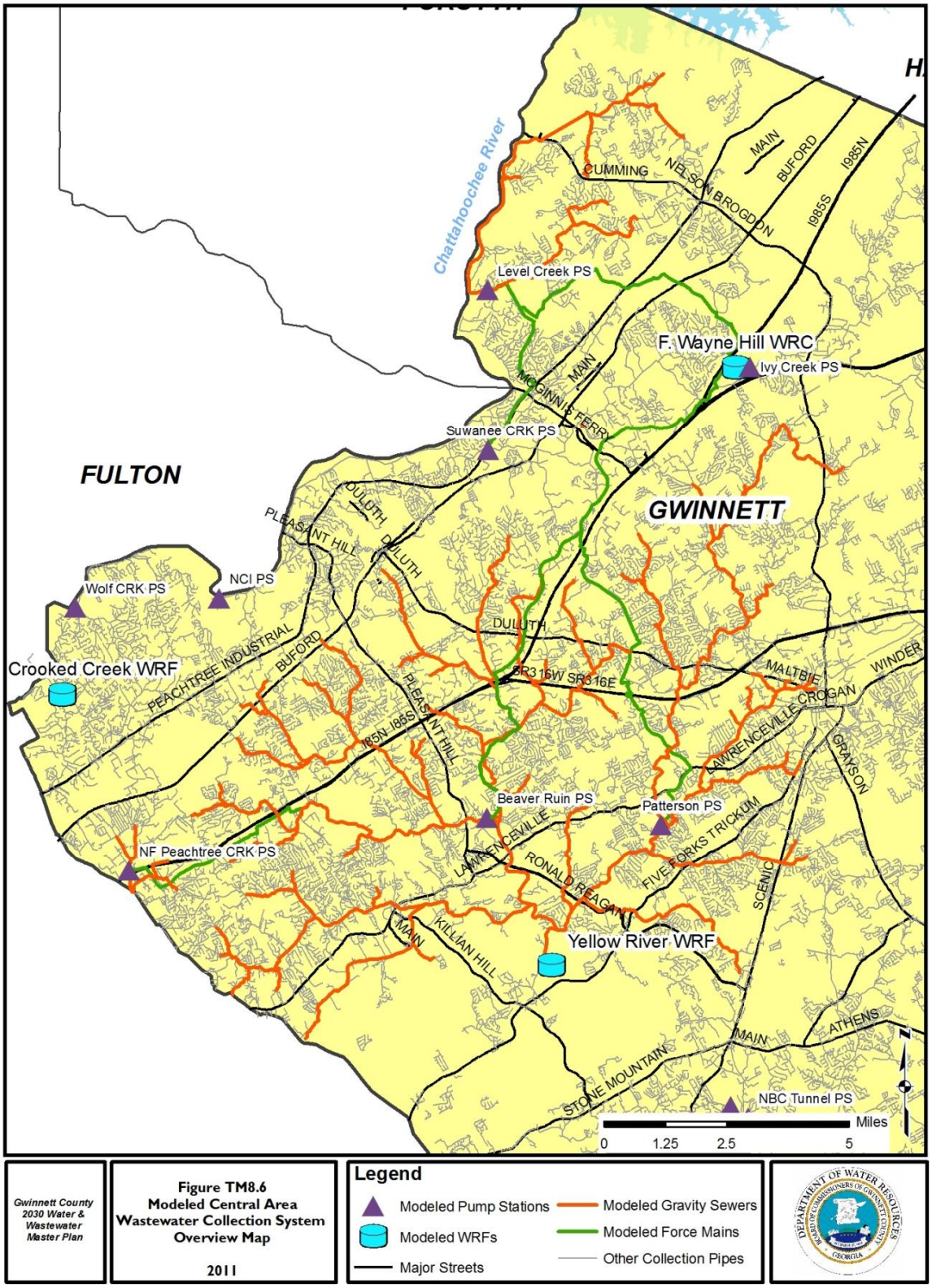
South Gwinnett Area: Flows from parts of the Lower Yellow River sub basin, shown in Figure TM8.2, make up the modeled South Gwinnett Area of the collection system. Flows to Bermuda Road PS are pumped into the NBC Tunnel. The NBC tunnel transports flows to the NBC PS. The diversion at the NBC PS sends local flows and flows from the NBC tunnel northwest to the Beaver Ruin PS which then transfers flows to F. Wayne Hill WRC. The modeled collection system in the South Gwinnett Area is shown in Figure TM8.5.

Figure TM8.5: Modeled South Gwinnett Area Wastewater Collection System Overview Map



Central Area: Flows from parts of the Upper Yellow River and Chattahoochee sub basins, as shown in Figure TM8.2, make up the modeled Central Area of the collection system. Local flows to the Level Creek PS, Patterson PS and Beaver Ruin PS all are transported to the F. Wayne Hill WRC. Bypass flows from the Beaver Ruin PS and gravity flows to Yellow River WRF are sent to the Yellow River WRF. The modeled collection system in the Central Area is shown in Figure TM8.6.

Figure TM8.6: Modeled Central Area Wastewater Collection System Overview Map



MODEL ANALYSIS

A hydraulic model was used to evaluate the performance of the wastewater collection system under current and future wastewater flow conditions. Gwinnett DWR uses a SewerGEMS model for more detailed analysis on specific areas of the system. For master planning purposes, a system-wide SewerGEMS model was completed by incorporating the data used in the individual area models, identifying missing data and filling in the gaps. A system-wide wastewater system model is used to (1) evaluate the available capacity in the existing wastewater collection system under future flow scenarios, (2) evaluate short-term and long-term system improvements, and (3) consider future flow management options (preferred over new infrastructure projects). A more detailed summary of the model analysis is provided in TM 5 - Distribution and Collection System Modeling.

FLOW ALLOCATION

The future wastewater flows are outlined in TM 2 – Summary of Water and Wastewater Forecasts and based on the International Gateway scenario in the Unified Plan. These flows were allocated to specific nodes in the SewerGEMS model based on the following steps:

- Determine the most appropriate input manhole nodes based on the 482 traffic analysis zone (TAZ) areas, generally in the centroid of the TAZ area.
- Assign future wastewater annual average day flows to specific input manholes and apply the diurnal flow pattern.

FLOW SCENARIOS

The annual average day flows presented in TM 2 range from 73 to 104 MGD, based on the planned development identified in the Unified Plan International Gateway scenario. The hydraulic model evaluated a wider range of future flows, including flows lower than the forecasted flows. If growth anticipated in the Unified Plan is not realized or if water conservation efforts are more successful than anticipated, there will be information on the projects needed at these lower flow rates. The flows evaluated include annual average flows of 55, 60, 67, 74, 81, 85, 94, and 104 MGD on an annual average day basis.

These eight annual average day flow scenarios were allocated throughout the system using the methodology described above. The collection system was evaluated for its ability to adequately handle these flows while maintaining a defined set of operating guidelines described in the next section.

WASTEWATER COLLECTION SYSTEM EVALUATION

The hydraulic model was used to evaluate the system performance for each of the flow scenarios shown in Table TM8.4 against specific hydraulic evaluation criteria or operating guidelines. The two evaluation categories are system capacity and flow velocity. If an evaluation criterion was not met, then a proposed system improvement was identified. The operating guidelines include flow management to optimize available system capacity and reduce pumping (and energy consumption), where possible. The wastewater system operating guidelines were developed from past experience along with information provided by Gwinnett County personnel. The wastewater system hydraulic evaluation criteria are described in detail below.

SYSTEM CAPACITY (SURCHARGING)

The collection system capacity was determined to be insufficient if the hydraulic model identified surcharging. Surcharging is defined as the condition in a pipe when the water level exceeds the crown elevation (i.e. the pipe is full). Based on meetings with DWR, surcharging was not considered acceptable for interceptors. When surcharging was identified, interceptor upgrades were simulated until the surcharging was eliminated. In a limited number of instances, surcharging was considered acceptable based on the level of surcharging relative to the depth of the sewer and the overall extent of surcharging. For purposes of the Master Plan, interceptor upgrades were recommended as opposed to parallel or relief sewers; however, both would

accomplish the same goal and should be considered in the preliminary design phase of the system improvements.

In some instances the surcharging was caused by insufficient pumping capacity and not the pipe capacity. The hydraulic capacity at the regional pump stations was determined by reviewing the existing firm capacity for each flow scenario. In general, when the pump station inflows exceeded the pump station's firm capacity, the simulated water levels would increase and cause surcharging upstream of the interceptor system. When this occurred, additional pumping capacity was simulated to eliminate these surcharges. Typically, additional pumps of equal size (to that of the existing station pumps) were evaluated. For purposes of the Master Plan, preliminary design considerations such as sufficient space for additional pumps, wet well volume requirements, intake velocities, pump efficiencies, and energy requirements were not evaluated.

VELOCITY

The focus for this evaluation was on force main velocity. High pipe velocity results in high headloss which leads to high energy loss within a pipe. The higher the energy loss, the more pumping is required and therefore higher energy usage and energy costs. If velocity in the pipe is too low, solids can settle in the force main. Therefore, this evaluation set an acceptable range of a maximum velocity of 8 feet per second (ft/s) for high flows, and a minimum velocity of 3 ft/s[1].

Upgrades were recommended when the pipe velocity exceeded the maximum. If additional pumping capacity at a pump station was required, the maximum force main velocity was compared against the criterion. If velocities exceeded 8 ft/s, upsizing of the force main was evaluated and recommended. The minimum velocities were only evaluated as they related to recommended pump station upgrades to confirm that the additional pumping capacity would not cause an unacceptable low velocity.

FLOW MANAGEMENT

Flow management was also considered in the wastewater system evaluation. Because many interceptors within the Gwinnett County system have considerable reserve capacity, the opportunity for flow diversion was investigated to maximize the existing capacity and minimize the proposed infrastructure cost. Maximizing the use of existing treatment capacity at each of the three wastewater treatment facilities was also part of the overall flow management strategy. Flow management alternatives were also evaluated using the systemwide model.

PROPOSED HYDRAULIC IMPROVEMENT PROJECTS (FLOW BASED)

This section presents the infrastructure improvements required to meet the wastewater system operating guidelines under each of the modeled flow scenarios. The eight modeled flow scenarios range from approximately 55 MGD to 104 MGD on an annual average day basis. Proposed system improvements were recommended for each flow scenario to meet all of the operating guidelines presented in the previous section. A total of 14 discrete collection system improvements (including all of the phases associated with Projects – WC1 to WC13) are recommended by the 104 MGD flow scenarios as shown in Figure TM8.7. The recommended projects (Projects WC1 to WC13) include additional pumping capacity and increases in interceptor sizes throughout the collection system. In addition to the recommended projects, two alternative scenarios were considered. These projects are summarized based on the flows that trigger the need for the additional investment in the collection system.

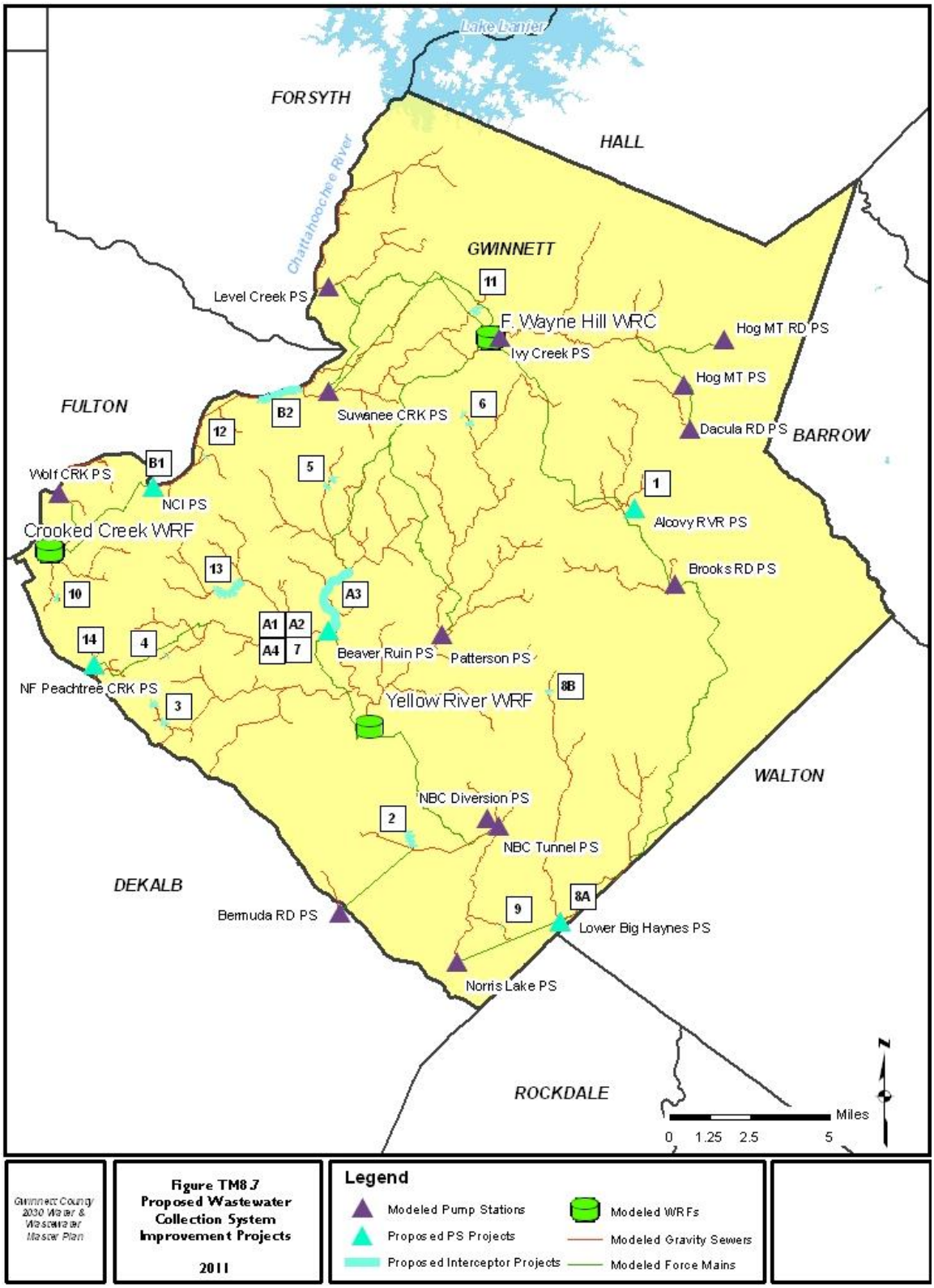
In addition to the recommended projects, 2 alternative scenarios (six recommended projects) were evaluated using the systemwide model. These alternative scenarios are presented following the list of proposed system improvements.

[1] Pump station standards recommend 2.5 ft/s minimum force main velocity, therefore this evaluation is more conservative.

Alternative A includes the upgrades at the Beaver Ruin PS recommended under the 104 MGD scenario earlier, at the 74 MGD scenario. Although the improvements at Beaver Ruin are expected to be difficult due to exsiting underground infrastructure, the pumping increases will be needed. Alternative A includes four projects (Projects WCA1 through WCA4) to provide additional pumping capacity at Beaver Ruin as well as additional force main capacity. This alternative maximizes the flows to FWHWRC, whereas Project WC7 bypasses flows past the Beaver Ruin PS and maximizes the YRWRC.

Alternative B considers the possibility of eliminating pump stations to save long-term energy costs. In this scenario, Suwanee PS is not used and wastewater would flow by gravity to the Crooked Creek WRF instead of being pumped to F. Wayne Hill WRC. With Alternative B, the total number of regional pump stations would be reduced, however, two new projects (Project B1 and B2) would be required in addition to the proposed system improvements (Projects WCA1 through WCA4 from Alternative A, Projects WC1 through WC6 and WC8 through WC13 from the recommended projects) to meet the future wastewater flows. Alternative B is not recommended, as the elimination of a pump station increases the number of proposed system improvements and removes the flexibility of the Suwanee PS to send flows to F. Wayne Hill WRC.

Figure TM8.7: Proposed Wastewater Collection System Improvement Projects



PROPOSED SYSTEM IMPROVEMENTS: 55 MGD, 60 MGD, 67 MGD, 74 MGD, 81 MGD, 85 MGD FLOW SCENARIOS

The existing wastewater collection system adequately meets the 55 MGD, 60 MGD, 67 MGD, 74 MGD, 81 MGD, and 85 MGD flow scenarios as modeled. No new infrastructure improvements are needed.

PROPOSED SYSTEM IMPROVEMENTS: 94 MGD FLOW SCENARIO

Six system improvements are recommended in the 94 MGD flow scenario. Table TM8.2 lists the recommended system improvements.

Table TM8.2: 94 MGD Flow Scenario Recommended System Improvements

Project ID	Description	Diameter (in.)	Approximate Length (ft)	Other
WC1	Additional pumping capacity at Alcovy River PS	N/A	N/A	Pumping capacity increased from 7.3 to 10 MGD
WC2	Increase pipe size from existing 10-inch to 12-inch pipe and existing 10-inch to 15-inch at Jacks Creek Interceptor	12/15	2,500/1,000	
WC3	Increase pipe size from existing 10-inch to 12-inch pipe and existing 12-inch to 15-inch pipe at Jackson Creek Interceptor	12/15	1,200/1,200	
WC4	Increase pipe size from existing 8-inch to 12-inch at the interceptor flowing east into the Beaver Ruin PS	12	370	
WC5	Increase pipe size from existing 10-inch to 12-inch at the interceptor flowing south into the Beaver Ruin PS	12	1,570	
WC6	Increase pipe size from existing 12-inch to 15-inch and existing 15-inch to 18-inch at the interceptor flowing south into the Patterson PS	15/18	390/760	

Project WC1

Under the 94 MGD flow scenario, the model simulates surcharging at the interceptor flowing east into the Alcovy River PS. Increasing the pumping capacity from 7.3 MGD to 10 MGD at the Alcovy River Pump Station will adequately meet the 94 MGD flow scenario.

Project WC2

Modeling the 94 MGD flow scenario results in surcharging at the gravity pipelines that flow south into the Jacks Creek interceptor. The recommended system improvement involves increasing the pipe size from an existing 10-inch pipe to a 12-inch pipe for about 620 linear feet. However, under the 104 MGD flow scenario, a total of 2,500 linear feet would need to be increased from the existing 10-inch to a 12-inch pipe that includes the 620 linear feet needed under the 94 MGD flow scenario. In the same area, an additional 1,000 feet of existing 10-inch pipe is recommended to be replaced with 15-inch pipe. To avoid repetitive disruption to the public associated with the pipeline replacement and to potentially achieve a better unit cost for the pipeline replacement, completing the entire pipe replacement needed in this area is recommended at the 94 MGD flow scenario.

Project WC3

The 94 MGD flow scenario simulation results in surcharging at the Jackson Creek interceptor. The recommended system improvements include increasing the pipe size from a 10-inch pipe to a 12-inch pipe for about 1,200 linear feet near Boyette Drive NW which ties into an existing 12-inch pipe downstream and increasing the existing 12-inch pipe to a 15-inch pipe for about 710 linear feet near Britt Road NW to tie into an existing 15-inch pipe downstream.

However, the Jackson Creek Interceptor also surcharges at the 104 MGD flow scenario. Similar to Project WC2, it is recommended that the projects needed to meet the 104 MGD flow scenario are constructed at the 94 MGD trigger, which would meet the need for both flow scenarios and minimize the repetitive disruptions. The recommended system improvements involve increasing the pipe size from an existing 10-inch to a 12-inch pipe for about 1,200 linear feet and from an existing 12-inch to a 15-inch pipe for about 1,200 linear feet.

Project WC4

Surcharging is also simulated at the interceptor flowing east into the Beaver Ruin PS. The recommended system improvement involves increasing the pipe size from an existing 8-inch pipe to a 12-inch pipe for about 370 linear feet. This project is located between Live Oak Parkway, Oakbrook Drive NW, and Hampton Ridge Road.

Project WC5

Surcharging occurs at the interceptor flowing south into the Beaver Ruin PS for the 94 MGD flow scenario. The recommended system improvement involves increasing the pipe size from an existing 10-inch pipe to a 12-inch pipe for about 1,570 linear feet. The project is located just north and south of Sugarloaf Club Drive near the intersection with Thurleston Lane.

Project WC6

Surcharging also is seen at the interceptor flowing south into the Patterson PS for the 94 MGD flow scenario. The recommended system improvements include increasing the pipe size from an existing 12-inch pipe to a 15-inch pipe for about 390 linear feet just east of Falcon Creek Drive NW to join the existing 15-inch diameter pipe. In addition, it is recommended to increase the pipe size from an existing 15-inch to an 18-inch pipe for about 760 linear feet at a location approximately 1,500 feet south of the first project.

PROPOSED SYSTEM IMPROVEMENTS: 104 MGD FLOW SCENARIO

Nine system improvements are recommended to adequately meet the anticipated flows associated with the 104 MGD flow scenario. When the system flows reach 104 MGD, all of the 14 projects (Project WC1 to Project WC13) in this TM will be needed to meet the future annual average day flow in the Gwinnett County wastewater collection system.

Table TM8.3: 104 MGD Flow Scenario Recommended System Improvements

Project ID	Description	Diameter (in.)	Approximate Length (ft)	Other
WC7	Increase pumping capacity at Beaver Ruin PS	N/A	N/A	Pumping capacity increased from 30 to 40 MGD
WC8A	Increase pumping capacity at Lower Big Haynes PS	N/A	N/A	Pumping capacity increased from 12 to 16 MGD

Table TM8.3: 104 MGD Flow Scenario Recommended System Improvements				
WC8B	Increase pipe size from existing 12-inch to 15-inch pipe at Lower Big Haynes Interceptor	15	690	
WC9	Increase pipe size from existing 8-inch to 10-inch pipe at interceptor flowing west into the Norris Lake PS	10	230	
WC10	Increase pipe size from existing 8-inch to 12-inch pipe at the interceptor flowing north into the Crooked Creek WRF	12	710	
WC11	Increase pipe size from existing 24-inch to 30-inch pipe at the interceptor flowing south into the Suwanee PS	30	1,720	
WC12	Increase pipe size from existing 15-inch to 18-inch pipe at the interceptor flowing southwest into the NCI PS	18	250	
WC13	Increase pumping capacity at North Fork Peachtree PS	N/A	N/A	Pumping capacity increased from 7.3 to 10 MGD

Project WC7

The Beaver Ruin inflow interceptor surcharges under the 104 MGD flow scenario; therefore an increase in the capacity from 30 MGD to 40 MGD is recommended. The timing and capacity of this project is based on bypassing a portion of the flows to the Beaver Ruin PS, allowing them to flow by gravity to the Yellow River WRF. Bypassing flows to the Beaver Ruin PS delays the increase in capacity from 74 MGD to 104 MGD flow scenario. The upgrades to the Beaver Ruin PS are expected to be difficult due to the dense development and underground infrastructure in this area, so delaying construction is preferred over Alternative A presented later. As outlined in the South Gwinnett Facility Plan, upgrades to the Sweetwater Creek trunk sewer may be required.

Project WC8A

Modeling the 104 MGD flow scenario results in surcharging at the Lower Big Haynes Interceptor. The recommended system improvements involve increasing the pumping capacity from 12 MGD to 16 MGD at the Lower Big Haynes Creek PS.

Project WC8B

Modeling the 104 MGD flow scenario results in surcharging at the Lower Big Haynes Interceptor just south of Hillside Drive SW. The recommended system improvements involve increasing the pipe size from an existing 12-inch to a 15-inch pipe for about 690 linear feet.

Project WC9

The 104 MGD flow scenario results in surcharging at the interceptor flowing west into the Norris Lake PS near Hapsburg Court SW. The recommended system improvement involves increasing the pipe size from an existing 8-inch to a 10-inch pipe for about 230 linear feet.

Project WC10

The interceptor northwest of Peachtree Industrial Boulevard and parallel to Bay Colony Drive SE that flows north into the Crooked Creek WRF also surcharges at the 104 MGD flow scenario. The recommended system improvement involves increasing the pipe size from an existing 8-inch to a 12-inch pipe for about 710 linear feet.

Project WC11
The interceptor flowing south into the Suwanee PS surcharges at the 104 MGD flow scenario. The recommended system improvement involves increasing the pipe size from an existing 24-inch to a 30-inch pipe for about 1,720 linear feet.

Project WC12
The interceptor flowing southwest into the NCI PS also experiences surcharging at the 104 MGD flow scenario. The recommended system improvement involves increasing the pipe size from an existing 15-inch to an 18-inch pipe for about 250 linear feet just southwest of the intersection of Peachtree Industrial Boulevard and Pleasant Hill Road.

Project WC13
Modeling the 104 MGD flow scenario results in surcharging at the North Fork Peachtree inflow interceptor. The recommended system improvements involve increasing the pumping capacity from 7.3 MGD to 10 MGD at the North Fork Peachtree Creek PS. This pump station is located near the intersection of Button Gwinnett Drive NW and Crescent Drive NW and to the west of I-85.

ALTERNATIVE PROJECT DESCRIPTIONS
As previously described, two scenarios were modeled with a focus on flow management; Alternative A postpones upgrades to the Beaver Ruin PS and Alternative B maximizes gravity flows by eliminating a regional PS. Both scenarios are outlined in greater detail below with the projects shown in Table TM8.4.

- Alternative A recommends upgrades to the Beaver Ruin PS at the 74 MGD flow scenario. The Beaver Ruin PS upgrades are expected to be difficult and expensive to implement due to the densely developed area with existing underground infrastructure, which is why this project was not recommended. Upgrades in pumping capacity, however will still be needed. Gwinnett County may consider Alterantive A (Projects WCA1 to WCA3 and WCA4) instead of Project WC7 depending on conditions when this project is needed. Alternative A maximizes flows to the FWHWRC.
- Alternative B considers the possibility of eliminating pump stations to save long-term energy costs. Alternative B maximizes the flows to the Crooked Creek WRF by mothballing[2] the existing Suwanee Pump Station and allowing wastewater to flow by gravity to the Crooked Creek WRF. Upgrades to the NCI Pump Station are needed (Projects WCB1 and WCB2) to convey flows to Crooked Creek that currently flow to the F. Wayne Hill WRC in addition to the recommended projects and Alternative A, listed above. For this alternative at the 104 MGD scenario, the average daily flows at the F. Wayne Hill WRC are almost 70 MGD, the average daily flows at the Crooked Creek WRF are almost 20 MGD, and the average daily flows at the Yellow River WRF are approximately 12 MGD. Alternative B is not recommended, as the elimination of a pump station increases the number of proposed system improvements and removes the flexibility of the Suwanee PS to send flows to F. Wayne Hill WRC.

[2] Mothballing refers to the closure of the pump station with the option to bring the station back into service if needed

Table TM8.4: Alternative System Improvements

Flow Scenario (MGD)	Project ID	Description	Diameter (in.)	Approximate Length (ft)	Other
Alternative A (Maximizing flows to FWHWRC)					
74	WCA1	Additional pumping capacity at Beaver Ruin PS	N/A	N/A	Pumping capacity increased from 30 to 35 MGD
81	WCA2	Additional pumping capacity at Beaver Ruin PS	N/A	N/A	Pumping capacity increased from 35 to 45 MGD
	WCA3	Increase 36-inch force main from the Beaver Ruin station to 42-inch	42	13,500	
	WCA4	Additional pumping capacity at Beaver Ruin PS	N/A	N/A	Pumping capacity increased from 45 to 50 MGD
Alternative B (PS Elimination Scenario)					
104	WCB1	Increase pumping capacity at NCI PS	N/A	N/A	Pumping capacity increased from 14 to 25 MGD
	WCB2	Increase pipe size from existing 30-inch to 36-inch and 36-inch to 42-inch at NCI	36/42	3,400/4,100	

Alternative A: Maximizing flows to FWHWRC

Project WCA1

Under the 74 MGD flow scenario, the model results simulate surcharging at the interceptor flowing east into the Beaver Ruin PS. Increasing the pumping capacity at the Beaver Ruin PS from 30 MGD to 35 MGD will address the surcharging and meet the 74 MGD flow. The upgrades to the Beaver Ruin PS are expected to be challenging given the interconnections of this pump station within the collection system. The South Gwinnett Facility Plan recommended a new PS and a new forcemain instead of upgrades to the existing PS. The new infrastructure will require easement acquisition and cause disruptions to the community (i.e. road closures, etc.) and also will be tricky given the proximity to the floodplain and utility conflicts with the density of this portion of Gwinnett County.

Project WCA2

Project WCA2 is a continuation of Project WCA1 to meet the increased flows at the Beaver Ruin PS. The first phase of the recommended improvement (Project WCA1) included additional pumping capacity at the Beaver Ruin PS. Modeling the 81 MGD flow scenario results in surcharging at the interceptor flowing east into the Beaver Ruin PS. This phase of the project would increase pumping capacity at the Beaver Ruin PS. Depending on the rate of growth, Projects WCA1 and WCA2 may both be completed at the 74 MGD flow

scenario. The additional pumping capacity is also recommended in the South Gwinnett Facility Plan[3], which recommends constructing a new pump station, abandoning the existing Beaver Ruin PS, and installation of a parallel force main.

Project WCA3

Modeling the 81 MGD flow scenario results in surcharging at the Beaver Ruin inflow interceptor. The recommended system improvement includes replacing the current 36-inch force main leaving the pump station with a 42-inch force main for a total of 13,500 feet.

Project WCA4

Project WCA4 is a continuation of Projects WCA1 and WCA2 to meet the increased flows at the Beaver Ruin PS. Under the 94 MGD flow scenario, the model results simulate surcharging at the Beaver Ruin inflow interceptor. Increasing the pumping capacity at the Beaver Ruin PS from 45 MGD to 50 MGD will accommodate the projected flows. Depending on the rate of growth, it may be prudent to combine Projects WCA1, WCA2, and WCA4.

Alternative B: Pump Station Elimination Scenario

Project WCB1

Modeling the 104 MGD flow scenario for Alternative B results in surcharging at the interceptor from the Suwanee PS to the NCI PS. The recommended system improvements involve increasing the NCI PS pumping capacity from 14 to 25 MGD to pump additional flows to the Crooked Creek WRF.

Project WCB2

The interceptor from the Suwanee PS to the NCI PS surcharges at the 104 MGD flow scenario. The recommended system improvements involve increasing the pipe size from a 30-inch to 36-inch for 3,400 feet and from 36-inch to 42-inch for 4,100 feet.

COST ESTIMATE FOR RECOMMENDATIONS

The cost estimates for the recommended improvement projects are shown in Table TM8.5. The collection system projects include additional conveyance and pumping capacity. The unit costs for different pipe diameters are presented in Table TM8.6. The unit cost for pump station upgrades was estimated at $0.50/gallon for increases in capacity less than 10 MGD, and $0.15 for all other increases in pump station capacity. The unit costs were based on recent project costs in Gwinnett County and the metropolitan Atlanta area and input from Gwinnett DWR. A 25% contingency was added to the calculated cost to account for the planning level nature of these estimates.

[3] *South Gwinnett Facility Plan*. CH2M Hill. May 2009.

Table TM8.5: Cost Estimates for Recommendations

Flow Scenario (MGD)	Project ID	Cost[1,2,3]
94	WC1	$1,687,500
	WC2	$1,646,250
	WC3	$1,215,000
	WC4	$166,250
	WC5	$707,500
	WC6	$698,750
104	WC7	$1,875,000
	WC8A	$2,500,000
	WC8B	$441,250
	WC9	$117,500
	WC10	$365,000
	WC11	$1,565,000
	WC12	$180,000
	WC13	$3,125,000
Alternate 1: Maximizing flows to FWHWRC		
74	WCA1	$3,125,000
81	WCA2	$6,250,000
	WCA3	$10,323,750
94	WCA4	$3,125,000
Alternate 2: PS Elimination Scenario		
104	WCB1	$2,062,500
	WCB2	$7,732,500

Notes:
1. A planning level contingency of 25% was added to the cost.
2. The cost was based on previous project costs and professional judgment.
3. Costs are presented in 2010 dollars.

Table TM8.6: Pipeline Unit Costs

Pipe Diameter (inches)	2010 Unit Cost (per linear foot)
8	$112.48
10	$122.45
12	$132.46
16	$160.84
24	$186.51
30	$237.24
36	$282.86
42	$366.27
48	$435.55
54	$574.13
60	$946.56
72	$1,712.23

The total cost for the collection system projects shown in Table TM8.5 are expected to cost approximately $22 million if the development patterns follow the Unified Plan International Gateway scenario.

CONCLUSION

The Gwinnett County wastewater collection system was analyzed for its ability to effectively support a range of future wastewater flow scenarios ranging from 55 MGD to 104 MGD. The model shows that no major collection system improvements are needed until the systemwide flows reach the 94 MGD flow scenario.

The recommended system improvements were developed using the existing Gwinnett County SewerGEMS hydraulic model, updated as described in TM5 – Distribution and Collection System Modeling. The projected flow scenarios were identified as needed to maintain the defined operating criteria (e.g. system capacity, velocity, and flow management). This evaluation identified 15 projects that would be needed for the collection system to effectively and efficiently meet the future flows. Two alternative scenarios were also evaluated that include different flow management options. Table TM8.8 presents a summary of all the recommended system improvement projects, which are also shown in Figure TM8.7.

Depending on the projects impelmeted by the 104 MGD flow scenario, the flows will vary for each fo the WRFs. A summary of the flows for the recommended projects, Alternative A, and Alternative B are shown in Table TM8.7.

Table TM8.7: Average Annual Daily Flow Estimates to FWHWRC, CCWRF, YRWRF at the 104 MGD Flow Scenario

Project	FWHWRC (MGD)	CCWRF (MGD)	YRWRF (MGD)
Recommended Projects: WC1 through WC13	69.2	12.5	18.6
Alternative A: Maximizing flow to FWHWRC (Projects WCA1 through WCA4Projects WC1 through WC6, WC8 through WC14)	75.4	12.5	11.7
Alternative B: PS Elimination Scenario (Projects WCB1 and WCB2, Projects WCA1 through WCA4, Projects WC1 through WC6, WC8 through WC13)	69.7	19.3	11.7

Table TM8.8: Summary of Recommended System Improvements by Flow Scenario

Flow Scenario (MGD)	Project ID	Recommended Improvement Type	Diameter (in.)	Approximate Length (ft)
94	WC1	Increase pumping capacity at Alcovy River Pump Station from 7.3 MGD to 10 MGD	N/A	N/A
	WC2	Increase pipe size from existing 10-inch to 12-inch pipe and existing 10-inch to 15-inch at Jacks Creek Interceptor	12/15	2,500/1,000
	WC3	Increase pipe size from existing 10-inch to 12-inch pipe and existing 12-inch to 15-inch pipe at Jackson Creek Interceptor	12/15	1,200/1,200
	WC4	Increase pipe size from existing 8-inch to 12-inch into the Beaver Ruin PS	12	370
	WC5	Increase pipe size from existing 10-inch to 12-inch into the Beaver Ruin PS	12	1,570
	WC6	Increase pipe size from existing 12-inch to 15-inch and existing 15-inch to 18-inch into the Patterson PS	15/18	390/760
104	WC7	Increase pumping capacity at Beaver Ruin Pump Station from 30 MGD to 40 MGD	N/A	N/A
	WC8A	Increase pumping capacity at Lower Big Haynes Pump Station from 12 MGD to 16 MGD	N/A	N/A
	WC8B	Increase pipe size from existing 12-inch to 15-inch pipe at Lower Big Haynes Interceptor	15	690
	WC9	Increase pipe size from existing 8-inch to 10-inch pipe into the Norris Lake PS	10	230
	WC10	Increase pipe size from existing 8-inch to 12-inch pipe into the Crooked Creek WRF	12	710
	WC11	Increase pipe size from existing 24-inch to 30-inch pipe into the Suwanee PS	30	1,720
	WC12	Increase pipe size from existing 15-inch to 18-inch pipe at the North Chattahoochee Interceptor (NCI) PS	18	250
	WC14	Increase pumping capacity at North Fork Peachtree Pump Station from 9 MGD to 14 MGD	N/A	N/A
Alternative A				
74	WCA1	Increase pumping capacity at Beaver Ruin Pump Station from 30 MGD to 35 MGD	N/A	N/A

Table TM8.8: Summary of Recommended System Improvements by Flow Scenario				
81	WCA2	Increase pumping capacity at Beaver Ruin Pump Station from 35 MGD to 45 MGD	N/A	N/A
	WCA3	Increase 36-inch force main out of Beaver Ruin Pump Station with 42-inch	42	13,500
94	WCA4	Increase pumping capacity at Beaver Ruin Pump Station from 45 MGD to 50 MGD	N/A	N/A
Alternative B				
104	WCB1	Increase NCI Pump Station pumping capacity from 14 MGD to 25 MGD	N/A	N/A
	WCB2	Increase pipe size from existing 30-inch to 36-inch and 36-inch to 42-inch at NCI Interceptor	36/42	3,400/4,100

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AECOM Water
In association with: **JJG & PPI**

Gwinnett County 2030 Water & Wastewater Master Plan

Technical Memorandum 9

Water Reclamation and Discharge Evaluation

TO:	Todd Cleaver - Gwinnett County Planning & Development	PAGES:	15
SUBJECT:	Gwinnett County 2030 Water & Wastewater Master Plan Technical Memorandum 9 – Water Reclamation and Discharge Evaluation		
FROM:	Kim Shorter, AECOM		
BY:	Vineeth Panicker, AECOM		
DATE:	May 11, 2011		

SUMMARY

This Technical Memorandum (TM) provides an overview of existing wastewater treatment facilities within Gwinnett County and an evaluation of long-term requirements for the treatment of wastewater generated within Gwinnett County. This memorandum also presents a review of existing and future regulatory and policy requirements related to wastewater treatment.

Gwinnett County currently owns and operates four wastewater treatment facilities. By year 2012, Gwinnett County plans to consolidate to three wastewater treatment facilities with a combined total permit capacity of 98 MGD on a maximum monthly flow (MMF) basis. The wastewater flow forecasts presented in TM2 – Summary of Water and Wastewater Forecasts, indicate that Gwinnett County may need approximately 16 MGD of additional treatment capacity on a maximum monthly basis to meet the anticipated 2030 flows.

In addition to the need for additional capacity within the planning horizon, future regulatory requirements and/or more stringent effluent discharge limits may trigger future upgrades to existing treatment facilities.

INTRODUCTION

Technical Memorandum 9, as part of the Gwinnett County 2030 Water and Wastewater Master Plan, summarizes the wastewater treatment projects that may be needed within the 20-year planning horizon. The wastewater flows presented in this TM are based on Technical Memorandum 2 – Summary of Water and Wastewater Forecasts.

This Technical Memorandum provides a summary of Gwinnett County's existing wastewater treatment system and provides guidance for projects that may be needed to meet forecasted wastewater flow flows and potential regulatory requirements. In January 2011, the Master Planning Team visited Gwinnett County's three major water reclamation facilities: F. Wayne Hill Water Resources Center (FWHWRC), Yellow River Water

Reclamation Facility (YRWRF), and Crooked Creek Water Reclamation Facility (CCWRF). The Master Planning Team also met with WRF superintendents to understand future needs at each facility from the operations perspective. The information provided background for this document.

This TM is organized in the following sections:

- Existing Water Reclamation Facilities – this section summarizes the existing Water Reclamation Facilities in Gwinnett County.
- Regulatory and Policy Considerations – this section summarizes existing policies and outlines future policy considerations.
- Future Water Reclamation Recommendations – this section summarizes recommendations and improvements to address operating efficiency, meeting future forecasted flows and expected regulatory requirements.
- Conclusion – this section summarizes the findings and recommendations.

EXISTING WATER RECLAMATION FACILITIES

The Gwinnett County Department of Water Resources (DWR) currently owns and operates four water reclamation facilities; FWHWRC, CCWRF, YRWRF and Jackson Creek WRF. The Jackson Creek WRF is scheduled to be decommissioned after the completion of the current upgrade at the YRWRF, which is scheduled to be completed by 2012. Gwinnett County will operate three wastewater treatment plants after decommissioning the Jackson Creek WRF.

Figure TM9.1 shows the location of these treatment facilities. In 2010, these wastewater facilities treated 50.8 MGD on an annual average basis of which approximately 2 MGD was treated at the DeKalb County Pole Bridge WRF. Gwinnett County currently has an agreement with DeKalb County to divert up to 5 MGD of wastewater for treatment by DeKalb County.

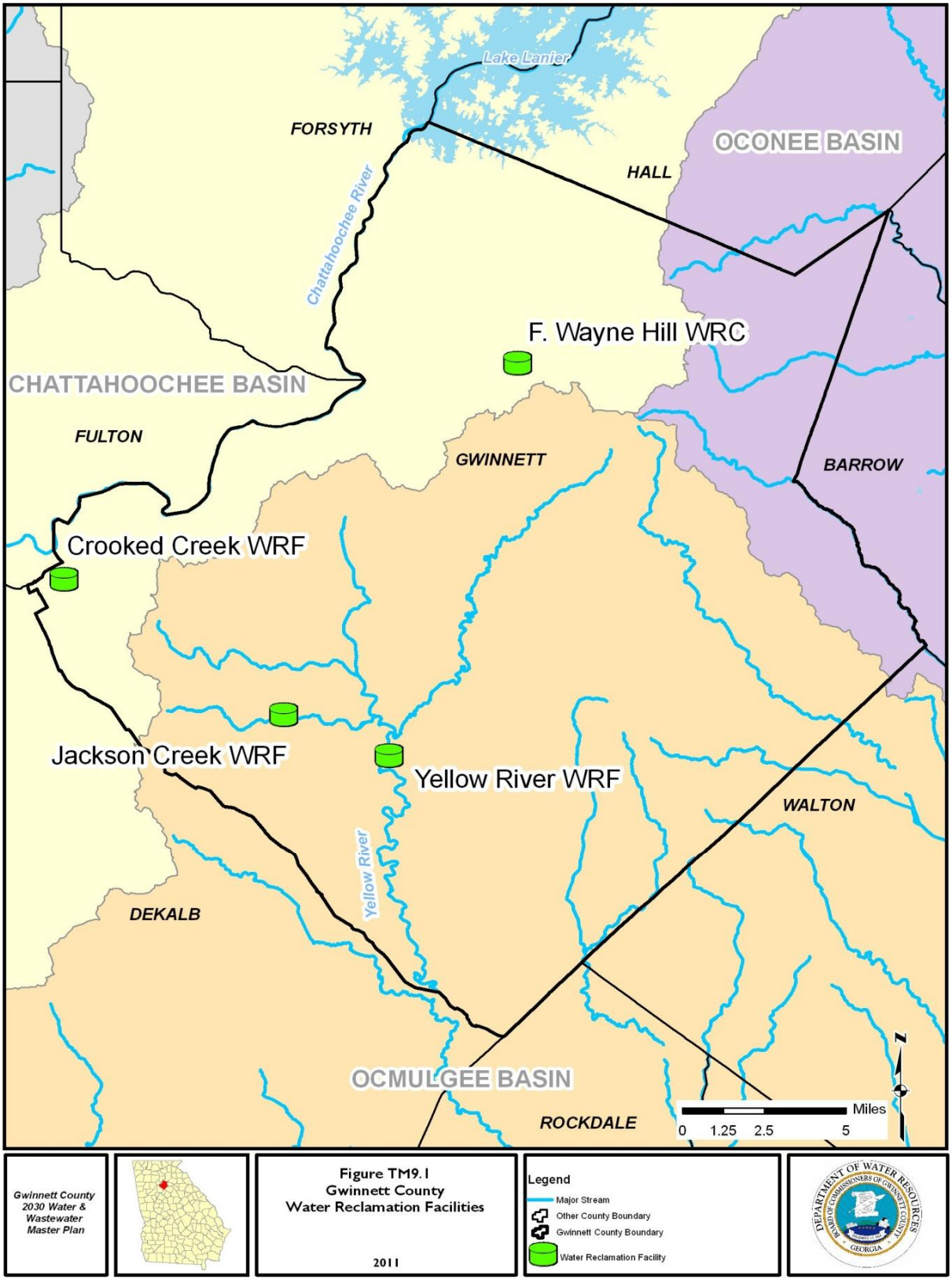
Over the past decade, Gwinnett County has decommissioned five small wastewater treatment plants; Jacks Creek WRF, Beaver Ruin WRF, Sugar Hill WRF, Big Haynes Creek WRF and No Business Creek WRF. The flow to these facilities was consolidated and diverted to the existing facilities to increase the level of treatment and to reduce overall treatment costs.

Table TM9.1 shows the permitted treatment capacity for each of the Gwinnett County wastewater treatment plants in 2012 in maximum monthly flow.

Table TM9. 1: Existing Water Reclamation Facilities and Permitted Capacities (Maximum Monthly Flow, 2012)

Treatment Facility	Permitted Discharge (MGD)
F. Wayne Hill WRC	60.0
Crooked Creek WRF	16.0
Yellow River WRF	22.0
Total	**98.0**

Figure TM9.1: Gwinnett County Water Reclamation Facilities



The following section provides an overview of the three major WRFs in Gwinnett County.

F. WAYNE HILL WRC

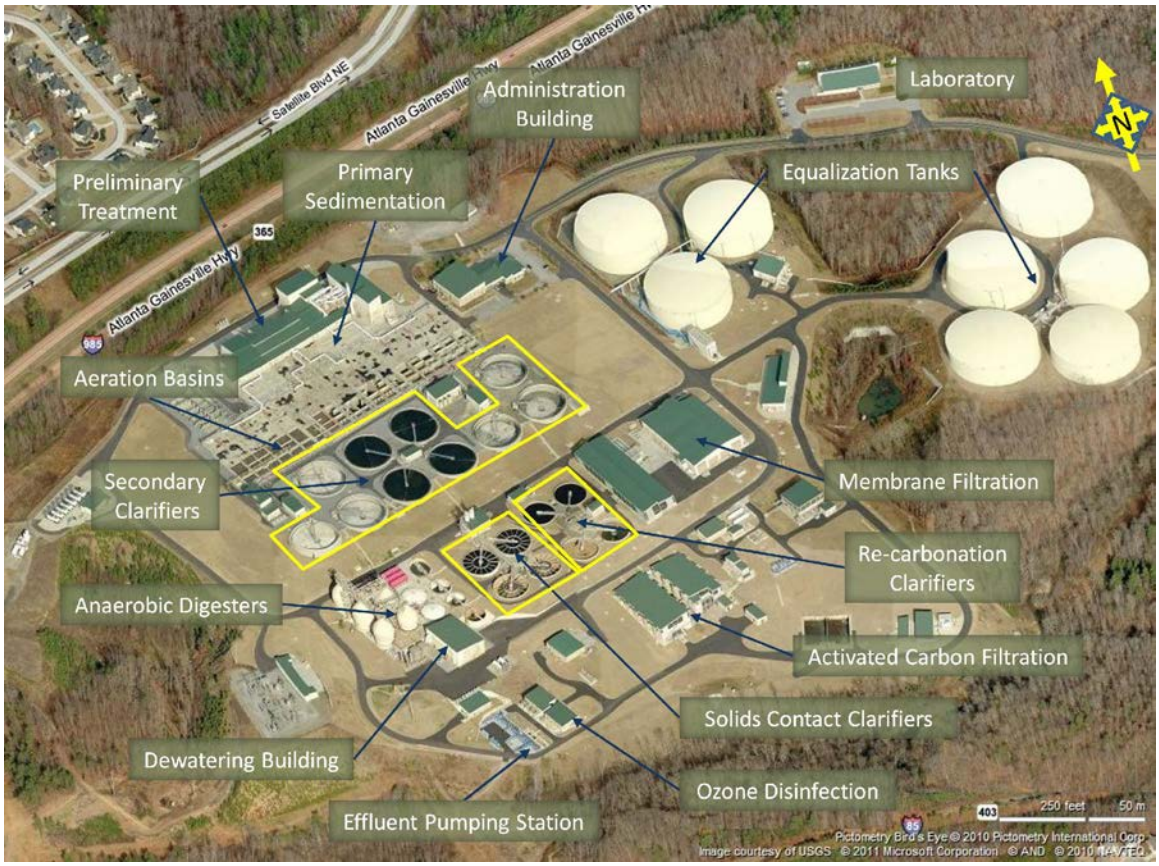
F. Wayne Hill WRC (FWHWRC) is located near the intersection of I-985 and I-85. FWHWRC is the largest wastewater treatment facility in Gwinnett County and is recognized for producing one of the highest quality effluents in the Southeast United States. An aerial image of the facility is shown in Figure TM9.1. FWHWRC can receive wastewater from six different wastewater pump stations (PS): Suwannee Creek PS, Beaver Ruin PS, Alcovy PS, Level Creek PS, Ivy Creek PS, and Patterson PS. The original 20 MGD plant was constructed from 1997 to 2001. The FWHWRC was upgraded to a capacity of 60 MGD on a maximum monthly basis in 2004 to 2005.

Preliminary and primary treatment at FWHWRC consists of band screens, vortex grit collectors and rectangular primary clarifiers. Advanced secondary treatment includes biological reactors and secondary clarifiers. Tertiary treatment consists of two separate treatment trains, a 40-MGD train and a 20-MGD train. The 40-MGD chemical clarification treatment train consists of chemical coagulation/clarification and filtration by ultra-filtration membrane. The 20-MGD treatment train consists of solids contact coagulation (ferric chloride)/clarification, re-carbonation clarification, and granular media filtration. Both treatment trains use chemical addition for phosphorous removal. The filtered effluent from both of the treatment trains is further treated with pre-ozonation, granular activated carbon adsorption and post-ozonation.

The primary sludge and thickened secondary sludge are stabilized in egg-shaped anaerobic digesters. The digested biological sludge is then combined with thickened chemical sludge from the solids contact clarifier and the chemical clarifier. The combined sludge is dewatered using centrifuges. Most of the primary and secondary process tanks are covered except for the final stage of aeration and clarifier tanks, and the plant uses two stage wet scrubbers for treating odorous gases generated by the plant.

FWHWRC is currently permitted to discharge to both Lake Lanier (40 MGD) and to the Chattahoochee River (20 MGD). The Lake Lanier discharge is carried through an indirect potable reuse pipeline to the Lake. Another reuse pipeline carries the remaining treated effluent from FWHWRC to the CCWRF discharge point and then the combined treated flow is discharged to the Chattahoochee River. The pipeline between FWHWRC and CCWRF also serves some non-potable reuse customers. These reuse pipelines are discussed in greater detail in TM10 – Reuse Evaluation and Recommendations.

Figure TM9.2: F. Wayne Hill Water Reclamation Center



Following is a partial list of projects that are currently underway or recently completed at FWHWRC.

- A pilot-scale project was conducted to determine the effectiveness of the Rotary Drum Thickeners (RDT) to thicken primary sludge from 2.5% to 5%. Additional information on solids handling requirements at FWHWRC is described in TM11 – Biosolids Treatment Evaluation and Recommendations.

- Existing primary clarifiers are being retrofitted to fix ongoing issues with sludge and scum collection.

- Installation of a combined heat and power (CHP) system is underway. This system will generate energy for use within the WRC. The WRC is also adding a new system to accept fat, oil, and grease (FOG). Additional information on this project is provided in TM11 – Biosolids Treatment Evaluation and Recommendations.

CROOKED CREEK WRF

The Crooked Creek WRF is located near the City of Norcross. CCWRF receives wastewater flows from the North Chattahoochee Interceptor (NCI) PS, Wolf Creek PS and local flows from areas near CCWRF. Additional details on wastewater collection systems are provided in TM8 – Wastewater Collection and Pumping Evaluation and Recommendations. Figure TM9.3 shows an aerial image of the existing CCWRF site. The original plant (two package plants) was constructed in 1972 with the total capacity of 1 MGD. The

package plants were replaced with new treatment facilities that have been expanded over time to a capacity of 16 MGD on a maximum monthly basis. Currently, the CCWRF permit allows the discharge of 16 MGD of treated effluent to the Chattahoochee River.

The CCWRF preliminary treatment will include channel grinders, influent pump station, band screens and vortex grit removal systems following completion of ongoing construction activities. At the CCWRF, wastewater flows directly from preliminary treatment to secondary treatment. The secondary treatment includes oxidation ditches with supplemental aeration, and clarifiers followed by filtration through sand filters. Final treatment includes UV disinfection and post aeration. The existing solids handling facility includes waste activated sludge (WAS) storage tanks, gravity sludge thickener and centrifuges for solids dewatering.

Figure TM9.3: Crooked Creek WRF

* Indicates facilities under construction in March 2011

The existing solids handling facility at CCWRF has capacity limitations. Gwinnett County originally proposed solids handling upgrades to replace the existing gravity thickener, thickened sludge pump station, and dewatering facilities and will expand the storage and processing capacities of thickening and dewatering operations. This project, planned for 2012, is currently being re-evaluated by Gwinnett County.

Following is a partial list of projects that are currently underway at CCWRF and will be operational by the end of 2011.

- A new influent pump station (IPS) with channel grinders upstream of the pumps and an influent flow metering structure downstream of the pumps is under construction.

- A new headworks facility is under construction. The new headworks facility will include band screens and vortex grit collectors to replace the existing screening and aerated grit removal systems located at the existing IPS.
- Existing odor control system is being upgraded to treat odors from the new IPS and the new headworks facility.

YELLOW RIVER WRF

The Yellow River WRF, located near the City of Lilburn, receives flow from the central part of Gwinnett County. The original plant, constructed in early 1980's, has been upgraded over the years. The improvements undertaken in 2003 increased the treatment capacity of the facility to 14.5 MGD on a maximum monthly basis. Figure TM9.4 shows an aerial view of the facility, and shows the current upgrade project underway.

The current plant improvements under construction at the YRWRF will allow Gwinnett County to consolidate its wastewater treatment operations in the Yellow River basin at the YRWRF. Four smaller wastewater treatment plants were already decommissioned. The fifth facility, Jackson Creek WRF, will be taken out of service after the YRWRF upgrade is completed. Following the ongoing upgrades, the YRWRF permitted capacity will be increased to 22 MGD on a maximum monthly basis. The increased capacity accounts for the 7.5 MGD of permitted capacity previously associated with the decommissioned Beaver Ruin and Jackson Creek plants.

After completion of the current upgrades, the preliminary treatment will consist of influent pumping, rotary drum screens and vortex grit chambers. Primary treatment will consist of primary clarifiers followed by flow equalization. Secondary and tertiary treatments will consist of rotary drum fine screens, aeration, and membrane biological reactors (MBRs). The final treatment process will include UV disinfection and post aeration.

The primary sludge and waste activated sludge from the facility is pumped to the FWHWRC by mixing it with the wastewater pumped from the No Business Creek (NBC) PS to the Beaver Ruin PS. As outlined in TM11 – Biosolids Treatment Evaluation and Recommendations waste solids will continue to be pumped to the F. Wayne Hill WRC.

Figure TM9.4: Yellow River WRF

Note: The area outlined in yellow is scheduled to be decommissioned.

REGULATORY AND POLICY CONSIDERATIONS

This section provides a summary of existing regulatory and policy requirements for wastewater treatment at the facilities in Gwinnett County. The regulations and policies outlined in this section include the acceptance of FOG and grease at water reclamation facilities, Metro Water District Wastewater Management Plan, the interbasin transfer rule, assimilative capacity limits, and the Chattahoochee River trout stream designation. The anticipated future regulations are outlined in the following section. The facilities in Gwinnett County are currently in compliance with all state, regional, and federal regulations.

Acceptance of FOG and Septage at the Water Reclamation Facilities:
Every 5 to 10 years, property owners should pump the solids collected in their septic systems to maintain optimum performance. The City of Berkley Lake requires that homeowners with septic tanks pump their tanks based on a schedule calculated based on the size of the septic system and the number of people using the system with an average of 2 to 5 years for most homes. Septage pumped from septic systems has higher total suspended solids (TSS) and biological oxygen demand (BOD) than normal wastewater influent. An increase in septage load can impact future treatment facility processes and capacity.

CCWRF is the only WRF in Gwinnett County that accepts septage. Septage is accepted Monday through Friday. From 2008 to 2010, septage was accepted at an average rate of about 17 loads per week; the highest rate of acceptance occurred in March 2008 at about 86 loads per week and the lowest rate of acceptance

occurred in July 2009 and again in November 2010 at about 4 loads per week. The amount of septage received at CCWRF was significantly lower in 2009 and 2010 than 2008, in part due to an increase in the cost charged for disposal of septage to CCWRF. Gwinnett County intends to maintain the CCWRF as the only plant in the county to accept septage.

Table TM9.2 provides a summary of the forecasted TSS and BOD loading from septage in Gwinnett County using the methodology from the 2009 Metro Water District Wastewater Management Plan. The forecasts were revised based on a more accurate estimate of the number of future septic systems developed for TM2 – Summary of Water and Wastewater Forecasts. The TSS and BOD loading is expected to increase slightly during the planning horizon as shown in Table TM9.2. No upgrades to the CCWRF are anticipated as a result of the additional septage loads.

Table TM9.2: TSS and BOD loading Forecasts from Septage

Forecasted Loading (lbs/day)	2015	2020	2025	2030
TSS	6,486	7,190	7,883	8,491
BOD	1,233	1,367	1,499	1,615

By 2012, FWHWRC will receive concentrated high strength waste and fats-oils-grease (FOG) from industries that is then pumped to anaerobic digesters. Additional information regarding the acceptance of FOG and the installation of the CHP system at FWHWRC is detailed in TM11 – Biosolids Treatment Evaluation and Recommendations.

Metro Water District Wastewater Management Plan:
The Metropolitan North Georgia Water Planning District (Metro Water District) was created by the Georgia legislature in 1991 (O.C.G.A. §12-7-572) to develop integrated water resources plans for the 15-county area surrounding metro Atlanta. Gwinnett County is one of the 15-counties within the Metro Water District and therefore must comply with the provisions within these regional plans. EPD performs audits of the jurisdictions within the Metro Water District to ensure compliance with the plans, and plan compliance is tied to Gwinnett County's water, wastewater, and stormwater permits. Gwinnett County was audited in 2007 and was in compliance with the requirements. The Wastewater Management Plan includes a number of requirements related to collection system operation and maintenance, emergency spill response, and septic systems. The Wastewater Management Plan also requires Gwinnett County to develop and update a local wastewater master plan every five years. This 2030 Water and Wastewater Master Plan addresses this requirement.

Interbasin Transfer Rule:
Interbasin transfer is defined as the withdrawal or diversion of water from one river basin, followed by the use and/or return of some or all of that water to a different river basin. Gwinnett County includes portions of three river basins. The largest drainage basin in Gwinnett County is in the Ocmulgee River basin, followed by the Chattahoochee River basin, and there is a smaller area within the Oconee River basin as shown in Figure TM9.1. Currently, all of Gwinnett County's drinking water is withdrawn from Lake Lanier, which is in the Chattahoochee River basin. The FWHWRC and CCWRF discharge to the Chattahoochee River basin. The YRWRF, however, discharges treated water to the Ocmulgee River basin.

On January 26, 2011 the Georgia Department of Natural Resources (DNR) adopted a new rule governing surface water withdrawal permits that involve interbasin transfers. The rule states that the Director of EPD should consider a variety of factors before issuing a permit for a new interbasin transfer. These considerations include the effect such transfers have on the environment and downstream communities. While Georgia's

environmental rules do not prohibit interbasin transfers, essentially EPD's environmental requirements must be met in both the withdrawal basin and the discharge basin before an interbasin transfer will be permitted.

The new interbasin transfer rule does not impact existing interbasin transfers but presents additional administrative requirements for any future interbasin transfers. In addition to potential challenges with increasing interbasin transfers, the rule would also impact decreases in interbasin transfers. The water users in the Ocmulgee basin rely on the existing discharges and would likely challenge any actions that would decrease the returns to this basin.

Assimilative Capacity Limits:
Assimilative capacity may become increasingly more limited if nonpoint source pollution loads increase and EPD develops more advanced tools to monitor and assess the assimilative capacity. As part of the wastewater permitting process, EPD establishes limits for each discharge based on the assimilative capacity of the receiving waterbody. The assimilative capacity refers to the maximum amount of pollution that can be discharged into a waterbody and continue to meet water quality standards.

In the Chattahoochee River basin, EPD has required permittees to limit the discharge of phosphorus to 0.13 mg/L. However, the FWHWRC provides a higher level of phosphorus removal and is permitted to discharge 40 MGD of treated effluent to Lake Lanier with a phosphorus limit of 0.08 mg/L. This limit is much lower than the established 0.13 mg/L limit in other treatment facilities in the Metro Atlanta region. The difference in phosphorus limits, could equate to approximately 25 MGD of additional effluent discharge capacity for FWHWRC. Gwinnett County's previous wasteload allocation was based on the discharge loading and would have allowed additional discharges of highly reclaimed effluent.

Also in the Chattahoochee River basin, the removal of heat load by Georgia Power could allow the discharge of up to 200 MGD of highly reclaimed water. Gwinnett County's planned expansion of the CCRWF near the end of the planning horizon is in part based on this available assimilative capacity.

In the Ocmulgee River basin, the State Water Plan Surface Water Quality Resource Assessments show that in the future there will be nutrient challenges in Lake Jackson that result from the increased wastewater treatment discharges upstream of the Lake, which includes the YRWRC[1]. In the future, EPD may require all of the discharges in the basin to upgrade treatment processes to meet the nutrient limits in Lake Jackson. This is discussed further in the Future Policy Considerations section of this report.

Chattahoochee River Trout Stream Designation:
The Wildlife Resources Division of Georgia Department of Natural Resources designates the Chattahoochee River (above the south-most I-285 bridge)as a secondary trout stream, which requires that the daily average dissolved oxygen of the stream be 6.0 mg/L or greater and no less than 5.0 mg/L on a daily average basis at any given time. This designation also requires that discharges shall not cause stream temperature to exceed 2°F of ambient stream temperatures at the effluent discharge locations. The combined effluent discharge from the CCWRF and the FWHWRC currently meets this requirement.

FUTURE POLICY CONSIDERATIONS

This section provides a summary of future policy considerations that may influence future actions related to wastewater treatment in Gwinnett County. The regulations and policies outlined in this section include future nutrient removal requirements and contaminants of emerging concern. The timing and requirements associated with these regulations is unknown and therefore Gwinnett County should continue to monitor any

[1] Middle Ocmulgee Water Planning Council Regional Water Plan. Draft. December 8, 2010.

proposed legislation that might trigger the need for changes in treatment processes. The facilities in Gwinnett County are currently in compliance with all state and federal regulations.

Future nutrient removal requirements:
The U.S. Environmental Protection Agency (EPA) is proposing more stringent requirement for nutrient (nitrogen and phosphorous) removal across the country. Table TM9.3 summarizes the phosphorus limits in the current NPDES permits for the Gwinnett County WRFs.

Table TM9.3: Current NPDES Permit Limits for Total Phosphorus

Location	Total Phosphorus Limits
FWHWRC to Lake Lanier	0.08 mg/L
FWHWRC to Chattahoochee River	Note 1
CCWRF to Chattahoochee River	Note 1
FWHWRC and CCWRF Combined Effluent to Chattahoochee River	54 kg/day
YRWRF to Yellow River	0.3 mg/L

Notes:
1. The flows from the FWHWRC to the Chattahoochee River and the flows from the CCWRF must meet the combined effluent load for phosphorus.

EPA requires states to develop Numeric Nutrient Standards for their major waterbody types (such as lakes, reservoirs and rivers). These changing regulations could take the nutrient removal technology to a new level and would add additional cost for wastewater treatment. Florida has already published draft numeric nutrient criteria for their major water bodies.

Many states will require total phosphorus (TP) limits of 0.1 mg/L or lower. Although there is no requirement or schedule for compliance in Georgia, planning should start now for all three of the Gwinnett County treatment facilities. The YRWRF discharge may become an early priority for this planning, as the Yellow River flows into Lake Jackson, which EPD modeling shows will have assimilative capacity challenges in the future.

Contaminants of Emerging Concern (CECs):
Contaminants of emerging concern (CEC) include natural and synthetic hormones, pharmaceuticals, personal care products (PCPs), pesticides and alkyl phenols. EPA and other agencies are studying and documenting the existence of trace levels of CECs in aquatic environments. These contaminants are not currently regulated as they evaluate whether there is a human health or environmental risk. Future policy changes regarding CECs could affect the treatment/ disinfection methods used in wastewater treatment plants.

FUTURE RECOMMENDATIONS

This section presents the future recommendations for the three Gwinnett County WRFs based on the events that would trigger additional investment. The triggers in this section include WRF expansion based on the flow forecasts, future upgrades to meet nutrient standards (if regulated), and facility upgrades to address CECs (if regulated). The projects described in this section are only needed if the trigger event occurs.

WRF Expansion Based on Flow Forecasts:
TM 2 – Summary of Water and Wastewater Forecasts provides the forecasted wastewater flows in Gwinnett County for the planning period ending 2030. The forecasts were developed based on the International Gateway Scenario as outlined in the Gwinnett County Unified Plan. The total Gwinnett County wastewater

flows are projected to increase to an annual average daily flow of 104 MGD by 2030, or 114 MGD on a maximum monthly basis.

The 2012 total permitted treatment capacity for Gwinnett County is 98 MGD on a maximum monthly basis. The water reclamation facilities may need additional capacity to accommodate the projected flows in the 2030 planning horizon.

Gwinnett County sewer collection and pumping system provides the flexibility to divert wastewater flows between three treatment facilities. Therefore, the capacity expansions can be done in stages as required based on future flows and other plant upgrade needs (i.e., if new regulations are also passed). The 2009 Metro Water District Wastewater Management Plan included the following two future capacity expansion projects for Gwinnett County.

1. Expansion of CCWRF from 16 MGD to 25 MGD permitted flow on a maximum month flow basis.
2. Expansion of FWHWRC from 60 MGD to 85 MGD on a maximum month flow basis.

These projects are still considered the best options for future upgrades; however Gwinnett County should re-evaluate the best location for upgrades closer to the system reaching the flows that trigger an expansion. The discharge locations may also need to be reconsidered based on future water supply needs and the availability of assimilative capacity. The plant upgrades are described below.

<u>Crooked Creek WRF expansion:</u>

The ongoing influent pump station and headworks project at CCWRF was designed considering future peak flows. The upgraded influent pump station is provided with space for a future influent pump to increase the preliminary rated capacity to match future peak hourly flow of 62.5 MGD. The solids handling facility upgrade, which is currently planned for 2012 construction, will provide additional equipment space for future plant expansion.

When the County's total wastewater flows approach the current permitted capacity of 98 MGD on a maximum monthly basis, additional treatment capacity should be evaluated. The CCWRF expansion is currently recommended ahead of the FWHWRC expansion as most of the CCWRF secondary treatment equipment is nearing the end of its life span (20 years). The age of the existing treatment equipment increases the maintenance costs at CCWRF. As with all large capital projects, Gwinnett County will evaluate these projects in greater detail prior to proceeding with final design and/or construction.

Membrane Bioreactors (MBRs) are recommended for future secondary treatment. This advanced technology can produce high quality effluent that can be reused for non-potable water use or discharged to surface water. MBR treatment also provides the flexibility to add the membrane cassettes in phases as the future flows increase.

The CCWRF expansion follows the Metro Water District Plan and will increase the total treatment capacity of Gwinnett County to 107 MGD maximum monthly flow.

<u>FWHWRC expansion:</u>

An expansion of FWHWRC may be required if the future wastewater flows require more treatment capacity after the expansion of CCWRF. Flow projections provided in TM 2 – Water and Wastewater Forecasts suggest that this could happen towards the end of this planning period.

Associated with the additional treatment capacity, TM11 – Biosolids Management Evaluation and Recommendations lists a number of projects that will be needed to address the increased biosolids load. These projects include conveying the primary sludge and scum from YRWRF to FWHWRC by mixing it with the wastewater pumped to FWHWRC as the lowest life cycle cost alternative evaluated. TM 11 also recommends replacing the existing thickening centrifuges at FWHWRC to increase efficiency and adding additional anaerobic digester and ancillary equipment to FWHWRC when the annual influent flow equals 34

MGD. The flow projections in TM 2 – Water and Wastewater Forecasts show this annual influent flow is expected between 2015 and 2016.

If the practice of sending YRWRF solids to FWHWRC is continued, the improvements outlined in TM11 – Biosolids Management Evaluation and Recommendations will be required later in the planning period. These projects include additional anaerobic digestion, solids storage and dewatering capacity. In addition, another biological treatment train may be needed to provide required redundancy to accommodate projected flows in 2023.

Yellow River WRF expansion:

As YRWRF is currently being upgraded, no significant expansion projects are recommended in this planning period. Gwinnett County also has an option to increase the treatment capacity of the upgraded YRWRF by adding more membrane trains to the secondary treatment.

Facility Upgrades to Meet Future Nutrient Removal Standards:
Currently, all three water reclamation facilities achieve the required phosphorous removal by Biological Nutrient Removal (BNR) as secondary treatment and by the chemical precipitation of soluble phosphorous. More stringent phosphorus and nitrogen removal standards as discussed in the Future Policy Considerations may require upgrades to the Gwinnett County treatment facilities.

Table TM9.4 presents the "triggers" that could require additional investment in the Gwinnett County WRFs either in terms of wastewater treatment capacity or to address new regulations. The flow trigger is the flow at which additional capacity will be needed. The planning, design, and permitting activities will need to occur prior to reaching these flow triggers based on the rate of development as flows approach the trigger level.

Table TM9.4: Recommended Wastewater Treatment Plant Improvements

Trigger	Impact	Improvements Required	Project Name
1. Total Wastewater flow exceeds 98 MGD on maximum month basis	Additional treatment capacity will be needed	Expand CCWRF from 16 MGD to 25 MGD on a maximum monthly basis.	WW1
2. Total Wastewater flow exceeds 107 MGD on maximum month basis	Additional treatment capacity will be needed	Expand FWHWRF from 60 MGD to 85 MGD on a maximum monthly basis.[2]	WW2
3. Total Wastewater flow exceeds 62.8 MGD on maximum month basis	Additional solids handling capacity needed at CCWRF	Install new thickeners and dewatering centrifuges at CCWRF.	WW3
4. Combined influent flow exceeds 50 MGD at FWCWRC (estimated 36 MGD) and YRWRF (estimated 20 MGD)[3]	Additional solids handling capacity needed at FWHWRC	Install improved thickening systems, new anaerobic digesters and ancillary equipments at FWHWRC.	WW4
5. Combined influent flow exceeds 56 MGD at FWCWRC (estimated 36 MGD) and YRWRF	Additional solids handling capacity needed at FWHWRC	Install new solids storage tank, anaerobic digester and ancillary equipment, expand the biological treatment system, and add a new	WW5

[2] Recommends evaluation of all three treatment facilities to finalize the best option when this improvement is required
[3] TM11- Biosolids Treatment Evaluation and Recommendations

Table TM9.4: Recommended Wastewater Treatment Plant Improvements

Trigger	Impact	Improvements Required	Project Name
(estimated 20 MGD)[4]		dewatering centrifuge	

COST ESTIMATES FOR RECOMMENDATIONS

The cost estimates for the recommended improvement projects are shown in Table TM9.5 below. These costs are based on unit costs for wastewater treatment expansion of $12/gallons per day of additional capacity. The costs for the additional solids handling are based on those presented in TM11 – Biosolids Treatment Evaluation and Recommendations. These costs were developed for planning purposes and will need to be evaluated in greater detail prior to construction. A 25% contingency was added to the calculated cost to account for the planning level nature of these estimates.

Table TM9.5: Cost Estimates for Recommendations

Project #	Improvement	Cost [1,2]
WW1	Expand CCWRF from 16 MGD to 25 MGD on a maximum monthly basis.	$135,000,000
WW2	Expand FWHWRF from 60 MGD to 85 MGD on a maximum monthly basis.	$375,000,000
WW3	Install new thickeners and dewatering centrifuges at CCWRF.	$13,600,000
WW4	Install improved thickening systems, new anaerobic digesters and ancillary equipments at FWHWRC.	$47,700,000
WW5	Install new solids storage tank, anaerobic digester and ancillary equipment, expand the biological treatment system, and add a new dewatering centrifuge	$43,400,000

Notes:
1. A contingency of 25% was added to all costs shown in this Table.
2. The costs for the recommended projects are based on previous project costs and professional judgment. The costs for Project 3 are based on the costs presented in TM11 – Biosolids Treatment Evaluation and Recommendations, with a 25% planning level contingency added.
3. Improvements are based on regulatory changes and the timeframe is dependent on when the regulations are implemented.
4. Cost is dependent on what compounds are being regulated and the limits for those compounds.

CONCLUSIONS

Gwinnett County will operate three wastewater treatment facilities namely FWHWRC, CCWRF, and YRWRF following the decommissioning of the Jackson WRF in 2012. The total permitted discharge capacity of these three facilities in 2012 would be 98 MGD on a maximum monthly basis, which is adequate to meet the current wastewater flows. These water reclamation facilities also comply with current regulations.

Based on TM2-Summary of Water and Wastewater Forecasts, the total wastewater flow in 2025 could reach 104 MGD on a maximum monthly basis. If these flows are reached within the planning horizon, one or more WRFs may require additional capacity. Consistent with the Metro Water District Plan, this TM recommends increasing the total treatment capacity of CCWRF from 16 MGD to 25 MGD on a maximum monthly basis. Additional expansions, if needed, are shown at the FWHWRC. These expansions could reach $510 million plus an additional $89 million for solids handling upgrades outlined in TM 11 – Biosolids Treatment Evaluation and Recommendations.

Future regulations of CECs and/or enhanced nutrient removal requirements may trigger installation of additional wastewater treatment processes. Gwinnett County should continue to track and evaluate potential recommendations and their impact on existing treatment processes.

Gwinnett County 2030 Water & Wastewater Master Plan

Technical Memorandum 10

Water Reuse Evaluation

TO:	Todd Cleaver - Gwinnett County Planning & Development	PAGES:	8
SUBJECT:	Gwinnett County 2030 Water & Wastewater Master Plan Technical Memorandum 10 – Water Reuse Evaluation		
FROM:	Kim Shorter, AECOM		
BY:	Chandra Mysore and Kim Shorter		
DATE:	May 11, 2011		

EXECUTIVE SUMMARY

Gwinnett County currently practices planned indirect potable reuse, incidental reuse, and non-potable reuse. The existing reuse practices include:

- Planned indirect potable reuse is practiced at the F. Wayne Hill WRC, which discharges a portion of the reclaimed water to Lake Lanier-- Gwinnett County's source water for water supply and drinking water.
- Incidental reuse is practiced at F. Wayne Hill WRC and Crooked Creek WRF, which both discharge reclaimed water to the Chattahoochee River upstream of water supply sources for downstream communities. Incidental reuse is also practiced by the Yellow River WRF, which returns reclaimed water to the Yellow River upstream of other water supply sources.
- Non-potable reuse is practiced by select customers located along the reclaimed water pipeline that conveys reclaimed water from the F. Wayne Hill WRC to the Crooked Creek WRF. The non-potable reuse customers use the reclaimed water to irrigate golf courses, public areas, and for other non-potable uses.

The water and wastewater forecasts in TM2 – Summary of Water and Wastewater Forecasts show that approximately 35 MGD of additional water withdrawal on a monthly average basis and 16 MGD of permitted wastewater discharge on a maximum monthly basis may be needed within the next 20 years.

INTRODUCTION

Technical Memorandum 10 (TM10), as part of the Gwinnett County 2030 Water and Wastewater Master Plan, presents the potential for future reuse projects over the 20-year planning horizon. The water and wastewater demands, presented in this section, are based on Technical Memorandum 2 – Summary of Water and Wastewater Forecasts.

This Technical Memorandum is organized in the following sections:

- Background – This section provides definitions for common reuse terminology.
- Existing Reuse Practices at Water Reclamation Facilities – This section provides an overview of the existing Gwinnett County water reclamation facilities and current reuse practices.
- Water Reuse Options – This section presents the potential reuse options that might be considered by Gwinnett County as the water and wastewater demands approach their permitted capacity.
- Water Quality and Treatment Requirements – This section presents the water quality existing and potential future regulations that could impact future reuse options.

BACKGROUND

Water reuse refers to the beneficial use of reclaimed water through wastewater treatment. There are a number of different types of water reuse, some of which are practiced in Gwinnett County.

Table TM10.1 provides an overview of the terminology that will be used in this TM as it relates to water reuse.

Table TM10.1: Water Reuse Terms and Definitions

TERM	DEFINITION
Water Reclamation	Refers to the treatment of wastewater to levels that make it reusable for one or more applications. Produces reclaimed water.
Water Reuse	The beneficial use of reclaimed water; such as for potable water, irrigation, cooling, washing, and environmental purposes.
Planned Reuse	The deliberate use of reclaimed water that is discharged to a natural environment and then withdrawn for a beneficial use.
Incidental Reuse[1]	The discharge of reclaimed water to a water supply source. This could include returns of reclaimed water to the water source for use by another jurisdiction.
Direct Potable Reuse	Beneficial use of highly treated reclaimed water as drinking water supply with contained transfer from reclamation plant to the distribution system. Direct potable reuse is not practiced in the United States.
Indirect Potable Reuse[1]	Beneficial use of reclaimed water as raw water source for water supply after the reclaimed water is returned to the natural environment (groundwater reservoir, storage reservoir, or stream) and it mixes with the receiving waters for a period of time. In areas with limited water resources, indirect potable reuse is a viable option to help maximize the use of water resources. *Incidental indirect potable reuse* occurs in virtually every major river system that receives discharges of treated wastewater. With *planned indirect potable reuse*, wastewater is treated to a much higher quality than is typical for incidental reuse of water, i.e., when the treated effluent from a water reclamation facility is discharged to surface water that is used downstream as a potable water source. Planned indirect potable reuse has been in practice for more than thirty years in the United States.
Non-Potable Reuse[1]	Beneficial use of reclaimed water for purposes, which includes agricultural

Table TM10.1: Water Reuse Terms and Definitions

TERM	DEFINITION
	and landscaping irrigation, industrial process, fire protection, air conditioning, and toilet flushing – i.e., not-potable uses. Non-potable reuse includes urban water reuse, which is covered by the Guidelines for Water Reclamation and Urban Water Reuse established by the Environmental Protection Division (EPD) in February 2002.
Water Rcycling	Reclamation of effluent generated by a given user for onsite reuse by the same user (e.g., industrial water recycling).
Grey Water	Wastewater of domestic strength and consistency that has not come in contact with toilet or urinal waste, typically the water from bathtubs, sinks, or washing machines.

Note: Adapted from *Water Reuse: Issues, Technologies, and Applications*. AECOM. 2007. and *Management Practices for Non-potable Water Reuse*, Water Environment Research Foundation, 2001.
1 .These reuse types are a component of Gwinnett County's water reclamation practices.

EXISTING REUSE PRACTICES AT WATER RECLAMATION FACILITIES

This section includes brief descriptions of the existing water reclamation facilities in Gwinnett County with a focus on current reuse practices. Gwinnett County currently practices planned indirect potable reuse, non-potable reuse, and incidental reuse, as shown in Table TM10.2.

Table TM10. 2: Existing Reuse at WRFs in Gwinnett County

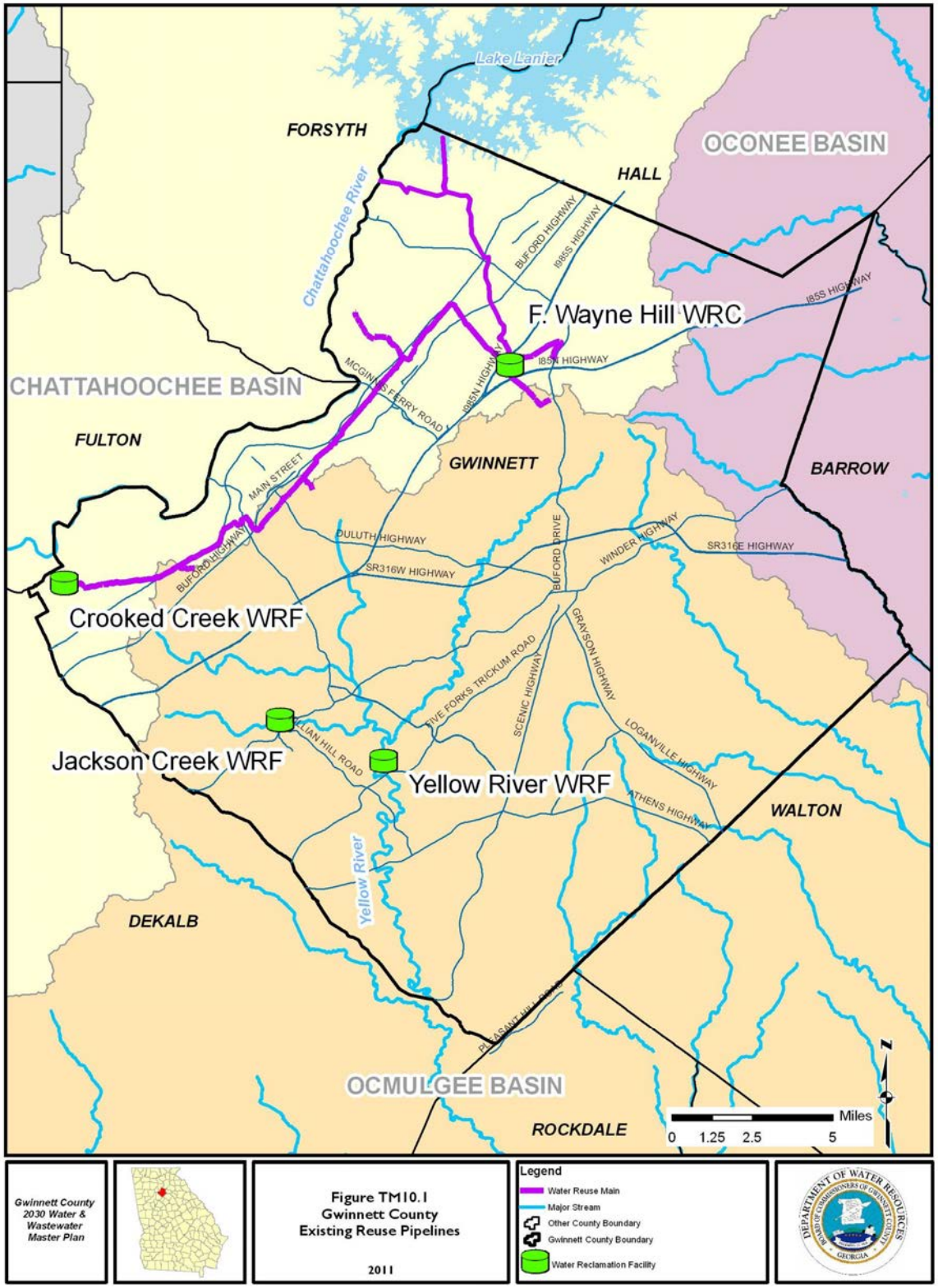
WRF	Permitted Capacity (MGD)	Type of Reuse
F. Wayne Hill WRC	40.0 20.0	Indirect Potable Reuse Non-Potable Reuse, & Incidental Reuse
Crooked Creek WRF	16.0	Incidental Reuse
Yellow River WRF	14.5 [1]	Incidental Reuse
Jackson Creek WRF	3.0 [2]	Incidental Reuse

NOTES:
1. Yellow River WRF is undergoing expansion (14.5 to 22.0 MGD) in 2011.
2. Jackson Creek is planned for decommissioning in 2011.

The dedicated pipelines for conveyance of reclaimed water are shown in Figure TM10.1.

Additional information on the water reclamation facilities and the application of reuse are outlined below for each of the three water reclamation facilities that will be operational throughout the planning horizon. These water reclamation facilities are outlined in greater detail in TM9 – Water Reclamation and Discharge Evaluation and Recommendations.

Figure TM10.1: Existing Gwinnett County Reuse Pipelines



F. WAYNE HILL WATER RESOURCES CENTER[1]

The FWHWRC is located adjacent to Ivy Creek, near the intersection of Interstate Highways I-85 and I-985 in northern Gwinnett County. The FWHWRC discharges high-quality, reclaimed water to Lake Lanier, Gwinnett County's source for water supply and drinking water.

The FWHWRC started operation in early 2001 with an initial treatment capacity of 20 MGD (Phase I). EPD initially did not grant Gwinnett County a new discharge permit to Lake Lanier for the FWHWRC, but Gwinnett County was permitted to discharge 20 MGD to the Chattahoochee River via the CCWRF discharge. Gwinnett County built a 48-inch reclaimed water pipeline, to convey up to 55 MGD (to account for potential expansion of FWHWRC) of high-quality, reclaimed water to the Crooked Creek WRF in the southwest part of Gwinnett County, where it would be blended for a combined discharge to the Chattahoochee River (incidental reuse).

Gwinnett County uses some of the highly treated reclaimed water from this pipeline for non-potable reuse applications, such as irrigating golf courses, irrigation for the Mall of Georgia, and public parks (e.g., Pinckneyville Park). The County also has some private customers who buy reclaimed water for indoor use to flush toilets, e.g., Coolray Field, the Gwinnett Braves Stadium (non-potable reuse) and to irrigate the ball field.

In late 2005, construction was completed on an additional 40 MGD of treatment capacity at the FWHWRC (Phase II). The additional capacity brought the total water reclamation capacity of the FWHWRC to 60 MGD (maximum monthly flow basis). The plant's Advanced Wastewater Treatment (AWT) processes included a 40 MGD ultrafiltration (UF) system. Biological treatment processes were designed for complete nitrification, partial denitrification, and phosphorus reduction. The AWT facilities provide tertiary treatment and achieve a high level of particle and pathogen removal, reduce organic matter, and control phosphorus to minimize water quality impacts to Lake Lanier. In November 2006, Gwinnett County received a permit to discharge 40 MGD of high-quality reclaimed water to Lake Lanier (planned indirect potable reuse).

YELLOW RIVER WATER RECLAMATION FACILITY[2]

The Yellow River Water Reclamation Facility (YRWRF) is located near the City of Lilburn and discharges reclaimed water to the Yellow River, upstream of drinking water supply sources for other communities in South Georgia. The YRWRF recently was upgraded, in part to consolidate wastewater flows from several smaller aging wastewater treatment facilities in the Yellow River Basin. The consolidation allowed Gwinnett County to decommission five smaller treatment facilities and redirect flows to the YRWRF. The YRWRF expansion will increase the present design capacity of 14.5 MGD to 22 MGD.

New facilities being constructed at the YRWRF include a preliminary treatment building, primary clarifiers, equalization tanks, fine screens, biological reactor basins, a membrane building (membrane bioreactor or MBR), UV disinfection channels; chemical feed systems, a plant odor control building, an operations building, and a maintenance building. The YRWRF currently meets the effluent permit limits as required by EPD. Additional details regarding the YRWRF are provided in TM9 – Water Reclamation and Discharge Evaluation and Recommendations.

CROOKED CREEK WATER RECLAMATION FACILITY[3]

The Crooked Creek Water Reclamation Facility (CCWRF) is located on a 45-acre site off Holcomb Bridge Road, approximately 1 mile southeast of the Chattahoochee River and the Fulton County line. The CCWRF can treat 16 MGD on a maximum monthly flow basis and practices incidental reuse through a discharge into the Chattahoochee River at a location upstream of drinking water withdrawals for other communities.

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[1] Design Development Report, Supplement No. 2. for the F. Wayne Hill Water Resources Center, CH2M Hill and Jordan Jones and Goulding (2005).
[2] Design Development Report, Yellow River Water Reclamation Facility, Jordan Jones and Goulding, CH2M Hill and Precision Planning (2006).
[3] Preliminary Design Report, Gwinnett County Crooked Creek WRF, CH2M Hill (2006).

The major unit treatment processes in operation at the CCWRF are raw sewage screening and grit removal, influent pumping, oxidation ditches, secondary clarification, filtration, and ultraviolet (UV) disinfection and post-aeration. Currently, treated effluent flow from the CCWRF and FWHWRC are combined and discharged to the Chattahoochee River through a diffuser located just downstream of the River's confluence with Crooked Creek. This combined discharge is considered incidental reuse because there are a number of drinking water withdrawals downstream of this site.

As discussed in TM9 – Water Reclamation and Discharge Evaluation and Recommendations, the CCWRF currently meets the effluent limits required by EPD.

WATER REUSE OPTIONS

Among the types of reuse presented in TM10.1, the most suitable water reuse option for Gwinnett County in the future is indirect potable reuse.

- Direct potable reuse is not currently practiced in the United States, due to a lack of regulatory acceptance and low public confidence with its safety. Significant changes in the Safe Drinking Water Act and its regulations would be needed over the 20-year planning horizon before direct potable reuse may be considered as an option.
- Non-potable reuse encourages the consumptive use of water. Consumptive use is defined as the difference between the water withdrawn and the amount of water returned to the same hydrologic system over a period of time[4]. Non-potable reuse is discouraged in the Metro Atlanta region, where the return of treated effluent is encouraged to maintain limited water supply sources.
- Indirect potable reuse provides flexibility for Gwinnett County in meeting future water demands, and does not encourage consumptive use. Near the end of the planning horizon, Gwinnett County may need additional water supplies. Increasing the practice of planned indirect potable reuse through returns from FWHWRC to Lake Lanier could be the basis for Gwinnett County requesting "credit" for additional withdrawals as an offset for the additional returns to Lake Lanier.

Regulatory acceptance of indirect potable reuse is high, given that such systems have already been approved in Georgia. There are no separate standards for indirect potable reuse in Georgia, although these discharges must still meet their EPD permit limits based on the assimilative capacity of the receiving waterbody.

Beyond the capacity of the existing discharge permits, Gwinnett County has several reuse options that are presented below:

1. Gwinnett County can increase the permitted returns to Lake Lanier and increase the option for "return credits". If the discharge exceeds 40 MGD, it will necessitate a permit modification. The increased discharge to Lake Lanier could decrease the water currently sent to CCWRF through the existing effluent line (55 MGD capacity).

2. Constructing a new reservoir site to allow for the blending of reclaimed water from FWHWRC or other WRFs with raw water from Lake Lanier. However, this would require continued use of Lake Lanier, new permits from EPD and new pipelines to carry water from Lake Lanier and the reclaimed water from FWHWRC to the new storage site.

Water quality and treatment requirements may be expected to become more stringent than current requirements in coming years and such a trend may impact Gwinnett County's ability to exercise the above options. The implications of these requirements are described in greater detail in the next section.

[4] Adapted from the *Georgia Comprehensive State-wide Water Management Plan*. January 8, 2008.

WATER QUALITY AND TREATMENT REQUIREMENTS

Currently, Georgia does not have separate regulations that govern indirect potable reuse aside from the NPDES discharge permit requirements, but Georgia does have limits for non-potable reuse where human contact is unrestricted, such as golf courses or parks (Guidelines for Water Reclamation and Urban Reuse).

WATER QUALITY REQUIREMENTS

In terms of water quality, three topics that could have a profound impact on treatment requirements are discussed below: nutrient standards to lakes, contaminants of emerging concern, and total organic carbon.

Nutrient Standards for Lakes

EPD has established standards for phosphorus and nitrogen for the major lakes in Georgia. The Environmental Protection Agency (EPA) is now developing nutrient standards for streams, which in turn, will be developed and may be adopted in Georgia in the future.

The currently defined load into Lake Lanier from all point sources is 36,900 lbs/yr of phosphorus. At the current waste load allocation for Lake Lanier, Gwinnett County may develop a case for discharging higher than current flows of reclaimed water into Lake Lanier based on lower phosphorus levels in the discharged water than the phosphorus level used to compute the waste load allocation.

Contaminants of Emerging Concern (CECs)

A new category of compounds for reclaimed water (for planned indirect potable reuse) has emerged as compounds of potential concern due to potential public health concern. Contaminants of emerging concern (CECs) include N-nitrosodimethylamine (NDMA), endocrine disrupting compounds (EDCs), and other pharmaceuticals and personal care products (PPCPs).

The CECs are commonly derived from municipal, agricultural, and industrial wastewater sources and pathways. CECs are not completely degraded or removed from conventional wastewater treatment plant processes, thereby allowing the microcontaminants to enter the environment via treated wastewater effluents[5, 6]. Some of these contaminants are listed on EPA's Contaminant Candidate List (CCL)[7].

Currently, there are no CEC regulations in the United States. However, California does have a NDMA standard and wastewater systems in California are required to monitor for CECs. If standards are established in California, other states, including Georgia may follow.

Indirect potable reuse projects in the future, may potentially include CEC limits as a product of new water quality regulatory goals[8, 9]. Should regulations in the future include monitoring for CECs in treated effluents or in reclaimed water for reuse, Gwinnett County's WRFs may need to incorporate advanced treatment processes .

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[5] Drewes, J., Hemming, J., Schauer, J. and Sonzogni, W. Removal of Endocrine Disrupting Compounds in Water Reclamation Processes. WERF, Alexandria, VA, (2006).
[6] Sedlak, D.L., K. Pinkston and C-H. Huang. Occurrence Survey of Pharmaceutically Active Compounds. AwwaRF/AWWA (2005).
[7] http://water.epa.gov/scitech/drinkingwater/dws/ccl/index.cfm
[8] Daugherty, J., Deshmukh, S., Patel, M. & Markus, M. Employing Advanced oxidation for water reuse in Orange County, Watereuse Association, California Section Conference, San Diego, California (2005).
[9] Traves, W.H., Gardner, E.A., Denninen, B., and Spiller, D. Towards Indirect Potable Reuse in South East Queensland, Water Science and Technology, 58.1, (2008).

Total Organic Carbon (TOC)

Total organic carbon (TOC) addresses the control of organics in wastewater pertaining to long-term (chronic) health risks from disinfection byproducts potentially formed in distribution systems downstream of potable water treatment plants. WRFs are moving towards TOC, particularly dissolved organic carbon (DOC), as an indicator parameter for CECs because it is difficult to reliably measure CECs. Several states, e.g. California, Florida, and Massachusetts, have adopted TOC limits related to aquifer recharge (TOC limits ranging from 0.5-3.0 mg/L are stipulated prior to aquifer recharge).

Gwinnett County 2030 Water & Wastewater Master Plan

Technical Memorandum 11

Biosolids Treatment Evaluation and Recommendations

TO:	Todd Cleaver - Gwinnett County Planning & Development	PAGES:	32
SUBJECT:	Gwinnett County 2030 Water & Wastewater Master Plan Technical Memorandum 11 – Biosolids Management Evaluation and Recommendations		
FROM:	Kim Shorter, AECOM		
BY:	Walt Bashaw, JJG/ Jacobs		
DATE:	May 11, 2011		

SUMMARY

This Technical Memorandum (TM) presents an evaluation of future options for processing and managing the biosolids generated within Gwinnett County during wastewater treatment. The analysis presents the advantages, disadvantages, and life-cycle costs for each option. This alternatives analysis is one component of the Gwinnett County 2030 Water and Wastewater Master Plan (Master Plan).

Five options were evaluated ranging from solids handling facilities at each treatment plant to consolidating all solids handling at a single location, the F. Wayne Hill Water Resources Center (WRC). One of the key options evaluated the long-term viability of the current practice of conveying solids from the Yellow River Water Reclamation Facility (WRF) to the F. Wayne Hill WRC by mixing these solids with wastewater and pumping to F. Wayne Hill WRC.

The analysis confirmed that continuing to convey waste solids from the Yellow River WRF to the F. Wayne Hill WRC by mixing these solids in wastewater is economically viable, and this option is recommended. This option maintains the separate biosolids treatment at the Crooked Creek WRF. This current practice has the lowest life-cycle cost of the options considered, and it has the lowest initial cost outlay and lowest operation and maintenance (O&M) costs. There is recognition of the inherent risk in conveying solids through a pressure pipeline, in the rare event that the pipeline ruptures. This risk is considered to be manageable,

particularly since Gwinnett County currently operates an extensive network of pressure pipelines to convey wastewater, and has managed the system and risks well.

Proposed improvements that are needed in the near term to implement the recommended biosolids treatment plan consist of:

1. Replace thickening equipment at the F. Wayne Hill WRC to improve efficiency;
2. Install an anaerobic digester and ancillary equipment at the F. Wayne Hill WRC; and
3. Install improved thickening and dewatering systems at the Crooked Creek WRF.

The total cost, in net present value, for these improvements is estimated at $37 million as described in this TM.

INTRODUCTION

This TM, as part of the Gwinnett County's 2030 Water and Wastewater Master Plan, summarizes the existing practices for managing the biosolids generated at three wastewater treatment plants within Gwinnett County and evaluates the long-term viability of five options for future management. The planning period for this biosolids evaluation is from 2010 to 2030.

This Technical Memorandum is based on guidance provided by the Gwinnett County Department of Planning & Development (P&D) and Department of Water Resources (DWR) during a workshop held on March 25, 2010. This TM also builds on two recent reports developed for DWR, as summarized below:

- **Biosolids and Energy Management Evaluation Report:** This report, authored by Black & Veatch, reviews different solids treatment options with potential beneficial uses of treated biosolids. The primary goal of the study was to determine how to increase flexibility to the County's biosolids management program by expanding the number of disposal options and/or end uses. Biosolids end-use alternatives were evaluated related to energy recovery, greenhouse gas emissions and net present value costs. The alternatives evaluated include landfill disposal of dewatered cake, landfill disposal/ distribution and marketing of dried solids and landfill disposal of thermal destruction ash. The memo recommends continued landfill disposal for the short term as the most efficient and cost-effective option. Other options were higher cost due to the capital requirements of equipment used for intensive drying and thermal destruction. The report concludes that the energy recovery alternatives could reduce greenhouse gas emissions, but the cost savings do not justify the equipment and facility investment at present. The report recommends revisiting long term plans when the flow or unit costs change by more than 15 percent. This report was completed in 2008.

- **TM#7: Summary of Capacity Evaluation for F. Wayne Hill Solids Handling Processes**. This memo, authored by Hazen & Sawyer, presents an evaluation of the capacity of each unit process at the F. Wayne Hill WRC to handle maximum design loads (at 60 million gallons per day (MGD)) which include the solids from the Yellow River WRF. The study identified capacity limitations of several unit

processes. Recommendations include capacity improvements for solids thickening and anaerobic digestion units. Thickening facility improvements includes replacing existing centrifuge thickeners with either a gravity belt thickener or rotary drum thickener to result in 5.5% total solids in the blended digester feed. The improvements identified for anaerobic digestion include adding three additional digester tanks to accommodate increased mass and volume loadings primarily from the Yellow River WRF. The memo also presented a recommendation for further evaluation of potential capital and O&M savings on changing from conventional mesophilic anaerobic digestion process to two-phase acid-gas process. This technical memorandum was completed in 2010.

Currently, waste solids generated at the Yellow River WRF are mixed with wastewater flows from the Beaver Ruin Pump Station and sent to the F. Wayne Hill WRC for treatment. The current operations were designed to temporarily defer construction costs at the Yellow River WRF. Gwinnett County is interested in the long-term viability of the current operations. This technical memo evaluates the long-term viability of continuing this practice compared to the viability of additional alternatives for future biosolids management.

This Technical Memorandum is organized in the following sections:

- Existing Solids Handling - This section provides an overview of the existing solids handling processes at each of the three wastewater treatment plants that will be operational in the long term.
- Options Evaluated – This section presents the five alternatives evaluated for this TM.
- Basis of Evaluation- This section presents the factors considered as the basis for this evaluation.
- Results for Each Option – This section presents a summary of the recommended processes at each wastewater treatment facility as well as a summary of the advantages and disadvantages for that option.
- Life-Cycle Cost Analysis - This section presents the methodology used and the basis for developing the life-cycle costs for each alternative by wastewater treatment facility.
- Summary and Recommendations - This section presents a summary of the results and provides recommendations for biosolids management improvements.

EXISTING SOLIDS HANDLING

Gwinnett County currently has four wastewater treatment plants; Crooked Creek WRF, Jackson Creek WRF, Yellow River WRF, and F. Wayne Hill WRC. Gwinnett County also has an existing agreement with DeKalb County to divert up to 5 MGD of wastewater to the DeKalb County Pole Bridge Water Pollution Control Plant (WPCP). Gwinnett County plans to decommission the Jackson Creek WRF and redirect the flows currently sent to the DeKalb Pole Bridge WPCP for treatment elsewhere in the Gwinnett County system in the 2012 timeframe. Once these changes are completed, all wastewater generated in Gwinnett County will be treated

at the three remaining facilities. A summary of the solids handling processes at each facility is provided below.

Crooked Creek WRF:

The Crooked Creek WRF is located near Norcross and has a current (2010) capacity of 16 MGD on a maximum monthly basis. This facility produces only waste activated sludge, which is thickened using a gravity thickener and stabilized in aerobic holding tanks. The stabilized solids are dewatered using centrifuges. Gwinnett DWR contracts with a private firm to haul away the cake solids and dispose of them in a solid waste landfill.

Yellow River WRF:

The Yellow River WRF is located near Lilburn and has a current (2010) capacity of 14.5 MGD on a maximum monthly basis. This facility, once the ongoing treatment plant expansion is completed, will have a treatment capacity of 22 MGD on a maximum monthly basis and produce both primary sludge and waste activated sludge. Currently, the waste solids are mixed with wastewater from the No Business Creek Pump Station, then pumped to the Beaver Ruin Pump Station, and finally pumped to the F. Wayne Hill WRC.

F. Wayne Hill WRC:

The F. Wayne Hill WRC is located near Buford and has a current (2010) capacity of 60 MGD on a maximum monthly basis. F. Wayne Hill WRC has the most complicated solids handling system among the three facilities. Primary sludge, waste activated sludge, and chemical sludge are removed from the liquid-stream treatment processes. The waste activated sludge is thickened in centrifuges, mixed with the primary sludge and the two are stabilized in anaerobic digesters. The anaerobic digesters produce biogas, a methane-rich green fuel, formed during solids decomposition. The stabilized solids and chemical sludge are dewatered using centrifuges. Gwinnett DWR contracts with a private firm to haul away the cake solids and place them in a landfill.

Gwinnett DWR plans to upgrade the F. Wayne Hill WRC biosolids process. The upgrades include improvements to increase the solids captured in the primary clarifiers, the installation of a combined heat and power (CHP) system that will generate electricity for use within the WRC, and the addition of a system to accept fats, oil and grease (FOG) and high strength waste. FOG contains a high percentage of volatile fatty acids, which can be converted into biogas by the anaerobic digesters. These upgrades are currently planned to be completed by 2013.

OPTIONS EVALUATED

Five different options for biosolids management were evaluated ranging from centralized treatment to independent biosolids processing at each of the three treatment plants. The five options are described in Table TM11.1 and explained in greater detail in the Results Section of this TM. Table TM11.1 presents the waste solids facilities that are included under each option evaluated by treatment facility.

Table TM11.1: Waste Solids Facilities by Treatment Facility for Each Option Evaluated

Future Option	Crooked Creek WRF	Yellow River WRF	F. Wayne Hill WRC
1. Separate Facilities	Thickening and dewatering systems	Thickening, stabilization, and dewatering systems	Thickening, stabilization, and dewatering systems
2A. Yellow River WRF to F. Wayne Hill WRC, solids blended with wastewater	Thickening and dewatering systems	Mixing and pumping systems	Thickening, stabilization, and dewatering systems, and eventual addition of a biological treatment train
2B. Yellow River WRF to F. Wayne Hill WRC, dedicated solids pipeline	Thickening and dewatering systems	Pumping system and solids pipeline	Thickening, stabilization, and dewatering systems
3. F. Wayne Hill WRC and Crooked Creek WRF Combined	Pumping system and solids pipeline	Thickening, stabilization, and dewatering systems	Thickening, stabilization, and dewatering systems
4. Consolidation at F. Wayne Hill WRC	Pumping system and solids pipeline	Pumping system and solids pipeline	Thickening, stabilization, and dewatering systems, and sidestream treatment

All of these options are based on continued use of landfills for the disposal of cake solids based on the discussion at the biosolids workshop held on March 25, 2010. Within the metropolitan Atlanta area, the prevailing landfill rates make this method of disposal the most economical. This analysis assumes that landfill disposal of cake solids will remain economical for the foreseeable future. Should the economics of landfill disposal change in the future, DWR may need to re-evaluate disposal options.

BASIS OF EVALUATION

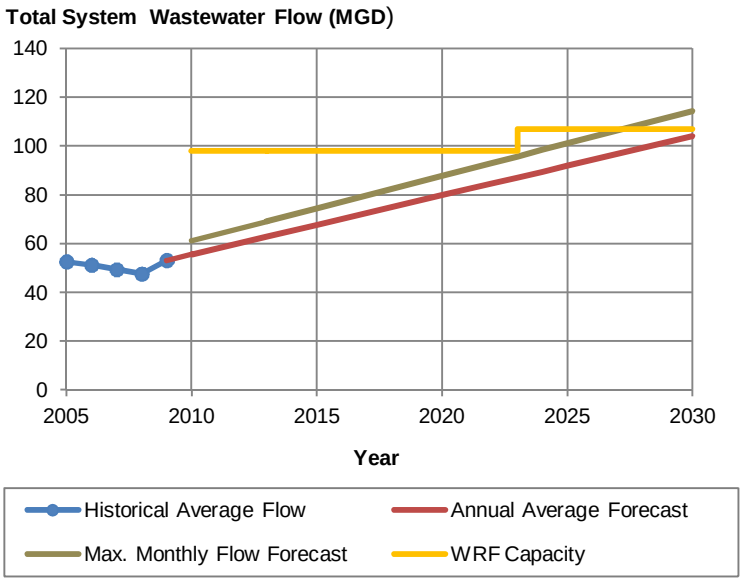
This Section provides a summary of the future wastewater flows, solids production, and the solids process performance used as the basis for the technical evaluation.

WASTEWATER FLOWS

The total Gwinnett County wastewater flows are anticipated to reach 104 MGD on an annual average day by 2030, as described in TM2 – Summary of Water and Wastewater Flow Forecasts. These forecasts were developed for the Gwinnett County 2030 Water and Wastewater Master Plan and are based on the International Gateway Scenario outlined in the Gwinnett County Unified Plan.

For this biosolids management evaluation, the future wastewater flows were projected using a uniform annual increase from the actual flow in 2009 of 53.2 MGD to the forecasted flow of 104 MGD in 2030 on an annual average day basis, as shown in Figure TM11.1. The maximum monthly flow was calculated to reflect the needed treatment capacity. The forecast maximum monthly wastewater flow in 2030 is 114 MGD.[1]

Figure TM11.1: Wastewater Flow Forecasts Used for Biosolids Evaluation



This biosolids analysis is based on the future wastewater flows to each WRF. Figure TM11.1 shows an increase in the Crooked Creek WRF to 25 MGD around the 2023 timeframe to meet increased demands. Although the 2030 flows are anticipated to be 114 MGD on a maximum monthly basis, only 107 MGD has been allocated to wastewater treatment facilities at the time of this memorandum. The additional capacity would likely be included at the F. Wayne Hill WRC, but the additional flows are not expected to change the biosolids analysis in this TM. Therefore, this analysis uses the following maximum month flows by treatment plant:

- F. Wayne Hill WRC – 60 MGD
- Yellow River WRF – 22 MGD
- Crooked Creek WRF – 25 MGD

SOLIDS PRODUCTION

The volume of solids produced at each wastewater treatment facility was estimated by multiplying the unit rate of solids generation and the volume of flow treated. The peak monthly solids production was estimated by multiplying the annual average daily wastewater flow with the solids generation factor and the solids generation ratio, provided in Table TM 11.2. This analysis is consistent with "Biosolids and Energy Management Evaluation," February 2008. The solids generation rates for the F. Wayne Hill WRC were based on "TM# 7: Solids Processing Unit Capacity Evaluation," dated June 2010, since this work is more recent than the 2008 evaluation and reflects the latest wastewater treatment conditions at this WRC. Solids generation rates are shown in Table TM11.2.

1 Technical Memorandum 2, Summary of Water and Wastewater Forecasts. AECOM. September 2010.

Table TM11.2: Projected Flows and Solids Generation Rates

Condition	Crooked Creek WRF	Yellow River WRF	F. Wayne Hill WRC	F. Wayne Hill WRC (With solids from Yellow River WRF in wastewater)
Annual Average Daily Wastewater Flow				
Year = 2013	12.5 MGD	20.0 MGD	30.3 MGD	30.3 MGD
Year = 2030	22.7 MGD	20.0 MGD	61.3 MGD	61.3 MGD
Plant Capacity (Maximum Monthly Flow)				
Year = 2030	25 MGD	22 MGD	60 MGD	60 MGD
Solids Generation Factors				
Primary Sludge	--	1500 lb/MG[2]	1520 lb/MG[3]	2020 lb/MG[9]
Waste Activated Sludge	2098 lb/MG[1]	1156 lb/MG[2]	1725 lb/MG[4]	1920 lb/MG[10]
Chemical Sludge	--	--	525 lb/MG[5]	525 lb/MG[5]
Solids Generation maximum monthly flow: Average Mass Ratio				
Primary Sludge	--	1.53[2]	1.20[6]	1.20[6]
Waste Activated Sludge	1.28[1]	1.73[2]	1.22[7]	1.22[7]
Chemical Sludge	--	--	1.20[8]	1.20[8]

Sources of Information:
[1] "Biosolids and Energy Management Evaluation," Technical Memo 1 – Solids Generation Evaluation, Table 3-3.
[2] "Biosolids and Energy Management Evaluation," Technical Memo 1 – Solids Generation Evaluation, Table 3-10.
[3] "TM# 7: Solids Processing Unit Capacity Evaluation," Table 2.1, as 152,181 lb TSS/d x 50% removal / 50 MGD = 1520 lb/MG.
[4] "TM# 7: Solids Processing Unit Capacity Evaluation," Tables 2.1, 2.3, and 2.4, as 1920 /b/MG x (118,424 lb TSS/d / 131,774 lb TSS/d)
[5] "TM# 7: Solids Processing Unit Capacity Evaluation," Tables 2.8, as 26,250 lb TSS/d / 50 MGD = 525 lb/MG.
[6] "TM# 7: Solids Processing Unit Capacity Evaluation," Tables 2.4 and 2.5, as 120,950 lb TSS/d / 100,760 lb TSS/d = 1.20.
[7] "TM# 7: Solids Processing Unit Capacity Evaluation," Tables 2.4 and 2.5, as 117,130 lb TSS/d / 96,210 lb TSS/d = 1.22.
[8] "TM# 7: Solids Processing Unit Capacity Evaluation," Table 2.8, as 31,500 lb TSS/d / 26,250 lb TSS/d = 1.20.
[9] "TM# 7: Solids Processing Unit Capacity Evaluation," Table 2.4, as 100,760 lb TSS/d / 50 MGD = 2020 lb/MG.
[10] "TM# 7: Solids Processing Unit Capacity Evaluation," Table 2.4, as 96,210 lb TSS/d / 50 MGD = 1920 lb/MG.

PROCESS PERFORMANCE

Key process performance parameters for the solids handling unit processes, shown in Table TM11.3, were used to estimate the mass and flow of solids through each plant. The bases for these factors are shown in the notes below the table.

Table TM11.3: Key Process Performance Factors

Parameter	Value
Primary Sludge – Volatile Fraction	75%[1]
Primary Sludge – Concentration	4% TS[1,3]
Waste Activated Sludge – Volatile Fraction	66%[2]
Waste Activated Sludge – Volatile Fraction (Yellow River WRF)	70%[1]
Waste Activated Sludge – Concentration (Yellow River WRF MBR)	1.0% TS[1]
Waste Activated Sludge – Concentration (Crooked Creek WRF)	1.2% TS[3]
Waste Activated Sludge – Concentration (F. Wayne Hill WRC)	1.37% TS[4]
Chemical Solids – Concentration (F. Wayne Hill WRC)	2.0% TS[5]
Rotary Drum Thickeners – Thickened Solids Concentration	3.0% TS[1]
New Thickeners at F. Wayne Hill WRC – Thickened Solids Concentration	5.5% TS
Anaerobic Digestion – Volatile Solids Destruction	33%
Anaerobic Digestion – Active Volume	90%
Centrifuge Dewatering – Cake Solids Content	23%[6]

Sources of Information:
[1] "Biosolids and Energy Management Evaluation," Technical Memo 1 – Solids Generation Evaluation, Table 3-9.
[2] "TM# 7: Solids Processing Unit Capacity Evaluation," Table 2.4.
[3] "Biosolids and Energy Management Evaluation," Technical Memo 1 – Solids Generation Evaluation, Table 3-2.
[4] "Biosolids and Energy Management Evaluation," Technical Memo 1 – Solids Generation Evaluation, Table 3-5.
[5] "TM# 7: Solids Processing Unit Capacity Evaluation," Table 3.7.
[6] "Biosolids and Energy Management Evaluation," Technical Memo 3 – Alternative Evaluation, page 2.

RESULTS FOR EACH OPTION

A basic process flow sheet was developed for each WRF for each of the five options to predict the need for new or upgraded facilities within the planning horizon of 2010 to 2030. The basic process flow sheets, included in Appendix A, are based on maximum monthly flows and the solids generation rates presented in Table 11.2 of this TM.

The Master Plan is based on continuing to use conventional mesophilic anaerobic digestion at the F. Wayne Hill WRC. Increasing the volatile solids destruction of the conventional anaerobic digestion process would be desirable to increase biogas production. Increasing the proportion of primary sludge in the digester feed is one way to improve the volatile solids destruction. Another option is to convert to the acid/gas two-phase anaerobic digestion process. This process is well-suited to stabilizing solids containing a high concentration of waste activated sludge and would reduce the volume of solids generated. The first step in the anaerobic process uses a small acid-phase reactor. After acidification, the solids enter methane-phase reactors, where methanogenic bacteria break down the volatile fatty acids formed during the acid-phase reactors. The DuPage County Illinois Woodridge-Green Valley Wastewater Facility has used an acid/gas two phase

digestion process for 20 years. These options should be considered as part of the design of new anaerobic digesters at the F. Wayne Hill WRC.

This section summarizes the results of the biosolids analysis for each option. The description includes a summary of the processes at each water reclamation facility as well as a summary of the advantages and disadvantages for that option.

1. SEPARATE FACILITIES

This option includes separate facilities to treat the solids at each of the three treatment facilities.

F. Wayne Hill WRC – New thickening equipment is proposed under this alternative to replace the existing thickening centrifuges, which are unable to achieve consistent thickening performance. The new thickening equipment was recommended as part of the more detailed study for "TM#7: Liquid Process Unit Capacity Evaluation," June 2010. The new thickening equipment will be used to co-thicken mixed primary and waste activated sludges. Over the planning period, three anaerobic digesters (1 million gallons (MG) each) as well as ancillary equipment will be installed to operate in tandem with the five existing 1 MG anaerobic digesters. A storage tank for digested solids will be added. The six existing dewatering centrifuges (five duty, one standby) were found to be adequate for the planning period.

Yellow River WRF – New rotary drum thickeners will be installed to thicken the waste activated sludge. Thickened waste activated sludge will be mixed with the primary sludge and fed to anaerobic digesters. Two egg-shaped digesters, each with a capacity of 2.2 MG, will be constructed, as planned in the preliminary design of the WRF. The digested solids will be dewatered using four centrifuges (three duty, one standby).

Crooked Creek WRF – The existing solids storage tanks will continue in service. The existing equipment has reached the end of its service life and one option being considered is to install new rotary drum thickeners and dewatering centrifuges (two duty, one standby). The cost estimates presented in this TM are based on this plan, however Gwinnett DWR is currently re-evaluating the options for solids handling at Crooked Creek.

Advantages – The main advantage of this option is that each WRF operates independently so that each plant manager can control operation of the liquid-stream processes and solids handling systems without impacts from the other plants. Unusual operating conditions at one WRF do not impact another WRF.

Disadvantages – The main disadvantage of this option is that each WRF must have staff for operating solids treatment systems. Overall, this will result in more operations costs across the County. In addition, neighborhoods at all three treatment facilities will be affected by truck traffic from hauling cake solids. Finally, it is uncertain how the neighbors of the Yellow River WRF will react to the visual appearance of egg-shaped digesters, which are likely to be the tallest structures at the site.

2A. YELLOW RIVER WRF TO F. WAYNE HILL WRC, SOLIDS BLENDED WITH WASTEWATER

Transferring solids from the Yellow River WRF to the F. Wayne Hill WRC for processing is addressed under this option. For this option, the current practice of pumping the solids to the Beaver Ruin Pump Station and mixing with wastewater that is pumped to the F. Wayne Hill WRC will be continued.

F. Wayne Hill WRC – The solids from the Yellow River WRF arrive at the F. Wayne Hill WRC mixed in the wastewater and added to the loads on the primary clarifiers and biological treatment system. The impacts on the liquid-stream treatment process were investigated in "TM#7: Liquid Process Unit Capacity Evaluation," June 2010, which concluded that the present liquid-stream processes can handle the loading, provided all 10 of the biological treatment trains are operated during the winter months to ensure nitrification. Since the design criteria for the plant is based on having one biological treatment train on standby, this option includes adding another biological treatment train. Flow projections suggest that the earliest a new biological treatment train would be needed would be around 2023. As a practical matter, adding a biological treatment train would most likely be included in a plant expansion project, rather than constructed as an independent project as is considered here.

New thickening equipment is proposed to co-thicken mixed primary and waste activated sludges. The anaerobic digestion process will be expanded by adding one digester with 1-MG capacity and two digesters each with 2-MG capacity) over the planning period, to operate in concert with the five existing 1-MG anaerobic digesters. A storage tank for digested solids will be added. One dewatering centrifuge will eventually need to be added to the six existing units to handle the increased quantity of solids.

Yellow River WRF – Because facilities are in place for delivering the waste solids from the Yellow River WRF to the F. Wayne Hill WRC, no substantial improvements are needed at the Yellow River WRF.

Crooked Creek WRF – Solids handling facilities at Crooked Creek WRF will be the same as under Option 1.

Advantages – The main advantage of any option consolidating solids handling at the F. Wayne Hill WRC is that there will be fewer solids processing systems for operation. Under Option 2A, there will be no solids processing systems at the Yellow River WRF, making this plant simpler to operate than if it included solids processing systems. This will result in less operations staff overall. Truck traffic from hauling cake solids will be eliminated at the Yellow River WRF, and result in only a 15% increase in hauling at the F. Wayne Hill WRC.

Another advantage of any option consolidating solids handling at the F. Wayne Hill WRC is that the use of the CHP system to produce electricity can be maximized.

A process advantage of Option 2A is that it produces the least volume of cake solids for off-site management. Because the solids from the Yellow River WRF are treated by the liquid-stream processes at the F. Wayne Hill WRC, some of the solids are oxidized, reducing the final quantity of cake solids generated.

Disadvantages – Transporting solids in a pipeline involves a risk that, in the rare event that the pipeline ruptures, solids will be discharged to the environment. This wastewater will have a higher concentration of sludge and therefore could have a greater environmental impact if there is a pipeline rupture. Another

disadvantage is that the nutrients contained in the solids will be transferred to the F. Wayne Hill WRC, which must meet extremely low nutrient concentrations in its treated flow. The presence of the nutrients could complicate treatment operations at the F. Wayne Hill WRC.

2B. F. WAYNE HILL WRC AND YELLOW RIVER WRF COMBINED, DEDICATED SOLIDS PIPELINE

This option is similar to Option 2A, however this option includes constructing a dedicated solids pipeline to transport the solids. With a dedicated solids pipeline, the solids can be delivered into the solids thickening system and will not affect the liquid-stream treatment processes.

F. Wayne Hill WRC – New thickening equipment is proposed to thicken mixed primary and waste activated sludges and the solids received from the Yellow River WRF. The anaerobic digestion process will be expanded by adding three digesters (each with 2-MG capacity) over the planning period to the five existing 1-MG anaerobic digesters. A storage tank for digested solids will be added. One dewatering centrifuge will eventually need to be added to the six existing units to handle the increased quantity of solids.

Yellow River WRF – A new solids holding tank will be added at the Yellow River WRF to allow solids to be conveyed through the pipeline in batches. A new off-site solids pumping station will be installed, perhaps in the vicinity of the Beaver Ruin Pump Station. A new dedicated pipeline, approximately 20 miles in length, will be installed, terminating at the F. Wayne Hill WRC. The route of the pipeline was not finalized as part of this TM. An example of a utility operating a pipeline for solids conveyance is JEA (formerly Jacksonville Electric Authority) in Jacksonville, FL, which uses a pipeline to deliver solids to the Buckman WRF.

Crooked Creek WRF – Solids handling facilities at Crooked Creek WRF will be the same as under Option 1.

Advantages – The advantages of Option 2B are essentially the same as those for Option 2A. Under Option 2B solids will not be added to the liquid-end treatment processes at the F. Wayne Hill WRC, which should make operations less complicated.

Disadvantages – The biggest disadvantage with Option 2B is the disruption associated with installation of the pipeline. Installing the portions of the pipeline that are located in existing public easements will likely disturb other underground utilities and disrupt traffic. Installing the portions of the pipeline that are outside of existing public easements will cause fewer disruptions, but will add cost and time for acquiring easements.

Similar to Option 2A, in the rare event that the pipeline ruptures, solids will be discharged to the environment. Operation of a solids-only pressure pipeline, however, could involve more complications than those encountered with a conventional wastewater force main. For example, air release valves, needed at the high-points along the pipeline, are expected to be more prone to plugging and have a higher potential for odor release than with a conventional wastewater force main.

3. F. WAYNE HILL WRC AND CROOKED CREEK WRF COMBINED

Option 3 combines solids processing at two facilities—the F. Wayne Hill WRC and the Yellow River WRF. A dedicated solids pipeline will be installed to convey the solids from the Crooked Creek WRF to the solids thickening system at the F. Wayne Hill WRC.

F. Wayne Hill WRC – New solids handling systems to be installed at the F. Wayne Hill WRC will be essentially the same as those proposed under Option 2A.

Yellow River WRF – The same solids handling systems proposed under Option 1 will be installed at the Yellow River WRF, which will operate independently of the other two treatment facilities.

Crooked Creek WRF – A new solids pumping system will be added at the Crooked Creek WRF, along with a dedicated pipeline, approximately 20 miles in length, connecting to the F. Wayne Hill WRC. The route of the pipeline was not finalized as part of this TM.

Advantages – The advantages of Option 3 are similar to those for Option 2A. Under Option 3, the Crooked Creek WRF will be simpler to operate because solids will no longer be processed at this facility. A process advantage to Option 3 is that the solids produced by the Crooked Creek WRF, which presently are not digested, will undergo anaerobic digestion at the F. Wayne Hill WRC. Anaerobic digestion reduces the quantity of solids through decomposition, thereby resulting in fewer solids for off-site management. In addition, biogas is produced as a by-product of the anaerobic decomposition, and biogas is the fuel for the (future) CHP system for energy recovery.

Disadvantages – Similar to Option 2B, the most important disadvantage with Option 3 is the temporary inconvenience resulting from installation of the pipeline to convey the solids. Option 3 also entails the risk that, in the rare event that the pipeline ruptures, solids will be discharged to the environment. Operations of a solids-only pipeline could be more complicated than operating a conventional wastewater force main, as discussed for Option 2B.

All of the waste solids from the Crooked Creek WRF are waste activated sludge, which could pose a process issue with solids treatment at the F. Wayne Hill WRC. Conveying these solids to the F. Wayne Hill WRC will increase the portion of waste activated sludge, changing the ratio of primary sludge to waste activated sludge from 45%/55% to 35%/65%. Since waste activated sludge is more difficult to digest, additional study of the impacts of the ratio change at F. Wayne Hill WRC may be needed prior to implementation of this alternative.

4. CONSOLIDATION AT F. WAYNE HILL WRC

Under this option, all solids processing will be consolidated at the F. Wayne Hill WRC. Solids will be conveyed in dedicated solids pipelines from the other two WRFs.

F. Wayne Hill WRC – Centralizing the solids processing operations at the F. Wayne Hill WRC will nearly double the quantity of solids processed, compared to operating the WRC independently. A significant expansion of the existing solids handling systems will be needed to handle the increase in load.

New thickening equipment is proposed to thicken mixed primary and waste activated sludges and the solids received from the Crooked Creek and Yellow River WRFs. The anaerobic digestion process will be expanded and the total digester volume will be 13 MG. The storage tank volume for digested solids will need to double in size. One new dewatering centrifuge will be needed immediately and a second will be needed before the end of the planning period.

To control nutrients returned to the liquid-end treatment process from the solids processes, a sidestream treatment system is included in this option. The main concern with nutrients is the soluble phosphorus and ammonia-nitrogen that result from anaerobic digestion and are contained in the centrate. The sidestream treatment system that is envisioned includes chemical precipitation for phosphorus removal and a biological system for nitrogen removal. One alternative is a phosphorus recovery system, such as Ostara's Pearl Nutrient Recovery Process, that produces a marketable product by forming struvite.

Yellow River WRF – The same solids pumping system described for Option 2B will be installed.

Crooked Creek WRF – The same solids pumping system described for Option 3 will be installed.

Advantages – Centralizing solids processing at the F. Wayne Hill WRC will simplify operations at the Crooked Creek and Yellow River WRFs. This alternative reduces the hauling and trucking cost by limiting these operations only to the F. Wayne Hill WRC, which is located closer to the landfills.

Centralizing solids processing provides the best opportunity for energy recovery with a CHP system. Less equipment needs to be installed for the CHP system, if it is all installed at one plant. Repair and maintenance is expedited by having this equipment in a single location. Processing the waste solids from the Crooked Creek WRF through anaerobic digestion increases the biogas available for the future CHP system, as well as decreases the quantity of cake solids.

Centralizing solids processing also makes it easier to add a further processing step, should it be needed sometime in the future. Further processing could include a heat drying system that produces pellets which can be used as fertilizer. Alternately, further processing could be a thermal destruction system that extracts energy from the cake solids and reduces the material to ash. In either case, the volume of material for off-site management will be greatly reduced by the further processing system. Both of these systems are more economical at a larger scale, so centralizing solids processing at one WRF is likely to be part of implementing a further processing system, if it is needed in the future. Because the need for a further processing system is considered to be well into the future, there is little value to be realized today for centralizing solids processing, other than the convenience of having all solids handling facilities at one WRF.

Disadvantages – The disadvantages with Option 4 are similar to those under Options 2A, 2B, and 3, except that they are intensified by the larger volume of solids being processed. For example, two solids conveyance pipelines will be in operation with Option 4, increasing the risks and concerns to be managed.

To meet the nutrient treatment requirements at the F. Wayne Hill WRC, a sidestream treatment system is included in this alternative. This additional treatment system increases the cost of this option.

Under Option 4 the operation of all three treatment facilities is linked as a result of the consolidated solids treatment at the F. Wayne Hill WRC. Operation of all three treatment facilities must be coordinated to meet solids treatment schedules at the F. Wayne Hill WRC. Issues at any one of the treatment facilities may affect operations at the other two facilities.

While centralizing solids processing under Option 4 makes it easier to add a further processing step, there are disadvantages to this approach. Primarily, further processing entails installation and operation of an expensive facility for handling the solids, increasing the cost and effort for managing solids.

LIFE-CYCLE COST ANALYSIS

A life-cycle cost analysis was performed to evaluate the five alternatives for biosolids management. The life-cycle costs were estimated as a present worth cost, using the following components:

- Capital Cost
- Operation and Maintenance Costs
- Renewal and Replacement Costs
- Salvage Value

The present worth cost was calculated for each year and totaled for the planning period. The industry standard factors used to develop the life-cycle cost analysis are listed in Table TM11.4.

Table TM11.4: Factors for Life-Cycle Cost Analysis

Factor	Value
Operations Period	2013 through 2030
Discount Rate	5% per year
Inflation Rate	3% per year
Salvage Value in 2030	Straight-line Depreciation
Economic Life of Process Equipment	8 years
Economic Life of Buildings	33 years
Economic Life of Structures	30 years
Economic Life of Buried Pipelines	50 years

CAPITAL COST

The capital costs for the major process equipment at each WRF for each option are presented in Table TM11.5. Option 4, which consolidates solids treatment at F. Wayne Hill WRC, has the largest estimated capital cost at $242 million. Option 2A, with the Yellow River WRF solids treated at F. Wayne Hill WRC and the Crooked Creek WRF solids treated separately has the lowest estimated capital cost of just over $100 million.

Capital costs for the solids improvements associated with each of the five options were, in general, developed by updating recent cost information developed for Gwinnett DWR in recent reports2. These capital costs were adjusted to 2010 dollars.

A construction capital cost of $5.3 million was used for installing gravity belt thickeners at the F. Wayne Hill WRC based on "TM# 7: Solids Processing Unit Capacity Evaluation" report. An engineering, legal, and administration cost of 10% was added to this cost.

The capital cost to add a biological treatment train at the F. Wayne Hill WRC for Option 4 was the only cost developed specifically for this Technical Memorandum. This cost was estimated at $20 million for one treatment train, based on the construction costs for Contract 2 – Biological Treatment Facilities at F. Wayne Hill WRC. The total contract cost of $114 million included other projects in addition to the 6 new biological treatment trains, approximately 75% of this contract cost was associated with the new treatment trains. The estimated cost per treatment train was updated to consider inflation since 2002 and to include a 10% cost for engineering, legal, and administration.

Table TM11.5: Comparison of Capital Costs for Biosolids Treatment Options ($million in 2010 dollars)

Items	Year	Option 1 Separate Facilities	Option 2A Yellow River WRF to F. Wayne Hill WRC, Solids Blended with Wastewater	Option 2B F. Wayne Hill WRC and Yellow River WRF Combined, Dedicated Solids Pipeline	Option 3 F. Wayne Hill WRC and Crooked Creek WRF Combined	Option 4 Consolidated at F. Wayne Hill WRC
Crooked Creek WRF						
Thickeners and Dewatering Centrifuges[1]	2012	$13.6	$13.6	$13.6	--	--
Storage and Pumping[1]	2012	--	--	--	$2.1	$2.1
Solids Pipeline[1]	2012	--	--	--	$28.6	$28.6
Yellow River WRF						

2 Cost references include: "Biosolids & Energy Management Evaluation Report, Technical Memo 3 – Alternative Evaluation," "TM#7: Solids Processing Unit Capacity Evaluation," and the contract 2 for biological treatment facilities at F. Wayne Hill

Table TM11.5: Comparison of Capital Costs for Biosolids Treatment Options ($million in 2010 dollars)

Items	Year	Option 1 Separate Facilities	Option 2A Yellow River WRF to F. Wayne Hill WRC, Solids Blended with Wastewater	Option 2B F. Wayne Hill WRC and Yellow River WRF Combined, Dedicated Solids Pipeline	Option 3 F. Wayne Hill WRC and Crooked Creek WRF Combined	Option 4 Consolidated at F. Wayne Hill WRC
Thickeners and Dewatering Centrifuges[1]	2012	$17.5	--	--	$17.5	--
Anaerobic Digesters and CHP[1]	2012	$55.5	--	--	$55.5	
Storage and Pumping[1]	2012	--	--	$6.5	--	$6.5
Solids Pipeline[1]	2012	--	--	$23.6	--	$23.6
F. Wayne Hill WRC						
Thickeners[2]	2012	$5.2	$5.8	$5.8	$5.8	$5.8
Anaerobic Digesters[1]	2012	--	$17.5	$53.0	$17.5	$74.1
	2014	$17.5	$24.4	--	$26.5	$37.0
	2020	$15.4	--	$26.5	$26.5	$37.0
	2022	--	$17.5	--	--	--
	2025	$13.3	--	--	--	--
Storage Tank[1]	2020	$1.7	$1.7	$1.7	$1.7	$3.4
Dewatering Centrifuges[1]	2012	--	--	--	--	$3.3
	2020	--	--	--	--	$3.3
	2025	--	$3.3	$3.3	$3.3	--
Sidestream Treatment[1]	2012	--	--	--	--	$17.0
Biological Treatment Train[3]	2023	--	$20.9	--	--	--
TOTAL		**$140**	**$105**	**$134**	**$185**	**$242**

Sources of Cost Estimates:
[1] "Biosolids and Energy Management Evaluation," Technical Memo 3 – "Alternative Evaluation". Black & Veatch. February 2008.
[2] "TM# 7: Solids Processing Unit Capacity Evaluation," Table 4-5. Hazen & Sawyer. June 2010.
[3] Contract 2 – Biological Treatment Facilities at the F. Wayne Hill WRC

OPERATION AND MAINTENANCE COSTS

The O&M costs include labor, electrical power, chemicals/supplies, spare parts/maintenance, and off-site solids management fees. All O&M costs were based on 2010 costs and escalated for inflation at 3% per year over the planning period.

O&M costs were estimated for the year 2013 and the year 2030. The O&M costs for the intervening years were calculated based on a straight line interpolation. The operations period starts in 2013, as that is when construction of the first recommended projects in this TM are planned to be operational.

The major O&M unit cost factors are listed in Table TM11.6. The unit cost factors were applied to the estimated operating time for the solids handling equipment, based on the estimated throughput for the forecast solids production, as shown in Appendix A.

Table TM11.6: Major Unit Cost Factors for Operation and Maintenance Costs

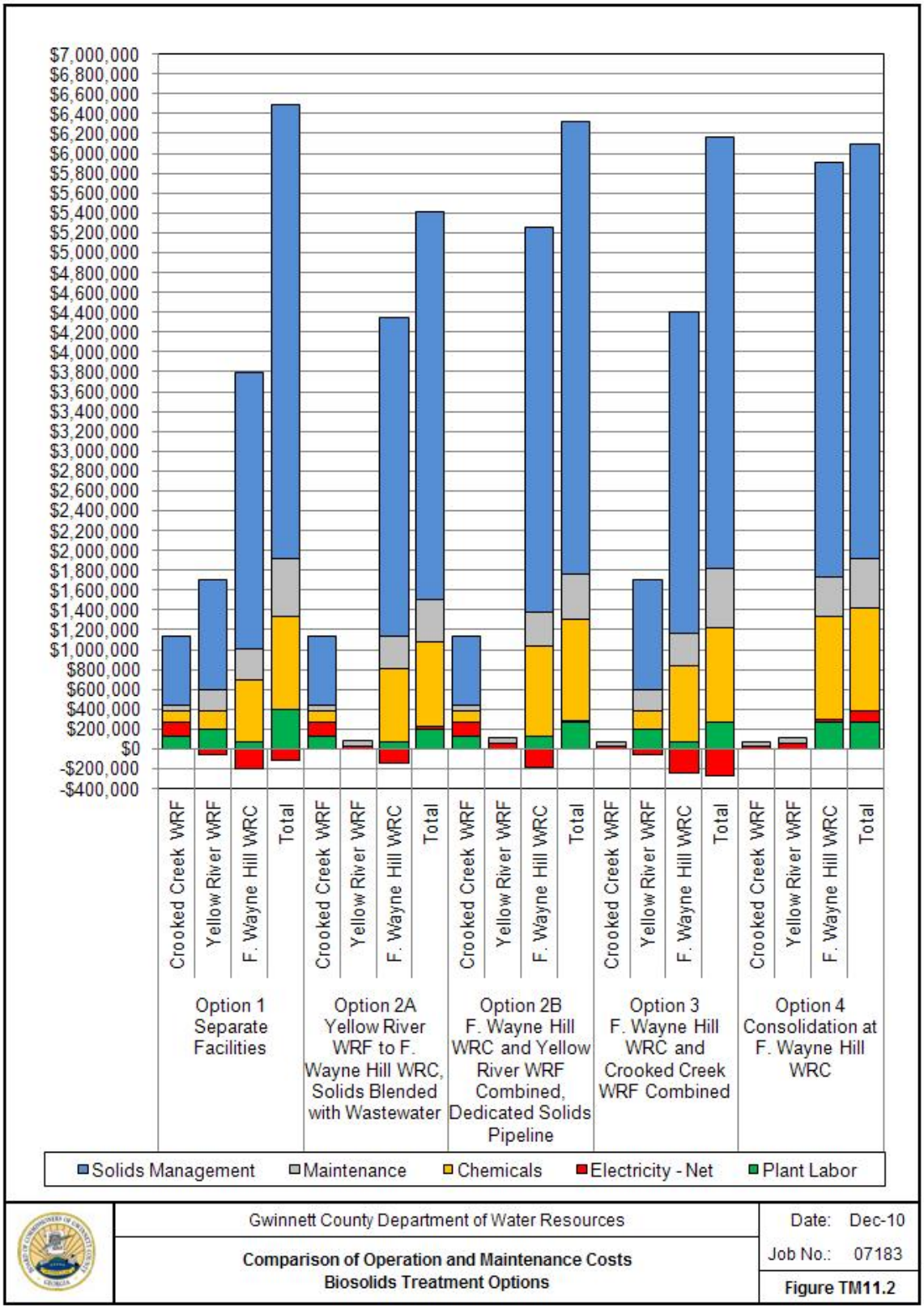
Factor	Value
Operator Labor Rate	$65,750 per year [1]
Electrical Power Cost (Crooked Creek WRF)	$0.062 per kwh[1]
Electrical Power Cost (Yellow River WRF)	$0.060 per kwh[1]
Electrical Power Cost (F. Wayne Hill WRC)	$0.057 per kwh[1]
Landfill Fee – Present Rate with 3 WRFs	$36.95 per wet ton[1]
Landfill Fee – Potential Rate without Crooked Creek WRF	$35.95 per wet ton
Landfill Fee – Potential Rate without Crooked Creek and Yellow River WRFs	$34.95 per wet ton

Sources of Information:
[1] "Biosolids and Energy Management Evaluation," Technical Memo 3 – Alternative Evaluation, Table 8. Black & Veatch. February 2008. Inflation was added for 2007 to 2010 at 3% per year.

The landfill fee includes hauling cake solids to a municipal solid waste landfill for disposal. Since the landfills used by the County are to the east of the treatment facilities, the hauling distance is further from the Crooked Creek WRF than from the other two treatment facilities. Hence, a reduction in the landfill fee is considered likely under Options 3 and 4, since cake solids would no longer be produced at the Crooked Creek WRF.

The operation and maintenance cost in 2013 by WRF and by option is shown in Figure TM11.2.

Figure TM11. 2: Operation and Maintenance Cost Comparison



Option 1 – Separate Facilities is expected to have the highest operation and maintenance costs of approximately $6.4 million per year in 2013, and Option 2A – Yellow River WRF to F. Wayne Hill WRC, Solids Blended with Wastewater is expected to have the lowest costs at just over $5.4 million per year.

Approximately 70 to 75% of the operation and maintenance costs are for management of the solids off-site. As a result, the options with the lower quantities of cake solids, Options 2A and 4, have lower operation and maintenance costs.

For all the options, except Option 4, the cost of electrical power at the F. Wayne Hill WRC is less than zero, which indicates that the CHP system is expected to generate more electricity than is used in solids handling. The surplus in electricity could be used by other areas within the plant, such as for the liquid-stream treatment processes. Because all options except Option 4 have a negative cost for electrical power, a sharp increase in electrical cost, such as doubling or tripling of the rates, does not change the relative rankings of the options, except that Option 3 becomes slightly less expensive than Option 4.

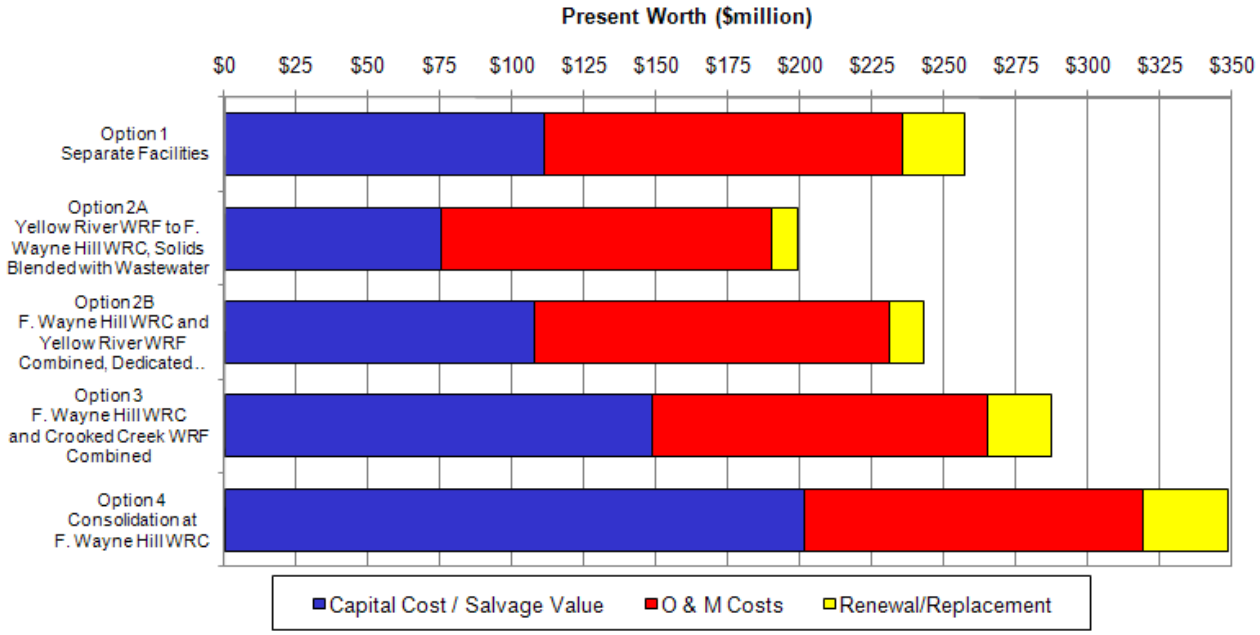
RENEWAL AND REPLACEMENT COSTS AND SALVAGE VALUE

Renewal and replacement costs were included in the life-cycle cost to recognize that some items, especially electronics and process equipment, must be replaced after a few years of use. Salvage value was also included in the life-cycle cost. Salvage value reflects the useful life remaining at 2030. For example, the solids pipelines have a useful life of 50 years, so over half the capital cost of the pipeline is recognized as salvage value in 2030. Also, those improvements scheduled to be installed in 2025 have a significant salvage value remaining in 2030.

LIFE CYCLE COSTS

The results of the life-cycle cost analysis, shown on Figure TM11.3, indicate that Option 2A – Yellow River WRF to F. Wayne Hill WRC, Solids Blended with Wastewater, has the lowest life-cycle cost with a present worth of nearly $200 million. This option has the lowest capital cost, the lowest operation and maintenance cost, and the lowest renewal and replacement cost. Option 2B – F. Wayne Hill WRC and Yellow River WRF Combined, Dedicated Solids Pipeline has the next lowest life-cycle cost, which is projected to be about 20% more than the cost for Option 2A. The option with the highest life-cycle cost is Option 4 – Consolidated at F. Wayne Hill WRC, has a present worth of $350 million. Option 4 has a much higher capital cost than the others and very little of the capital cost can be deferred to later in the planning period, since most of the cost is for facilities needed immediately to implement the option.

Figure TM11. 3: Life-Cycle Costs for Biosolids Treatment Options



SUMMARY AND RECOMMENDATIONS

This technical memorandum presents an evaluation of future options for processing and managing the biosolids generated during wastewater treatment. Five options ranging from solids handling facilities at each treatment plant to consolidating all solids handling at a single location, the F. Wayne Hill WRC.

The recommendation based on this Technical Memorandum is for Gwinnett County to continue to convey the solids from the Yellow River WRF to the F. Wayne Hill WRC by mixing these solids with wastewater pumped through the Beaver Ruin Pump Station, and sending the mixture to F. Wayne Hill WRC for processing. This option maintains the separate biosolids treatment at the Crooked Creek WRF. This current practice has the lowest life-cycle cost of the options considered, the lowest initial cost outlay, and lowest operation and maintenance costs. The following improvements are recommended for implementation over the next three years to optimize existing operations.

1. Replace thickening equipment at the F. Wayne Hill WRC to increase efficiency
2. Install an anaerobic digester and ancillary equipment at the F. Wayne Hill WRC
3. Install improved thickening and dewatering systems at the Crooked Creek WRF

The net present value of these improvements is projected to be around $37 million.

Later in the planning period, other improvements will likely be needed at the F. Wayne Hill WRC. When the influent flow reaches about 36 MGD (with 20 MGD treated at Yellow River WRF), then it will be time to

expand the anaerobic digesters again. Other improvements proposed for the F. Wayne Hill WRC include expanding anaerobic digestion capacity, adding another solids storage tank, and adding another dewatering centrifuge. In addition, another biological treatment train will likely be needed in the future to uphold the original design criteria of providing a standby biological treatment train.

APPENDIX A

Process Flow Sheets

Figure TM11. A-1: F. Wayne Hill WRC Flow Sheet for Option 1

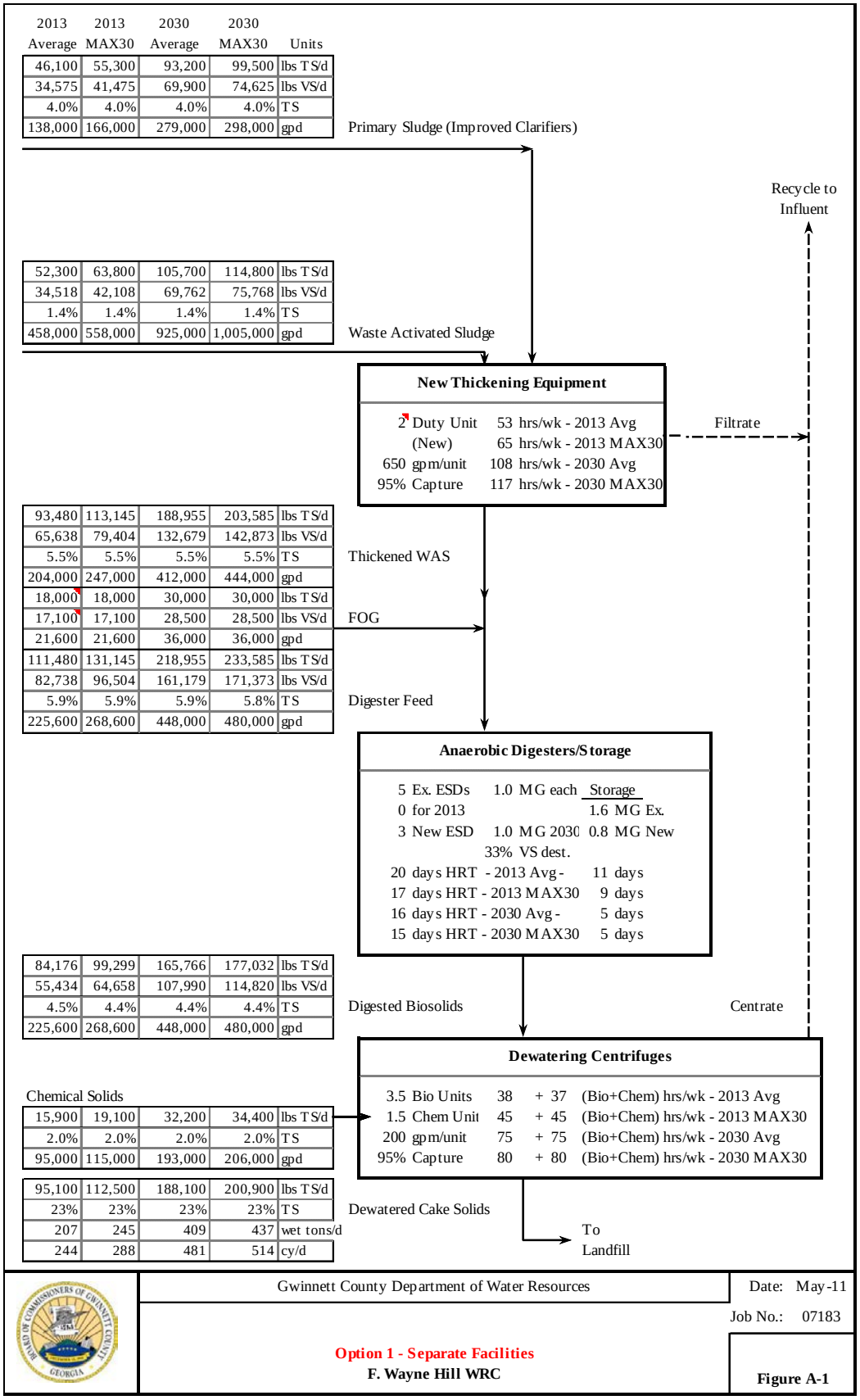


Figure TM11. A-2: F. Wayne Hill WRC Flow Sheet for Option 2A

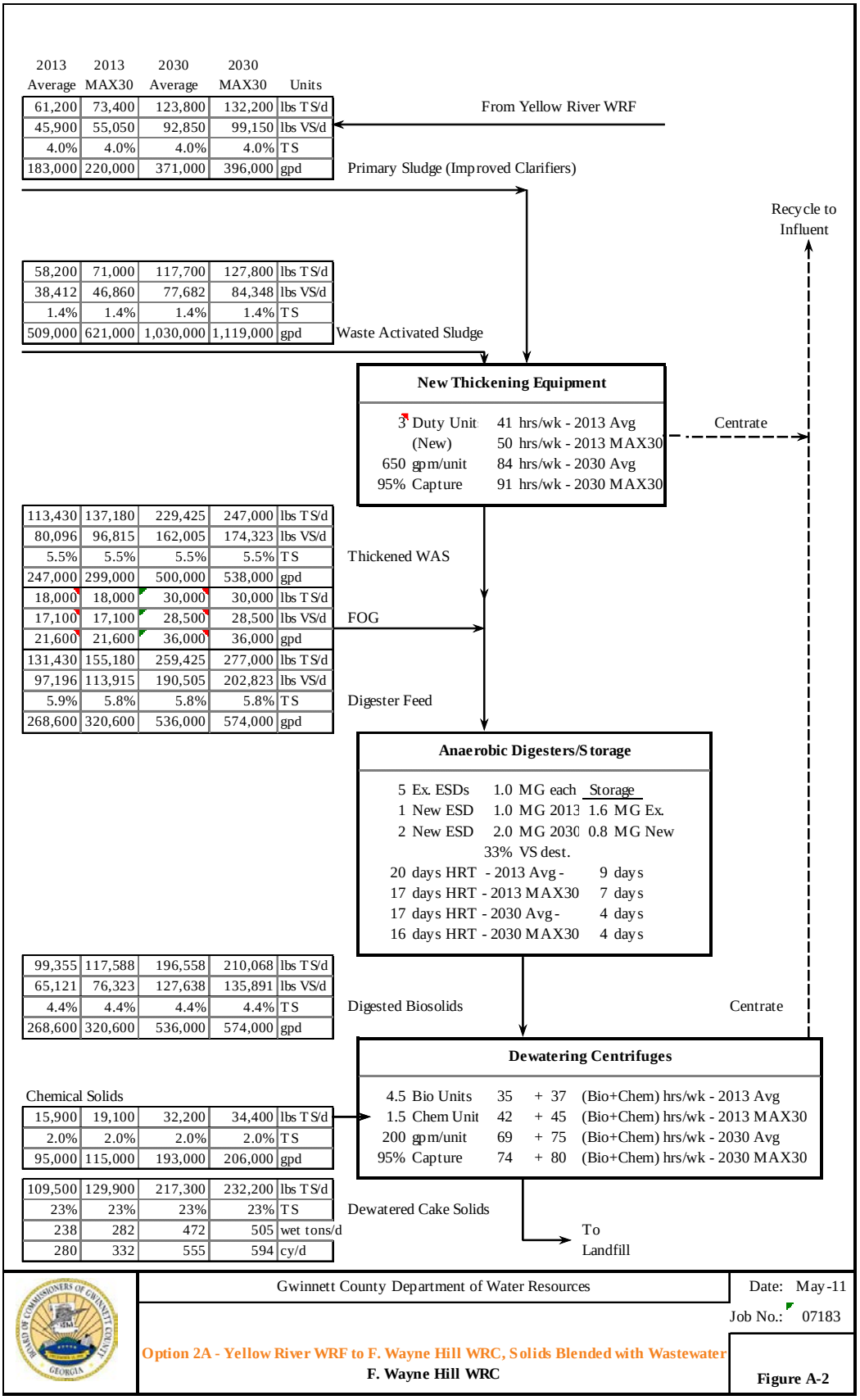


Figure TM11. A-3: F. Wayne Hill WRC Flow Sheet for Option 2B

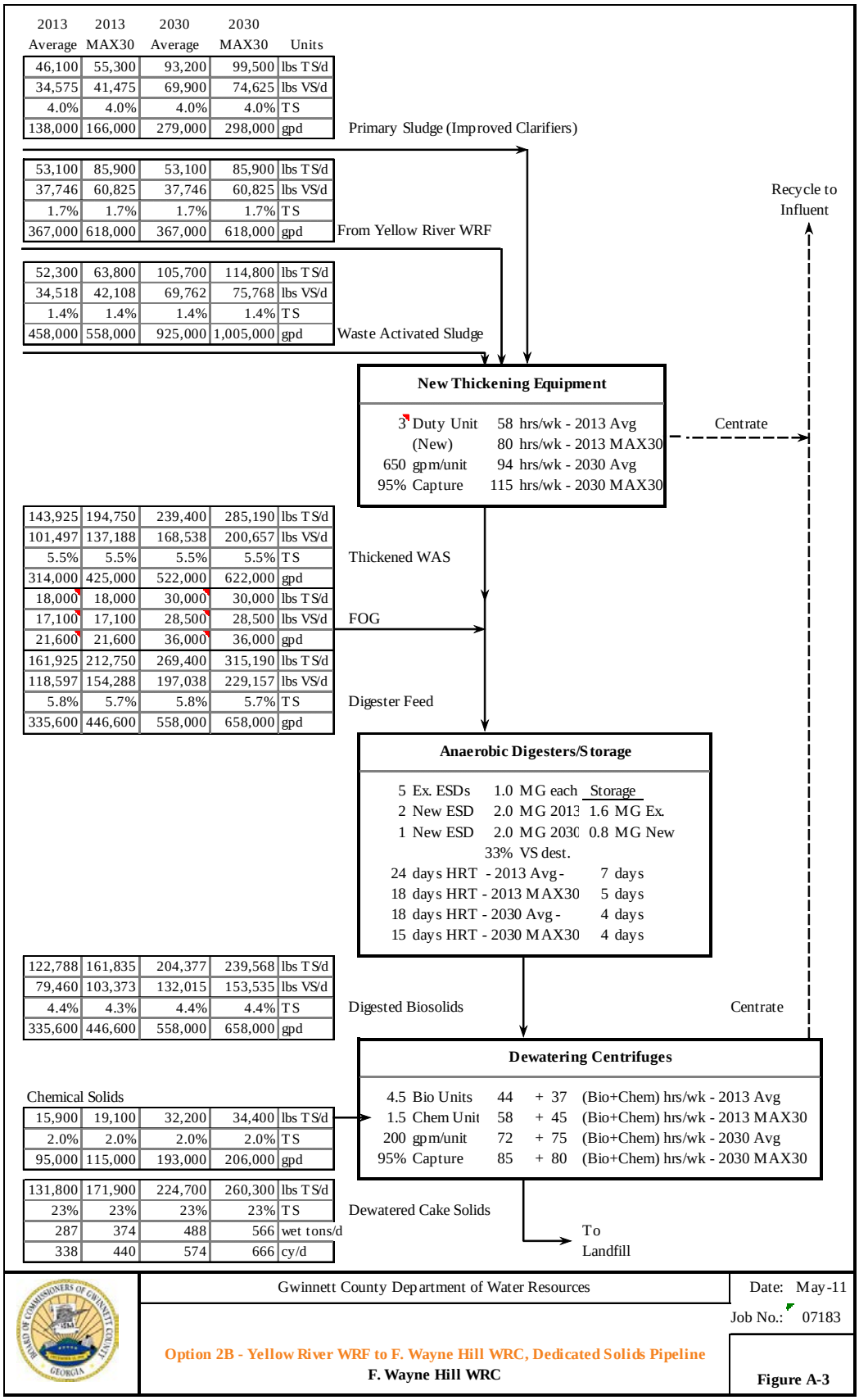


Figure TM11. A-4: F.Wayne Hill WRC Flow Sheet for Option 3

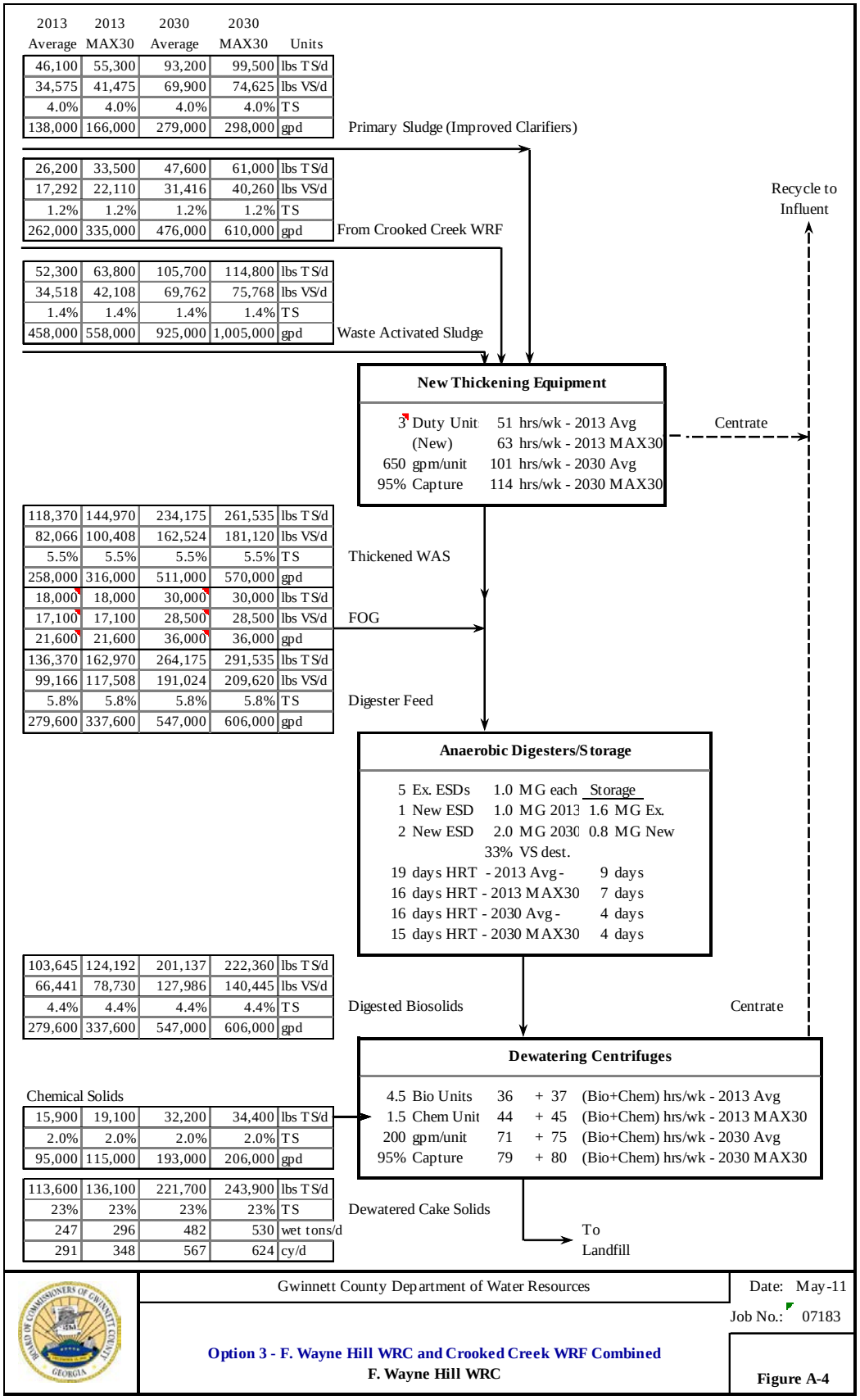


Figure TM11. A-5: F.Wayne Hill WRC Flow Sheet for Option 4

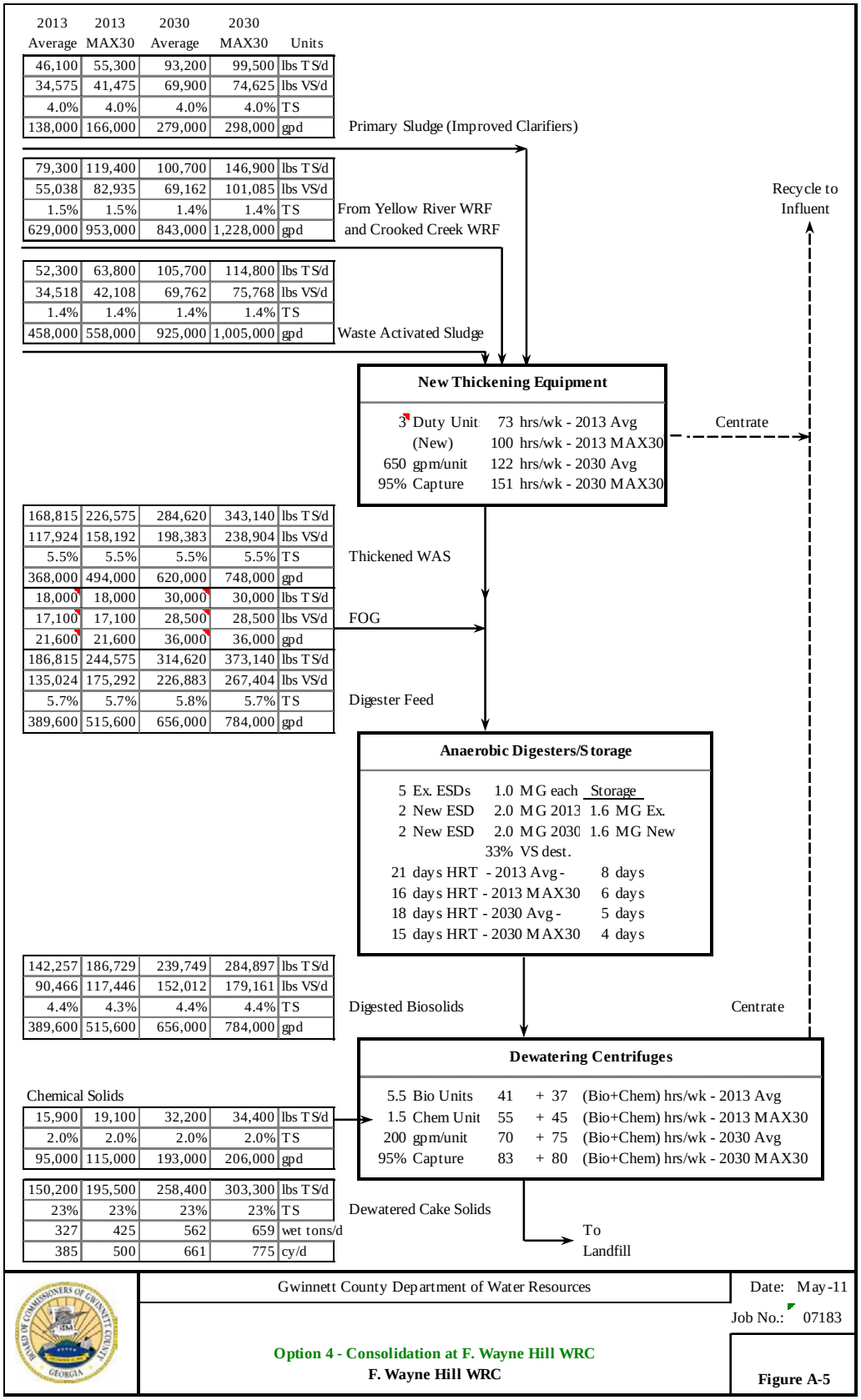


Figure TM11. A-6: Yellow River WRF Flow Sheet for Options 1 and 3

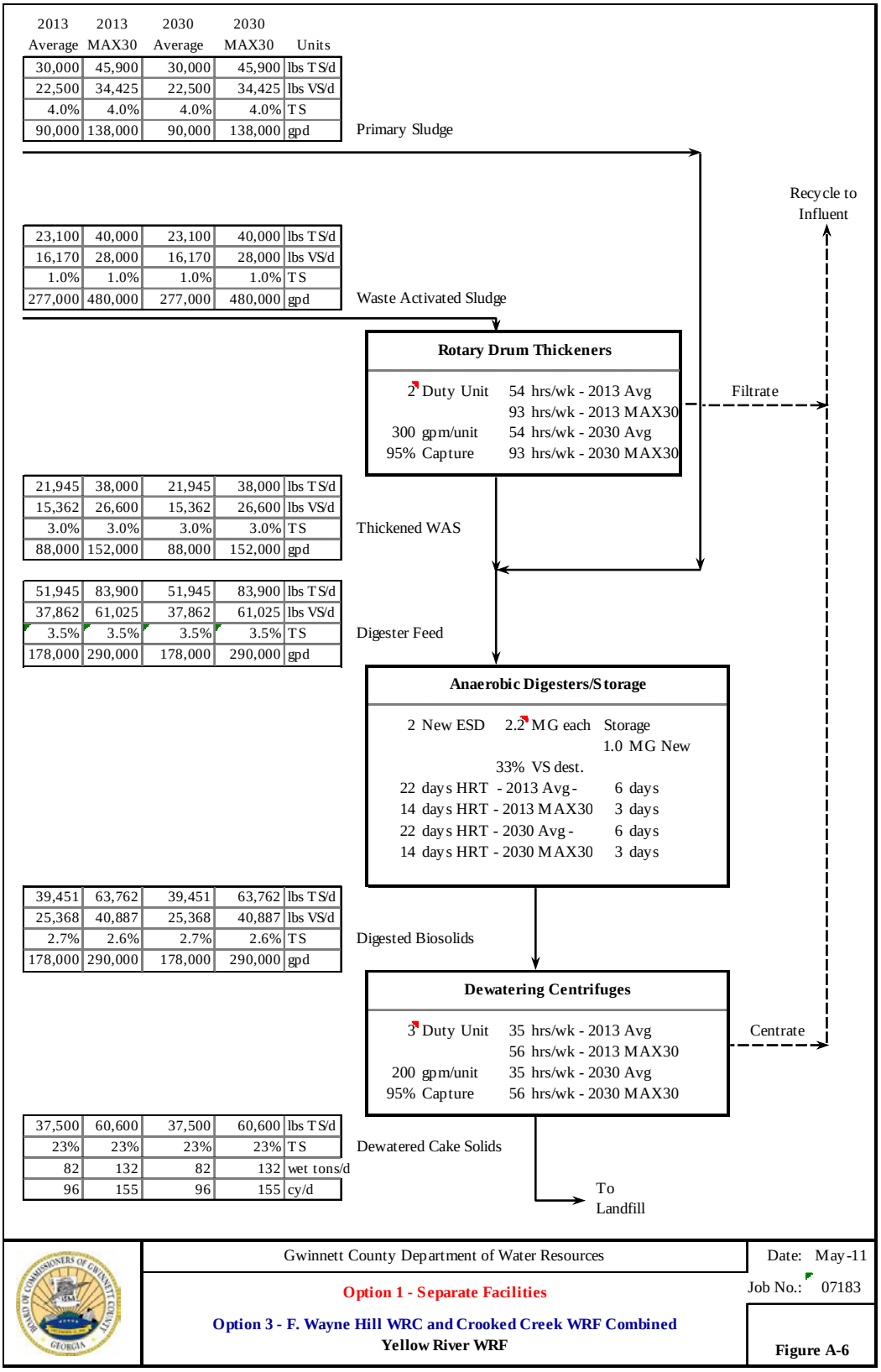


Figure TM11. A-7: Yellow River WRF Flow Sheet for Option 2A

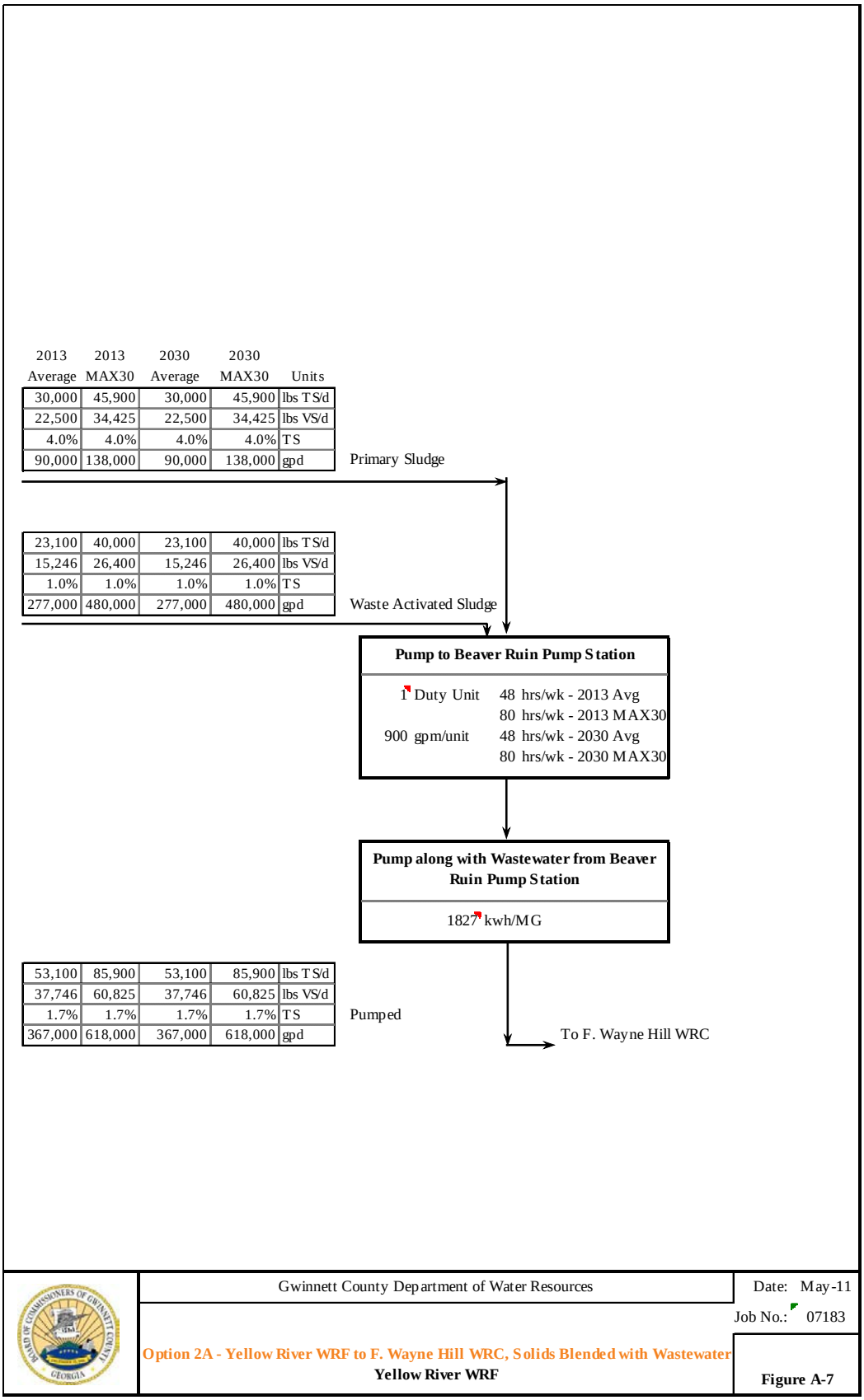


Figure TM11. A-8: Yellow River WRF Flow Sheet for Options 2B and 4

2013 Average	2013 MAX30	2030 Average	2030 MAX30	Units	
30,000	45,900	30,000	45,900	lbs TS/d	Primary Sludge
22,500	34,425	22,500	34,425	lbs VS/d	
4.0%	4.0%	4.0%	4.0%	TS	
90,000	138,000	90,000	138,000	gpd	

23,100	40,000	23,100	40,000	lbs TS/d	Waste Activated Sludge
15,246	26,400	15,246	26,400	lbs VS/d	
1.0%	1.0%	1.0%	1.0%	TS	
277,000	480,000	277,000	480,000	gpd	

Pump to F. Wayne Hill WRC

2 Duty Unit	54 hrs/wk - 2013 Avg
	93 hrs/wk - 2013 MAX30
300 gpm/unit	54 hrs/wk - 2030 Avg
Dual Stations	93 hrs/wk - 2030 MAX30

53,100	85,900	53,100	85,900	lbs TS/d	Pumped
37,746	60,825	37,746	60,825	lbs VS/d	
1.7%	1.7%	1.7%	1.7%	TS	
367,000	618,000	367,000	618,000	gpd	

Force Main to F. Wayne Hill WRC

Gwinnett County Department of Water Resources

Date: May-11

Option 2B - Yellow River WRF to F. Wayne Hill WRC, Dedicated Solids Pipeline

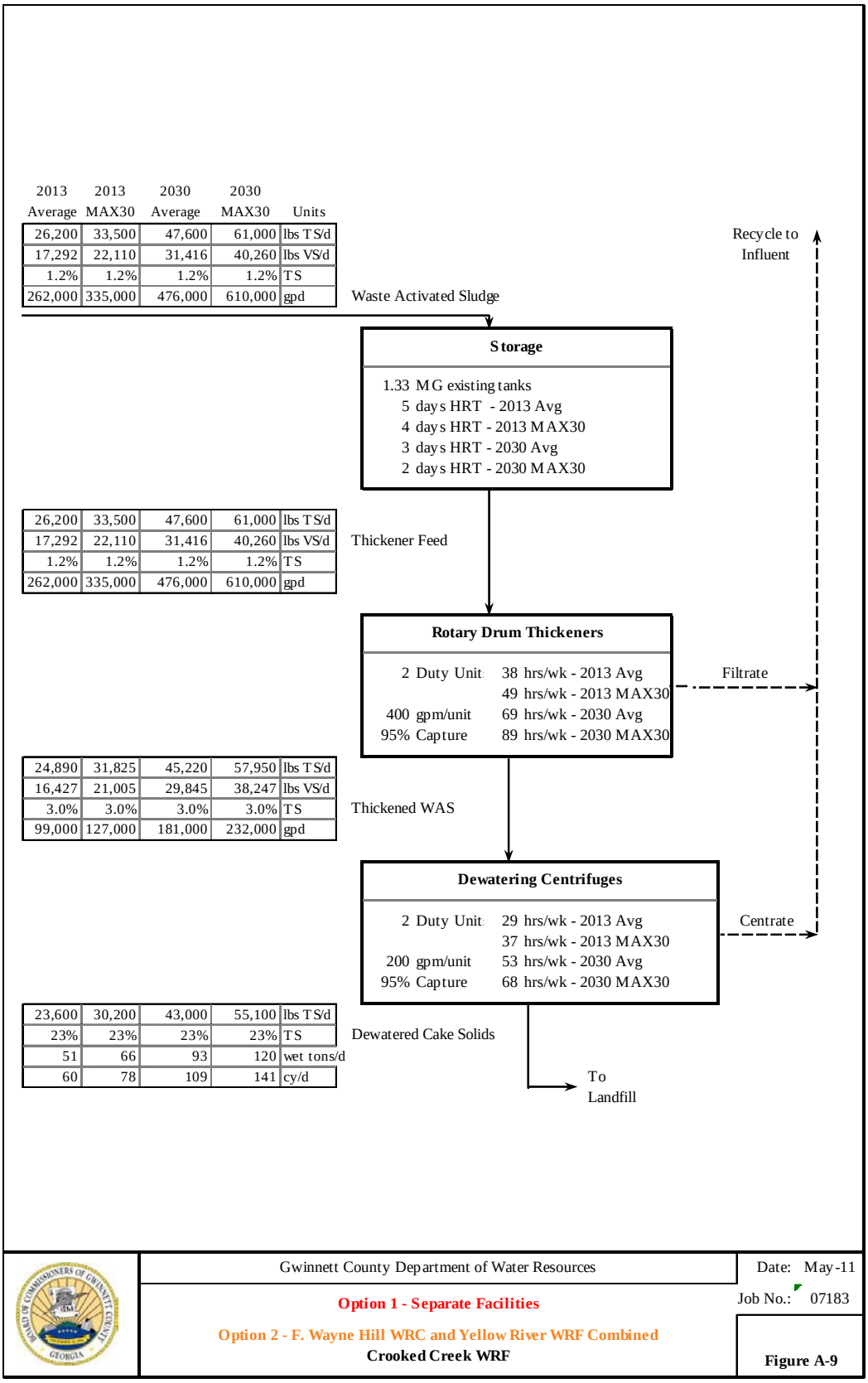
Job No.: 07183

Option 4 - Consolidation at F. Wayne Hill WRC

Yellow River WRF

Figure A-8

Figure TM11. A-9: Crooked Creek WRF Flow Sheet for Options 1, 2A, and 2B



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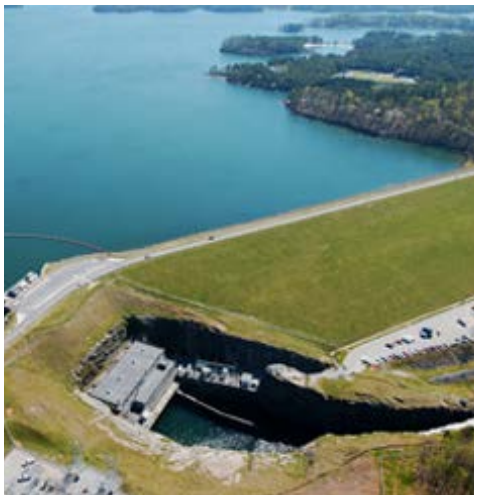
Appendix C
Project Timing Guidance

2030 Water and Wastewater
Master Plan



C.1. Introduction

The goal of any Master Plan is to identify projects for which it will be necessary to initiate design or construction during a stated planning period and to lay out the capital expenditures for the execution of those projects in a capital improvement program (CIP). The planning period for this Master Plan is 2030 and it utilizes the growth projections from the Unified Plan's International Gateway growth scenario. It was recognized early on that this plan was being prepared in the early stages of an economic environment different than any that Gwinnett County had experienced in the past. It is still believed that the goals outlined in the Unified Plan will succeed over time, however, the rate of growth in the near term and the resulting water and wastewater infrastructure needed to support that growth, have been significantly impacted. The goal of this plan was to develop an implementation strategy more suitable than the typical "build this infrastructure in this year" (i.e. specific projects and a fixed schedule) CIP that is found in a traditional planning document; something more flexible and usable in a period when growth is less predictable than it had been in the past was needed. It was decided that this document would use "triggers" that would be based on real system demands and performance, to establish the circumstances that should initiate detailed planning for a project.

For any project identified in this Master Plan a "trigger" was developed based upon the observed system use trend and the amount of remaining capacity. The trigger considers the rate at which the remaining capacity is being consumed, and the amount of time needed to implement a specific project to provide additional capacity. The goal of the trigger concept is to provide a mechanism for the County to implement future water and wastewater projects close to the time the project is actually needed. To be successful this mechanism must accomplish this goal in a variety of growth scenarios; in essence it must remain independent of growth and flow forecasts.

Figure C-1 illustrates the concept of defining a trigger point.

Once the technical analysis and hydraulic modeling were completed, work began on developing meaningful trigger points for each of the projects identified. However; once the projects identified as necessary for future growth were decoupled from flow and growth forecasts it became increasingly obvious that the trigger points were well into the future. So much so in fact that most of them fell outside of the 2030 planning timeframe. After much consideration it was decided that including trigger points in this document that occur that far into the future was almost meaningless. Rather it was decided to include only the point at which the infrastructure should be in place and operational (labeled as Start-Up New Capacity in Figure C.1.) but not to include trigger points that could ultimately be decades in the future and are certainly destined to change during that time frame.

The County's water and wastewater infrastructure was well prepared to support the continued booming growth that Gwinnett was experiencing; the economic downturn left the County with sufficient capacity to serve its' citizens for many years. While the trigger concept did not prove particularly useful in the preparation of this Master Plan it is a concept that should be utilized in the future when a faster pace of growth returns. As such, the remainder of this Appendix will more fully describe the concept of using triggers and the methodology for applying them to individual projects. This concept and methodology can be applied to the development and implementation of future Water and Wastewater Master Plans.

C.2. Guidance Terminology

An explanation of terms used in this Guidance is provided below.

Trigger: a calculated estimate of the level of system use that signals when a new project should be initiated. The trigger represents the minimum remaining capacity necessary to have in reserve to do the planning, funding and execution of a project

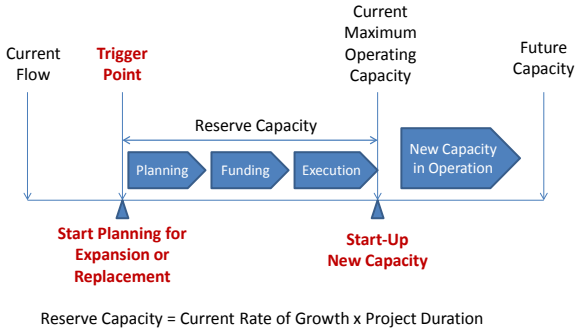
System influences: the variety of factors that could affect system demands and project timing decisions

Project duration: the total time required for project planning, design, construction and start-up

System limit: the maximum operational capacity of a system asset that directly affects the need for a project, as applied in the Master Plan

Rate of change: the change in system use over time, as monitored by the Department of Water Resources

Figure C-1 Defining a Trigger Point



C.3. System Monitoring Parameters for Assigning Triggers

The Department of Water Resources regularly monitors system performance parameters for its water and wastewater system assets. In addition to on-going monitoring at existing locations, several new locations are recommended based on the analysis performed for this Master Plan (Volume 1, Part 3, Section F, Figure 3-7 and Tables 3-12 to 3-14). The monitoring data will provide a baseline for establishing the triggers to begin planning for replacement, renewal or expansion of the assets.

Table C-1 provides a listing of potential parameters, including system monitoring data that could be used to establish trigger points for the projects in this Master Plan.

Parameters for Daily Monitoring

Most of the flow measurements listed in Table 1 are currently monitored at the treatment facilities and pump station locations.

Permanent or temporary pressure gauges can be installed to monitor system pressure at the recommended water distribution system locations. If permanent pressure gauges are installed, the County may wish to consider integrating the monitoring results with its SCADA or GIS system. The monitoring results can also be used for regular calibration of the water distribution system model (with proper software). Alternatively, the County can monitor pressure in key locations during the high water use season for a fixed duration (for example, conduct 24-hour continuous monitoring for 3 to 7 days) each year if permanent gauges are not available. The monitoring results can be used to estimate the rate of change over a period of time. Similarly, flow gauges can be installed at selected wastewater collection system locations and integration with SCADA or GIS could automate the monitoring efforts.

Parameters for Quarterly Monitoring

Most of the parameters listed for quarterly monitoring are currently identified as key performance indices (KPI) already observed or prepared by the Department of Water Resources and the Department of Planning and Development. In general, any major changes of the housing or economic trends or violation of a KPI would automatically initiate a review of the trigger for the relevant infrastructure (or asset). DWR is encouraged to review the existing KPI's for the water and wastewater system and determine if a specific set of KPI's should be used for each individual facility for the purpose of estimating triggers. These KPI's can be reviewed on a quarterly basis to record performance trends. Examples of suitable KPIs include percent of water loss (e.g. unacceptable amounts of water loss may result in water main replacement), main breaks (high number of main breaks may result in assessment of pressurized mains), and operation and maintenance (O&M) costs at pump stations or treatment facilities (high O&M cost may indicate a need for equipment replacement or other process improvements).

Table C-1: System Monitoring Parameters

Daily	Quarterly	Annually
Water Supply and Treatment Raw water quantity pumped Raw water quantity treated Finished water quantity (pumped to system) **Water Distribution System** Pressure at specified locations (continuous monitoring for a minimum of 24 hours) **Wastewater Collection System** Flow at specified locations (continuous monitoring for a minimum of 24 hours) **Wastewater Treatment** Influent flow at each water reclamation facility Influent and effluent flows at major pump stations	**Economic Development Indices** Housing trends (new construction and redevelopment) Major industrial, commercial and mixed-use development activities and plans **Performance Indices** Customer complaints (such as drinking water quality, sanitary sewer overflow, or number of red water incidents) Septic tank/drain field failures Citation or consent order (from EPD for water quality violations) Number of water main breaks per mile (for distribution system) Real water loss (for distribution system) Operation & maintenance costs	**Water Demand Trends** Population growth vs. projections Per capita water use (actual vs. projected) **Monitoring** Flow trending (determining annual average, maximum monthly, minimum and maximum daily values) Pressure trending (determining annual average, minimum and maximum daily values) System influences (Section C.4)

*See Tables 3-12, 3-13, 3-14 and Figure 3-7 for monitoring locations (Part 3, Gwinnett County Water and Wastewater Master Plan, 2012)

Parameters for Annual Monitoring

Each of the daily or quarterly data recorded should be compared on an annual basis so the "rate of change" can be calculated. Once a trigger for a project (or facility) is established, it should be followed by annual review and revision if needed.

C.4. Other System Influences

Beyond the trends observed through the system monitoring data, additional events or conditions could influence the timing for a project, by accelerating or stalling the trigger point. Examples of the type of information that should be tracked and applied to project timing decisions include:

1. Development examples
   a. Major water-using industry, employer or development coming to or leaving the County
   b. Major changes to the location or rate of growth presented in the International Gateway scenario

2. Regulatory examples
   a. Major changes in operation of Lake Lanier for water storage/withdrawal
   b. Major changes in EPD policy or regulations, such as the interbasin transfer policy or water quality standards
   c. Major changes in EPD permit conditions for withdrawals or discharges
   d. Major changes in the Metro Water District plans, such as additional water conservation requirements, interconnection, or interbasin transfer considerations

3. Technology example
   a. Availability of new technology that increases operational efficiency or cost effectiveness

4. Financial examples
   a. Major changes in the cost of existing operations (e.g. chemical or disposal costs)
   b. Availability of funding or favorable financing conditions
   c. Major decrease in anticipated revenues resulting from drought, conservation or other factors

5. Operational examples
   a. Major changes in the existing level of non-revenue water (e.g. increase in system leakage) and/or inflow and infiltration
   b. Major changes in wastewater flow management practices, such as the elimination of a pump station
   c. The creation of new pressure zones in the water distribution system
   d. Availability of interim operations that could allow deferral of a project
   e. Major changes in customer expectations of service levels, such as higher fire flow protection for a specific industry
   f. Significant decrease (or increase) in per capita and/or per employee water use

Figure C-2: Project Duration Elements

Planning	Funding	Execution
• Annual review of triggers • Environmental permitting • Easement planning • Legal review • Regional requirements • Public Involvement	• Business Case Evaluations, as needed • Grants, loans, and financing • Inclusion in Capital Improvement Program (CIP) cycle • Budget approval	• Design • Permitting • Land and easement acquisition • Construction • Mitigation • Operation

C.5. Project Duration Influences on Project Timing

The duration of a project includes the time needed for planning, funding and execution phases all the way to project start-up. Experienced project managers within the Department of Water Resources can estimate the typical timeframe for executing specific types of projects, including the projects in this Master Plan. Examples of conditions that typically affect the project duration include:

1. Project planning elements
   a. Extent of environmental permitting required
   b. Number of easements needed
   c. Extent of public interest and involvement required
   d. Potential for legal issues
   e. Processing time for an amendment to the Metro Water District plans or other agency approvals, if needed

2. Project funding elements
   a. Business Case Evaluation preparation and review
   b. Securing grants, loans, other financing approaches
   c. Metro District/EPD audits and compliance confirmation for State financing
   d. Consideration for the annual Capital Improvement Planning cycle

3. Project design elements
   a. Project complexity and schedule impact
   b. Inclusion of new and/or proprietary equipment and lead time needed for research and assurances
   c. Availability of data needed for design, and/or time required for acquiring needed data
   d. Internal reviews and approvals

4. Elements of project execution during construction
   a. Time required to acquire easements, property, and construction permits
   b. Subsurface challenges such as bedrock, utilities, etc.
   c. Other challenging site conditions and technical complexities of the project
   d. Impacts and coordination with operation of other infrastructure and facilities
   e. Mitigation or special conditions included in permits

5. Operations elements
   a. Staff training
   b. Preparation of O&M manual
   c. Post-construction monitoring and compliance with permits

The estimated project duration timeframe should be reviewed and revised when applying the trigger point to a project decision to confirm that information is current and applicable, including any changes to regulations or site conditions.

The project duration elements can be summarized into 3 phases as shown in Figure C-2: planning, funding and execution. Timeframes need to be estimated for each phase to help establish the duration of a project. The project duration is a key factor in determining a project trigger point.

C.6. Applications and Examples

The trigger point for a project can be calculated using a four-step process as outlined in Table C-2. Examples are included to illustrate how this process can be used for different components of the water and wastewater systems.

Table C-2: Calculating a Project Trigger Point

Step 1	Calculate historical rate of change in flow or pressure	Use flow or pressure monitored at specified locations based on a minimum of three years of data
Step 2	Consider changes caused by system influences	Estimate demand/flow increase based on proposed development; deadlines imposed by new regulation or policy; financial incentives or options; proposed operational changes; selected KPIs
Step 3	Determine project duration	Consider timeframe needed for additional planning (such as Business Case Evaluation), project funding, and execution
Step 4	Calculate trigger point	Use formula shown below

How to Determine a Project Trigger Point

For Treatment Facilities, Pump Stations, or Collection Pipelines

$$Q_{Trigger} = Q_{Max} - Q_{Change} \times D_{Project}$$

$Q_{Trigger}$ = Trigger point, MGD or cfs
Q_{Max} = Maximum operating capacity (such as rated or firm capacity), MGD or cfs
Q_{Change} = Rate of change, MGD/year or cfs/year
$D_{Project}$ = Project duration, years

For Distribution System Pipelines

$$P_{Trigger} = P_{Min} + P_{Change} \times D_{Project}$$

$P_{Trigger}$ = Trigger point (pressure), psi
P_{Min} = Maximum operating capacity (such as rated or firm capacity), MGD or cfs
P_{Change} = Rate of change, MGD/year or cfs/year
$D_{Project}$ = Project duration, years

Notes:

MGD = million gallons per day
cfs = cubic foot per second
psi = pounds per square inch

Example Calculation - Confirming Needs and Timing

A pump station project has an existing firm capacity of 6 MGD and recent annual influent flow measurements as shown below.

Example 1: Wastewater Pump Station Project

Year	1	2	3	4
Flow (MGD)	3.3	3.5	3.9	4.1

$$Q_{Trigger} = Q_{Max} - Q_{Change} \times D_{Project}$$

$Q_{Trigger}$ = Trigger point, MGD or cfs
Q_{Max} = Maximum operating capacity (such as rated or firm capacity), MGD or cfs
Q_{Change} = Rate of change, MGD/year or cfs/year
$D_{Project}$ = Project duration, years

Q_{Max} = 6 MGD
Q_{Change} = (4.1-3.3) MGD/4 years = 0.275 MGD/year
$D_{Project}$ = (Planning: 1 year) + (Funding: 2 years) + (Execution: 3 years) = 6 years
$Q_{Trigger}$ = 6 MGD – (0.275 MGD/year) x 6 years = 4.35 MGD

Therefore, planning for the project expansion can wait until the level of system use has reached the trigger flow of 4.35 MGD.

Variation on Example 1:

A new commercial development is planned and the ultimate flow from the development is estimated to be 0.8 MGD based on the information given by the developer. The development is expected to have an initial flow of 0.15 MGD during the first year, and increasing at the rate of 0.15 MGD each year with the maximum flow of 0.8 MGD. Using 0.15 MGD increase per year for the commercial development, the near-term combined rate of change will be 0.275 (existing) + 0.15 (new) = 0.425 MGD/year.

Q_{Max} = 6 MGD
Q_{Change} = 0.275 (existing) + 0.15 (new) = 0.425 MGD/year
$D_{Project}$ = (Planning: 1 year) + (Funding: 2 years) + (Execution: 3 years) = 6 years
$Q_{Trigger}$ = 6 MGD – (0.425 MGD/year) x 6 years = 3.45 MGD

In this case, the calculated trigger level (3.45 MGD) is less than the current system use (4.1 MGD). This signals that planning of the expansion project needs to be initiated immediately and design and construction may need to be expedited to support this proposed development.

Example Calculation - Confirming Needs and Timing

The system operating pressure in Area A has been observed to decrease continuously over the last few years. Recent minimum pressure measurements for the area served by an 8-inch water distribution pipe are as shown below. The operating standard for this area is to provide water pressure no lower than 40 psi during an average day conditions (no fire flow needed).

Example 2: Water Distribution Project

Year	1	2	3	4
Minimum Pressure (psi)	64	60	59	56

$$P_{Trigger} = P_{Min} + P_{Change} \times D_{Project}$$

$P_{Trigger}$ = Trigger point (pressure), psi
P_{Min} = Maximum operating capacity (such as rated or firm capacity), MGD or cfs
P_{Change} = Rate of change, MGD/year or cfs/year
$D_{Project}$ = Project duration, years

P_{Min} = 40 psi
P_{Change} = (64-56)/4 = 2 psi /year
$D_{Project}$ = (Planning: 1 year) + (Funding: 3 years) + (Execution: 2 years) = 6 years
$P_{Trigger}$ = 40 psi + (2 psi/year) x 6 years = 52 psi

The current system minimum pressure is 56 psi. When the pressure decreases to the trigger level (52 psi), related project planning for expansion or replacement should be initiated.

Note: Many conditions could contribute to change in the pressure in the distribution system. Other operation parameters such as booster pump and valve open/close arrangement near the area of concern should also be considered when a major change in system pressure is observed. The above example assumes all system operation conditions remain the same over the period of study.

Examples: Considering Influences

Example 1: Considering Development Influences

A major development is defined as an industrial, commercial or mixed used development that generates demand or flow greater than 0.5 million gallons per day (MGD). When a development of this magnitude is proposed, it triggers an automatic review of all existing and proposed infrastructure that will serve the development. This may include water mains, storage tanks, sewer lines, pump station, and plant treatment capacities.

Example 2: Considering Regulatory or Policy Influences

If new nutrient limits are imposed for effluent discharge into either Lake Lanier or the Chattahoochee River, it triggers a review of existing and proposed treatment and discharge projects, and pipeline or pump station projects needed for effluent discharges. A second example would be a change in the interbasin transfer policy. If current discharges into the Ocmulgee Basin must be returned in the future to the Chattahoochee River Basin, this would trigger a review of all wastewater treatment facilities and trunk sewers. Some other potential regulatory or policy influences could include state or regional policy changes regarding consumptive use and conservation practices.

C.7. Summary

This Guidance is presented as a concept to optimize the timing for implementing projects. Instead of requiring a definite timeframe for project implementation based upon demand projections (i.e. a traditional 20-year capital improvement plan), this Guidance recommends a flexible approach that can trigger planning for a project closer to the time the project is needed. The approach is based on regular monitoring of system performance indicators such as flow and pressure, and the time needed to implement a new project to add system capacity. Other variables are considered as well, to adjust project timing as appropriate. Through a disciplined review of system data and planning variables, the County can identify the conditions that could "trigger" the need and influence the timing for a project.

Specific project triggers could be established for the recommended projects in this plan based upon this Guidance. A collaborative planning and engineering assessment of the conditions that could affect the timing of each project should be developed by Department of Water Resources and the Department of Planning and Development.

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Addendum • July 2012

Update to Water Supply Challenges

On July 17, 2009, District Court Judge Magnuson ruled that drinking water supply is not a Congressionally-authorized use of the storage in Lake Lanier. The County's withdrawals from Lake Lanier are therefore considered unauthorized by this District Court. The Judge gave the parties three years to obtain Congressional approval of the reallocation of the use of Lake Lanier and allowed the current water withdrawals to continue during this period.

The Governor of Georgia worked to resolve this issue by taking the following steps:

> Participating in negotiations with Alabama and Florida; seeking Congressional authorization; contingency planning for alternate water sources; and appealing Judge Magnuson's decision

On June 28, 2011, a three-judge panel of the Federal Eleventh Circuit Court of Appeals ruled on the appeal of Judge Magnuson's 2009 Decision and reversed the decision and held that the reservoir comprising Lake Lanier was authorized for water supply use and remanded to the District Court and the United States Army Corps of Engineers saying the Corps of Engineers did not constitute a final agency action when it denied Georgia's 2000 water supply request. The court gave the Corps of Engineers one year to complete its analysis of its water supply authority and release its conclusions.

By August 2011, the States of Alabama and Florida and the Southeastern Federal Power Customers petitioned the United States Court of Appeals for the Eleventh Circuit for rehearing en banc, by the whole court, and on September 16, 2011, this request was denied. On October 5, 2011, District Judge Magnuson ordered, as the Eleventh Circuit Court of Appeals having issued a mandate, reversing and vacating the District Court's opinion, and remanded the matter to the United States Army Corps of Engineers for proceeding with the Eleventh Circuit Court of Appeals opinion.

In February 2012, the States of Alabama and Florida along with the Southeastern Federal Power Customers each filed petitions for writs of certiorari to the United States Supreme Court. On June 25, 2012, the United States Supreme Court denied each petition for writ of certiorari allowing the Eleventh Circuit Court of Appeals ruling to stand.

Following a one-year analysis, on June 25, 2012, the United States Army Corps of Engineers issued its legal opinion on its authority. The Corps of Engineers concluded it has the legal authority to exercise its discretion, should it ultimately choose to do so, to adjust operations to accommodate the full amount of water supply withdrawals and return flows that the Georgia 2000 water supply requested assuming those withdrawals and returns occur as projected. The Corps of Engineers further states that any decision to exercise that discretion would occur at a later time, and separately from the issuance of this legal opinion.

Several issues remain outstanding in the Tri-State Water Rights Litigation including rulings on issues surrounding endangered and threatened species in the basin along with decisions by the Corps of Engineers regarding system operations which will be made at the conclusion of the ongoing manual update process and *National Environmental Policy Act* (NEPA) analysis.

The County continues to pursue getting the Corps of Engineers to give credit for the volume of water returned to Lake Lanier and subtracts this amount from the water withdrawn for payment of the $18.80 per million gallons withdrawn.

Buford Dam at Lake Lanier