# WATER FACILITIES PLAN

## for

## SRF MAGNOLIA POINT RECLAIMED WATER SYSTEM

## & REYNOLDS WATER SYSTEM IMPROVEMENTS

## CITY OF GREEN COVE SPRINGS, FLORIDA

## DW 100102


Prepared by:

MITTAUER & ASSOCIATES, INC.
CONSULTING ENGINEERS
Orange Park, Florida


Project No. 8905-61-1
May 2023

# WATER FACILITIES PLAN

## for

## SRF MAGNOLIA POINT RECLAIMED WATER SYSTEM

## & REYNOLDS WATER SYSTEM IMPROVEMENTS

## CITY OF GREEN COVE SPRINGS, FLORIDA

## DW 100102


Prepared by:

MITTAUER & ASSOCIATES, INC.
CONSULTING ENGINEERS
Orange Park, Florida



Project No. 8905-61-1
May 2023

# TABLE OF CONTENTS

**TABLES**

**FIGURES**

# EXECUTIVE SUMMARY

The City completed a Water System Master Plan in July 2018 (‘2018 Water Master Plan”), Reclaimed Water System Master Plan in 2016 (“2016 Reclaimed Water Master Plan”), and a Technical Memorandum on Surface Water Discharge Elimination Plan in 2021 (“2021 SW Discharge Elimination Plan”), which reviewed and provided direction related to the City’s water, wastewater and reclaimed water treatment infrastructure. The enclosed Water Facilities Plan (“Plan”) provides a similar comprehensive review of the City’s utility infrastructure in attempts to define a detailed surface water elimination plan with focus on replacement of potable water use with reclaimed water for non-essential purposes. As well as traditional water system improvements to address aging infrastructure.

As documented further herein, the Plan outlines and provides detailed support for the following approach:

<u>Reclaimed Water System Improvements</u>

- Maximizing reclaimed water supply and use within the City Limits and Utility Service Area including consideration of supplying neighboring utilities, such as Clay County Utility Authority (CCUA), with surplus reclaimed water.

  - The above approach provides the additional benefit of minimizing withdrawals from the Floridan Aquifer for non-essential water demands.

- Expand reclaimed water storage capacity by 1.24 million gallons (MG) via a second ground storage tank (GST No. 2).

- Extend reclaimed water distribution piping into the Magnolia Point development to replace existing residential potable water irrigation systems with reclaimed water. This improvement is anticipated to increase reclaimed water demands by approximately 0.50 million gallons per day (MGD) on an annual average daily flow (AADF) basis.

- Continue coordination with CCUA to determine reclaimed water interconnection possibilities, capacities, and locations.

- Evaluate enhancements to the City's reclaimed water operating protocol related to times when the system does not meet public-access reclaimed water quality requirements.

Water System Improvements

- Construct Ground Storage Tank No.3 and complete high service pump upgrades for the Reynolds Water Treatment Facility.

The enclosed Plan reviewed the following areas:

- Existing System Capabilities (**Section II**);
- Growth Review and Population Projections (**Section III**);
- Operation and Maintenance Program (**Section IV**)
- Regulatory and Policy Considerations (**Section V**);
- Projected Demands through the Planning Period (**Section VI**);
- Development of Alternatives (**Section VII**);
- Selected Plan (**Section VIII**); and
- Environmental Considerations (**Section IX**).

The enclosed Plan is submitted to the SRF Program to support the design Requests for Inclusion (RFI).

# I. INTRODUCTION

## A. OBJECTIVE

The City of Green Cove Springs ("City") authorized the preparation of this report to:

1. Further develop the approach outlined in the surface water elimination plan with focus on replacement of potable water use with reclaimed water for non-essential purposes.

2. Provide recommendations for Reynolds Water Treatment Facility improvements.

3. Review environmental and growth related issues as it relates to the North Florida Regional Water Supply findings and recommendations; and

4. Provide specific utility system improvements to be funded through the FDEP SRF Program.

The City's Utility Service Area extends beyond the municipal limits. Since 2015, the City has been experiencing growth within its corporate limits as well as areas outside of these limits within the Utility Service Area. To address these growth needs, the City completed regional studies, master planning efforts, and coordination with developers related to their water, wastewater, and reclaimed water infrastructure requirements.

One large variable in the City's planning horizon is related to a Future Land Use Amendment that was completed in 2010. The amendment covered a 2,000+ acre parcel of land (i.e., "Reynolds Parcel") that will be a major factor in the City's long-term growth driving future potable water demands and fire suppression requirements. Accordingly, the City desires to appropriately plan for its infrastructure needs in order to identify the most logical and practical means of accommodating the growth and demands placed on the City's water systems. The Reynolds Parcel future development is further explored in **Section III.B.**

This translates into developing an implementable capital improvement plan based on projected demands that will take into account the following:

1. Reclaimed Water Service Areas;

2. The "Planning Period" which will be through the Year 2040;

3. Reynolds Water Treatment and the City's overall Wastewater Treatment capabilities and capacities of the existing infrastructure;

4. Conservation projections and influence of reclaimed water delivery alternatives through the Planning Period;

5. Regional options related to infrastructure connections; and

6. The influence of current and pending regulatory requirements for the design, permitting, construction, operation and maintenance of infrastructure improvements.

The objective of this Water Facilities Plan ("Plan") is to develop a capital improvement approach that will accommodate the above elements. The Plan will identify proposed projects, an implementation schedule, and review necessary capital needs to implement the proposed alternative(s).

## B. GENERAL APPROACH

This Plan will utilize a number of documents that have been previously published and reviewed by the City including, but not limited to:

1. 2040 Comprehensive Plan
2. Reynolds FLUM Amendment materials
3. FDOT First Coast Expressway Plans
4. 2015 Wastewater System Master Plan
5. 2016 Reclaimed Water System Master Plan
6. Utility & Service Area Build-out Study (Fleet & Assoc. 2006)
7. North Florida Regional Water Supply Plan
8. 2021 Surface Water Discharge Elimination Plan

In concert, these materials, along with other traditional planning references, will be utilized to determine wastewater treatment capabilities and reclaimed water demands to minimize the use of potable water for non-essential purposes. These system components are reviewed and discussed in **Section II**. **Section III** provides an aggregate growth review from various sources to be utilized in developing future water demands. **Section IV** reviews the operation and maintenance requirements. **Section V** reviews the regulatory implications on the future design and operation of the Wastewater/Reclaimed System, while **Section VI** will expand upon the previous sections and determine time lines on proposed growth with associated reclaimed water demands. Implications of the proposed demands on future Utility System expansion are reviewed in **Section VI**. **Section VII** includes budgetary cost estimates for designing, permitting, and constructing various Water System Alternatives. An implementation schedule and a capital improvement plan is summarized in **Section VIII**. Environmental considerations are reiewed and discussed in **Section IX**.

# II. EXISTING UTILITY SYSTEM

The City is located on the St. Johns River in Clay County, Florida, and lies at the crossroads of State Road 16 and U.S. Highway 17, approximately 30 miles south of the City of Jacksonville, Florida. The U.S. 2010 Census listed the City's population at 6,908 persons, the 2020 Census listed the population at 9,786 and the University of Florida Bureau of Economic and Business Research's ("BEBR") Year 2021 estimate is 9,959 persons. From 2010 to 2020, the population growth was approximately 4.2% per year, while the more recent trend is approximately 1.8% per year (2020 to 2021). These population figures are limited to the City's corporate limits. The City also serves customers outside of the City Limits within unincorporated areas of Clay County. Electric, water, and wastewater services are provided by the City and the electric service area varies from the water and sewer service area limits. The City also implemented a Reclaimed Water Service Area (RWSA) in 2015/2016 that focuses on future growth areas as well as existing locations within the City that have more significant irrigation demands. The RWSA is located within the City's existing Utility Service Area, but is a subset of the overall area whose limits will be reviewed in more detail throughout the Plan. The water service area ("Service Area") encompasses approximately 6.77 square miles. The City limits and Service Area boundaries differ from one another, and the respective limits are shown in **Figure II-1**. The sub-areas within the overall service area boundaries are presented in this figure; however, a more in-depth discussion for these sub-areas is provided in **Section II.C.** The RWSA is illustrated in **Figure II-2.**

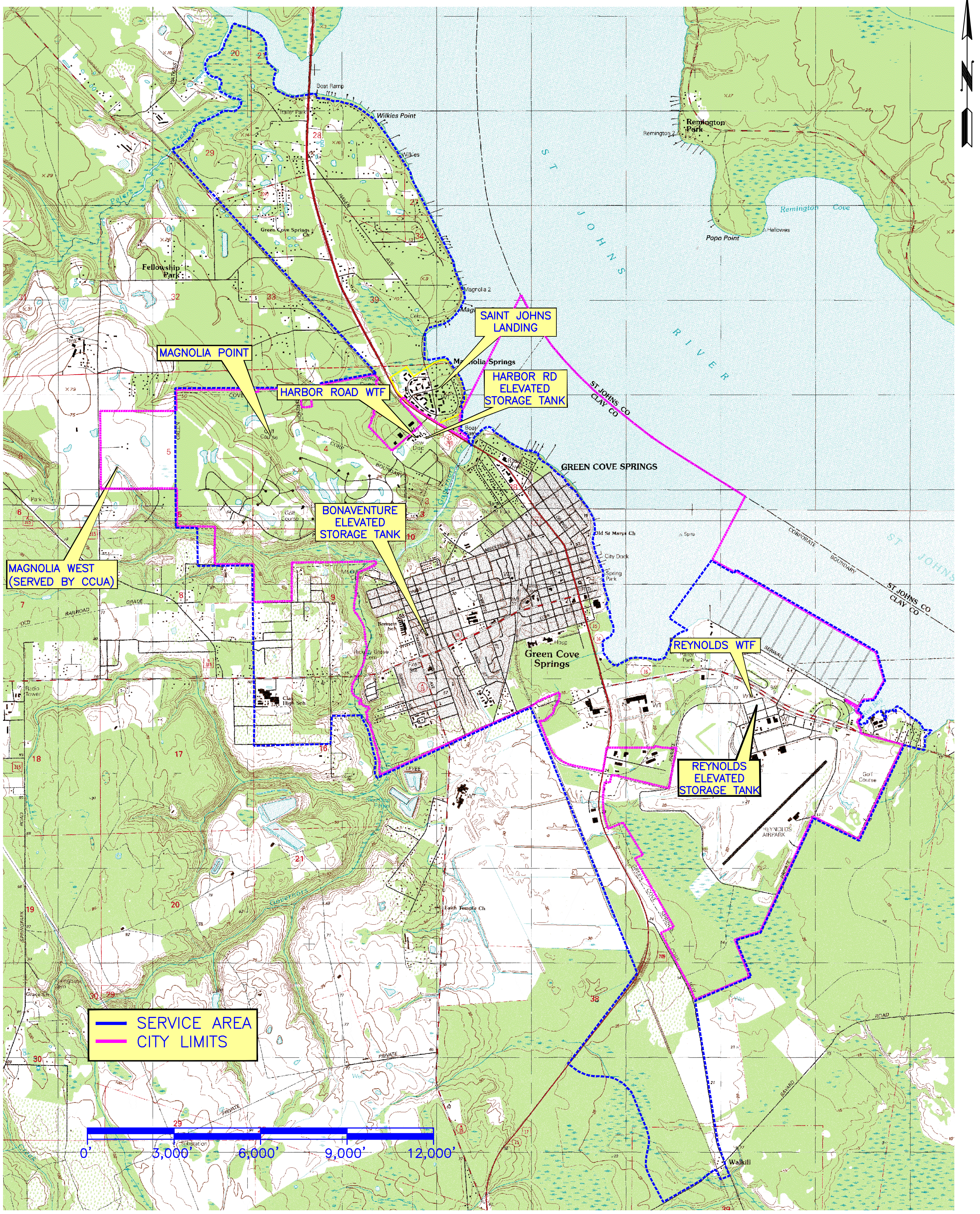
The City's owns and operates a Water System that interconnects two water treatment facilities, Reynolds Water Treatment Facility (RWTF) and Harbor Road Water Treatment Facility (HRWTF), through distribution system piping and three elevated storage tanks.

## A. WATER SYSTEM

The City owns and operates two (2) permitted Water Treatment Facilities ("WTF"). The Harbor Road WTF ("HRWTF") generally serves Magnolia Point and elevated areas along Randall Road to SR 16 at Clay High School, while the Reynolds WTF ("RWTF") is located toward the south end of the City and serves the majority of the core city and customers to the north.

The two WTFs are interconnected via distribution piping that is connected to three separate elevated storage tanks (EST). The HRWTF is isolated from the distribution system and ESTs via two hydraulic control valve stations that ensure

SCALE: 1" = 4,500'

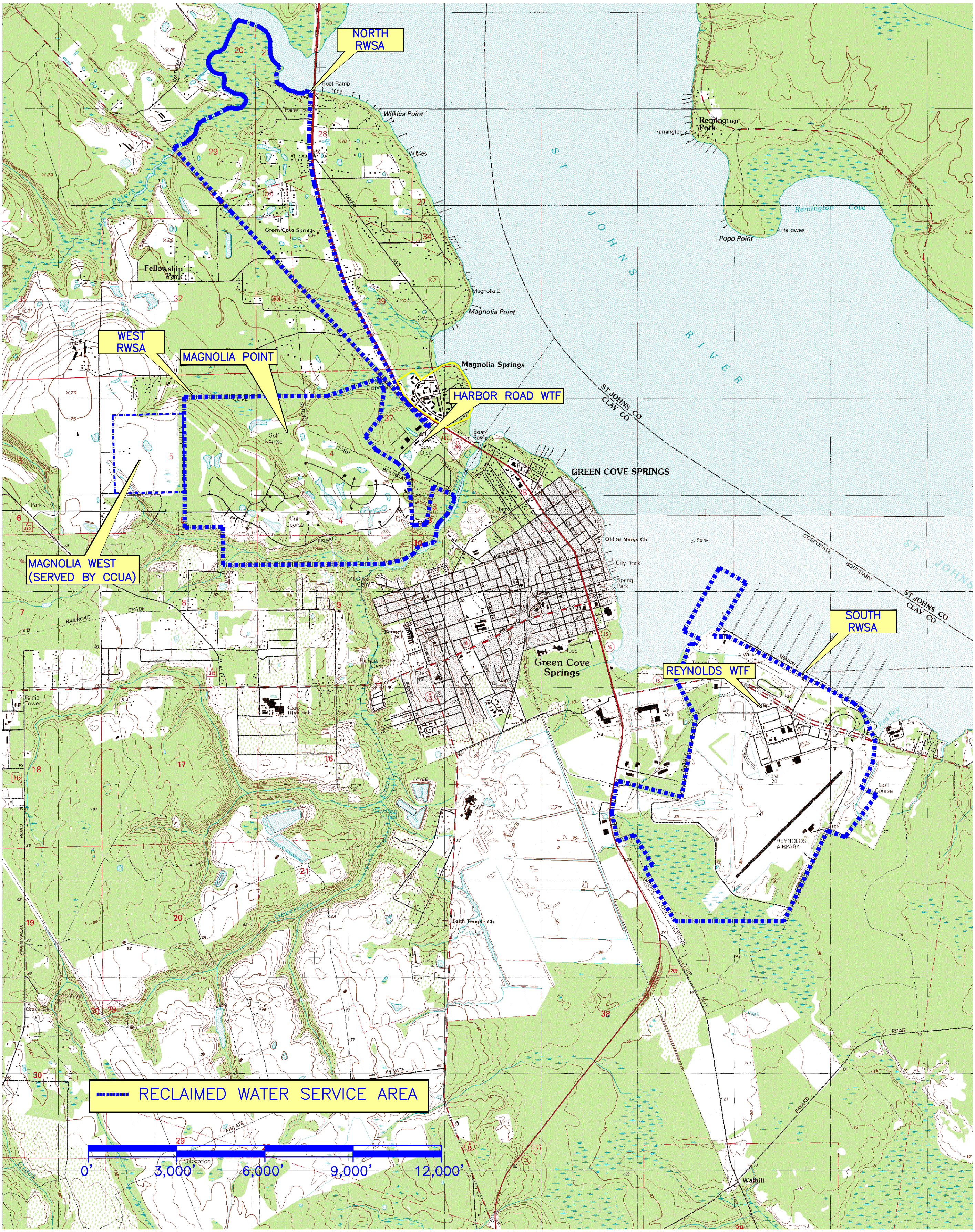



MITTAUER & ASSOCIATES, INC.
CONSULTING ENGINEERS
580-1 WELLS ROAD, ORANGE PARK, FLORIDA 32073
TEL. (904) 278-0030 FAX. (904) 278-0840 FLORIDA RY NO. 6569

CITY OF GREEN COVE SPRINGS
Water Facilities Plan
Overall Service Area Map
Clay County, Florida

FIGURE
II-1
May 2023
Project No.
8905-61-1

SCALE: 1" = 4,500'




MITTAUER
& ASSOCIATES, INC.
CONSULTING ENGINEERS


580-1 WELLS ROAD, ORANGE PARK, FLORIDA 32073
TEL. (904) 278-0030 FAX. (904) 278-0840 FLORIDA RY No. 6569


CITY OF GREEN COVE SPRINGS
Water Facilities Plan
Reclaimed Water Service Area
Clay County, Florida

FIGURE
II-2
May 2023
Project No.
8905-61-1

high-pressure service to the elevated regions of Magnolia Point and Randall Road is maintained, but also allow the HRWTF to pump finished water to the larger distribution system when the control valves are open.

The three ESTs are the Harbor Road EST (200,000 gal), Reynolds EST (250,000 gal), and Bonaventure EST (75,000 gal). Each EST was constructed at different elevations, which complicates operations.

The HRWTF has the following critical components:

- Two production wells (Well No. 1 - 1,600 gpm and Well No. 2 - 2,000 gpm); three high service pumps (HS Pump 1 thru 3 - 1,200 gpm/pump); two jockey pumps (Pump 1 & 2 - 400 gpm/pump); and two ground storage tanks (200,000 gallons/each).

- The HRWTF Firm Capacity is limited on a: maximum daily flow (MDF) basis of 1.36 MGD (GST volume limiting); and peak hourly flow basis (PHF) of 1,667 gpm (GST limiting). An additional GST is needed at the Harbor Road site based on current peak hourly flow demands.

- The maximum daily flow peaking factor is approximately 2.10, and current peak hour flows can approach or exceed 2,000 gpm (2.88 MGD-PHF).

- As Magnolia Point has built-out, irrigation demands can lead to reduced service pressures. The City has begun to address this dynamic by coordinating with CCUA to complete an interconnect with CCUA's Peter's Creek WTF Service Area at the westerly boundary of Magnolia Point and Magnolia West at Medinah Lane.

**Table II-1** summarizes the HRWTF facility components:

| TABLE II-1<br>HARBOR ROAD WTF COMPONENT SUMMARY | |
|---|---|
| **Unit** | **Description** |
| Well No. 1[a]<br>SJRWMD ID = HR-1<br>(Raw Water Pump) | Well Total Depth: 1,148' (bls)<br>Well Casing Diameter: 16"<br>Well Casing Depth: 750' (bls)<br>Well Capacity: 1,600 gpm (2.30 MGD)<br>Well Motor Size: 40 Hp |
| Well No. 2[a]<br>SJRWMD ID = HR-7<br>(Raw Water Pump) | Well Total Depth: 1,000' (bls)<br>Well Casing Diameter: 16"<br>Well Surface Casing Depth: 360' (bls)<br>Well Capacity: 2,000 gpm (2.88 MGD)<br>Well Motor Size: 60 Hp |
| Jockey Pump No. 1 & No. 2 | Capacity: 400 gpm @ 165' TDH (71 psig)<br>Operating Range:<br>Motor Size: 30 Hp |
| High Service Pumps No. 1 thru No. 3 | Capacity: 1,200 gpm @ 165' TDH (71 psig)<br>Motor Size: 75 Hp |
| Chlorination System | Chlorine Analyzer<br>Two 550 Gallon HDPE Double-Walled Hypochlorite Storage Tanks<br>Two Hypochlorite Chemical Metering Pumps for Well No. 1 and Two Hypochlorite Chemical Metering Pumps for Well No. 2 |
| Instrumentation & Control System | Magnolia Point High Pressure Indicator<br>HR EST Pressure Indicator<br>One (1) 16-inch Turbine Finished Water Meter<br>Data Flow System (DFS) SCADA Control<br>Hydraulic Control Valves |
| Auxiliary Power System | 300 kW Auxiliary Generator with 48 hour Steel Diesel Fuel Tank capacity for Generator |
| HR GST No. 1<br>(Finished Water Storage) | 200,000 gallon Pre-Stressed Concrete Storage Tank<br>2,600 gpm Cascade Aerator<br>Finished Floor Elevation (FFE) = 21.30'<br>High Water Level (HWL) = 34.88' |
| HR GST No. 2<br>(Finished Water Storage) | 200,000 gallon Pre-Stressed Concrete Storage Tank<br>2,600 gpm Cascade Aerator<br>FFE = 21.30'<br>HWL = 34.88' |

| TABLE II-1<br>HARBOR ROAD WTF COMPONENT SUMMARY | |
|---|---|
| **Unit** | **Description** |
| HR EST<br>(Finished Water Storage) | 200,000 gallon Steel Elevated Storage Tank<br>Grade Elevation = 23.5'<br>Bottom Bowl Elevation = 119.3' (41.5 psi)<br>High Water Elevation = 147.3' (53.6 psi) |
| FDEP Permitted Capacity | 2.304 MGD (MDF) |
| Operating Category & Class | 5C (see category and class rating requirements in Rule 62-699.310(2)(e), F.A.C.) |

*a: Bonaventure EST has an out-of-service well (HR-4) that is a 10" production well with 425' of casing and 65' total depth.*

Items associated with the RWTF include the following:

- Three production wells (Well No. 1 - 520 gpm, Well No. 2 - 400 gpm, and Well No. 3 - 575 gpm); three high service pumps (HS Pump 1 thru 3 - 400 gpm/pump); and two ground storage tanks (200,000 gallons/each). All three wells are dated with limited capacities. A new, larger production well should be considered to replace one of the smaller production wells.

- The RWTF Firm Capacity is limited on a: maximum daily flow (MDF) basis of 1.15 MGD (HS Pumping capacity limiting); and peak hourly flow basis (PHF) of 1,200 gpm (HS Pumping capacity limiting). As additional customers come online, modifications to the HS Pumping Capacity will be one the first improvements required to ensure sufficient firm capacity.

- The maximum daily flow peaking factor is approximately 1.5, and current peak hour flows can approach or exceed 800 gpm.

- The reduction of peaks at the RWTF in comparison to the HRWTF is due to the amount of elevated storage on the Reynolds ‘side’ of the distribution system. This value would drastically change if the ESTs were removed from service and the City relied on ground storage for system reliability.

**Table II-2** summarizes the RWTF facility components

| TABLE II-2<br>REYNOLDS WTF COMPONENT SUMMARY | |
|---|---|
| **Unit** | **Description** |
| Well No. 1<br>SJRWMD ID = RS-1<br>(Raw Water Pump) | Well Capacity: 520 gpm (0.75 MGD)<br>Well Motor Size: 10 Hp<br>*Existing well construction information is not available* |
| Well No. 2<br>SJRWMD ID = RS-2<br>(Raw Water Pump) | Well Capacity: 400 gpm (0.58 MGD)<br>Well Motor Size: 7.5 Hp<br>*Existing well construction information is not available* |
| Well No. 3<br>SJRWMD ID = RS-3<br>(Raw Water Pump) | Well Capacity: 575 gpm (0.83 MGD)<br>Well Motor Size: 7.5 Hp<br>*Existing well construction information is not available* |
| High Service Pumps No. 1 thru No. 3 | Capacity: 400 gpm @ 153‘ TDH (66 psig)<br>Motor Size: 40 Hp |
| Chlorination System | Hypochlorite Metering System |
| Instrumentation & Control System | One (1) 8-inch Turbine Finished Water Meter<br>One (1) Chlorine Residual Analyzer<br>One (1) True line Chart Recorder<br>Radio Telemetry/Control with WTF No. 2 and WTF No. 3 and Total DFS SCADA System |
| Auxiliary Power System | 250 kW Auxiliary Generator with (48 hour) Steel Diesel Fuel Tank for Generator |
| Reynolds GST No. 1<br>(Finished Water Storage) | 200,000 gallon Poured-in-Place Concrete Storage Tank with Cascade Aerator |
| Reynolds GST No. 2<br>(Finished Water Storage) | 200,000 gallon Poured-in-Place Concrete Storage Tank with Cascade Aerator |
| Reynolds EST<br>(Finished Water Storage) | 250,000 gallon Steel Elevated Storage Tank<br>[Operable Volume = 200,000 gallon]<br>Grade Elevation = 13.8'<br>Bottom Bowl Elevation = 138.8' (54.1 psi)<br>High Water Elevation = 157.5' (62.2 psi) |
| FDEP Permitted Capacity | 1.728 MGD (MDF) |
| Operating Category & Class | 5C (see category and class rating requirements in Rule 62-699.310(2)(e), F.A.C.) |

The original construction date for the facility is not known. The wellfield is adjacent to the old Navy base and airfield, and the well construction likely does not meet current requirements for a potable water supply well per Chapter 62-532, F.A.C. The wells operate based on the ground storage tank level, and the high-service pumps operate based on the Reynolds EST levels. Variable frequency drives control the speed of the high-service pumps to efficiently meet the system demands.

FDEP reviews the City's Water System in its entirety since the different components are interconnected. However, the RWTF would not provide sufficient service pressure should the HRWTF come offline, but the HRWTF could back-up the RWTF. A 'fill line' from the distribution system to the HRWTF ground storage tanks is proposed to address this redundancy issue should Harbor Road have issues with both of its wells.

The Total Firm Capacity of the City's Water System is 4.032 MGD which is based on a Maximum Daily Flow (MDF) basis. The Maximum Daily Flow basis is typically 2.0 times the annual average daily flow (AADF). On an annual daily flow (AADF) basis, the FDEP limit is approximately 2.016 MGD (4.032 MGD/2). The limiting components of the aggregate firm capacity are the production well capacity and storage capacity for a 1,000 gpm fire flow demand.

The City's current aggregate MDF is approximately 2.19 MGD or 54% of the system's rated capacity. The City's FY 2022 AADF was approximately 1.25 MGD.

The City's other limiting permit basis is through the St. Johns River Water Management District (SJRWMD), which regulates groundwater allocations. The City's Consumptive Use Permit (CUP) expires in 2024 and has different annual average allocations for water use per calendar year. The current permitted annual average withdrawals are presented in **Table II-3**.

| TABLE II-3<br>2018 THROUGH 2024 SJRWMD CUP ALLOCATIONS | |
|---|---|
| **Year** | **CUP Allocation (MGD-AADF)[a]** |
| 2018 | 1.453[b] |
| 2019 | 1.569 |
| 2020 | 1.694 |
| 2021 | 1.831 |
| 2022 | 1.940 |
| 2023 | 2.056 |
| 2024 | 2.135 |

*a: CUP allocations expire in 2024.*
*b: 2017 AADF Demand = 1.15 MG*

The City's Distribution System was reviewed, and the following items were noted:

- The Bonaventure Elevated Storage Tank (EST) is the smallest EST and provides a relatively small pressure band from 33 to 41 pounds per square inch (psig) versus the Harbor Road and Reynolds ESTs that provide a 41 to 54 psig and 54 to 62 psig band, respectively.

- The City has an existing interconnect with St. Johns Landing, and has delivered service to the development when their water system is offline for maintenance. Regardless of an annexation process, St. Johns Landing may request dedicated service from the City at some future date. The Plan anticipates their existing facility components would be removed or placed out of service by the development. The current demand from that system is approximately 90,000 gpd (ADF), which would be added to the City's overall demands should dedicated service be provided to St. John's Landing.

- In 2017/2018, the City completed an interconnect with CCUA to serve elevated portions of Magnolia Point along the westerly limits of the development that abut Magnolia West. The total investment in the connection was approximately $75,000. The connection has assisted increasing service pressures to the system, and the City will need to consider enhancing that connection to serve additional customers or implement a different approach via the City's infrastructure.

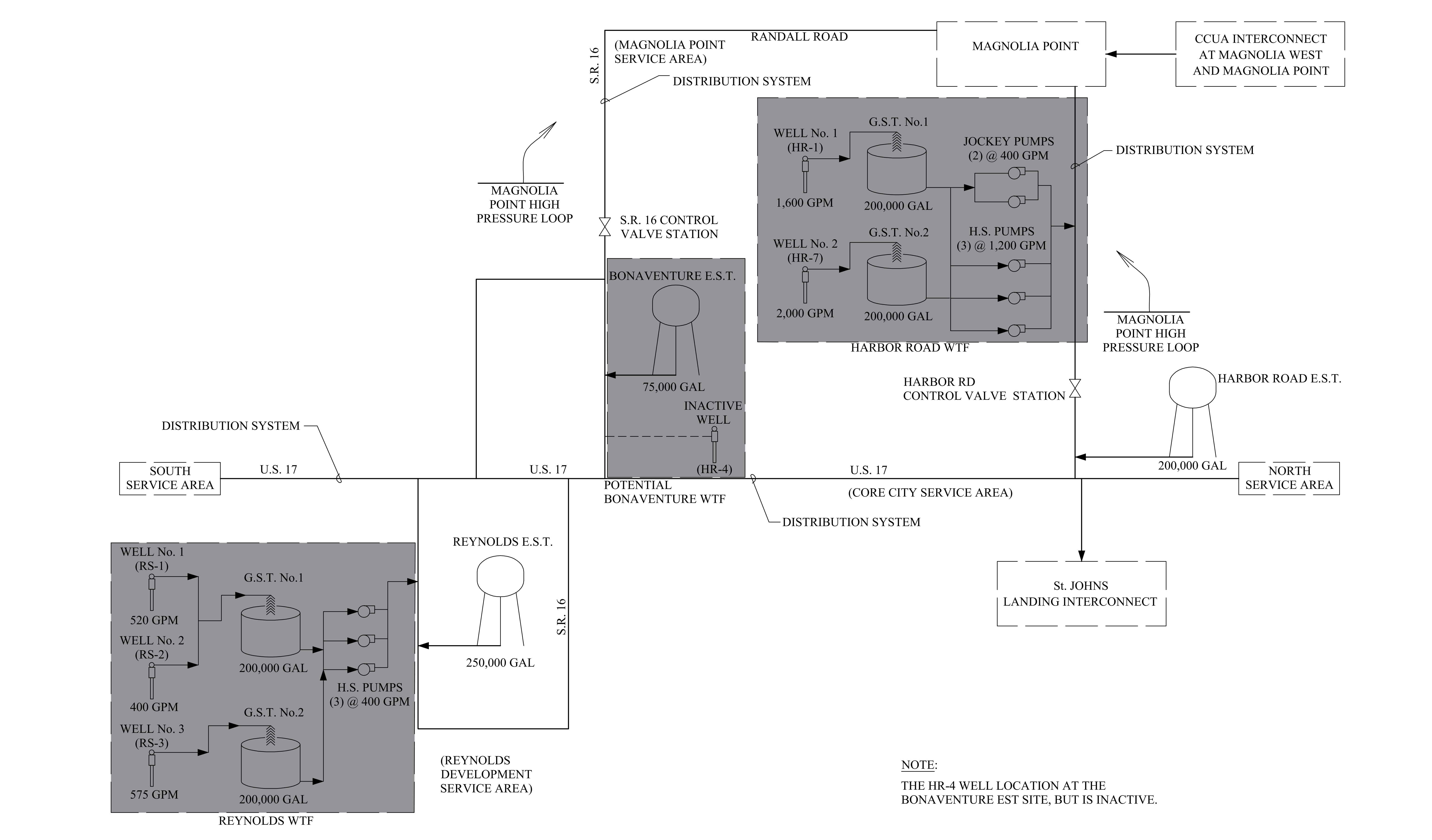
These various systems are depicted in the diagram provided as **Figure II-3**.

## B. WASTEWATER SYSTEM

The City of Green Cove Springs ("City") currently operates the Harbor Road Wastewater Treatment Facility ("HRWWTF"), NPDES Facility ID FL0020915, and the South Wastewater Treatment Facility ("SWWTF"), NPDES Facility ID FL0030210, with permitted surface water discharges to the St. Johns River (Class III Fresh Waters, WBID #2213I). **Figure II-4** shows the locations of permitted surface water discharges for the HRWWTF. **Figure II-5** illustrate the SWWTF outfall location. The HRWWTF is currently undergoing expansion resulting in a 1.25 million gallon per day (MGD) advanced wastewater treatment (AWT) Water Reclamation Facility (WRF). Once the improvements are complete, the SWWTF may be deactivated and all flow directed to the Harbor Road Water Reclamation Facility ("HRWRF"). Pending future development needs, the SWWTF may be reactivated to serve currently unknown users.

Surface Water Discharge Point D-001 (HRWRF) is located near the City's existing boat ramp at Govenors Creek and US 17. The St. Johns River outfall was constructed with the 1971 WWTF, and the design was based on a 15" VCP from the treatment facility and transitions to 16" Ductile Iron Pipe (DIP) in the river. The gravity pipeline extends approximately 140 feet in length from the shoreline and discharges at a depth of approximately four (4) feet (coordinates are approximately latitude 30°00'50"N, longitude 81°41'20"W).

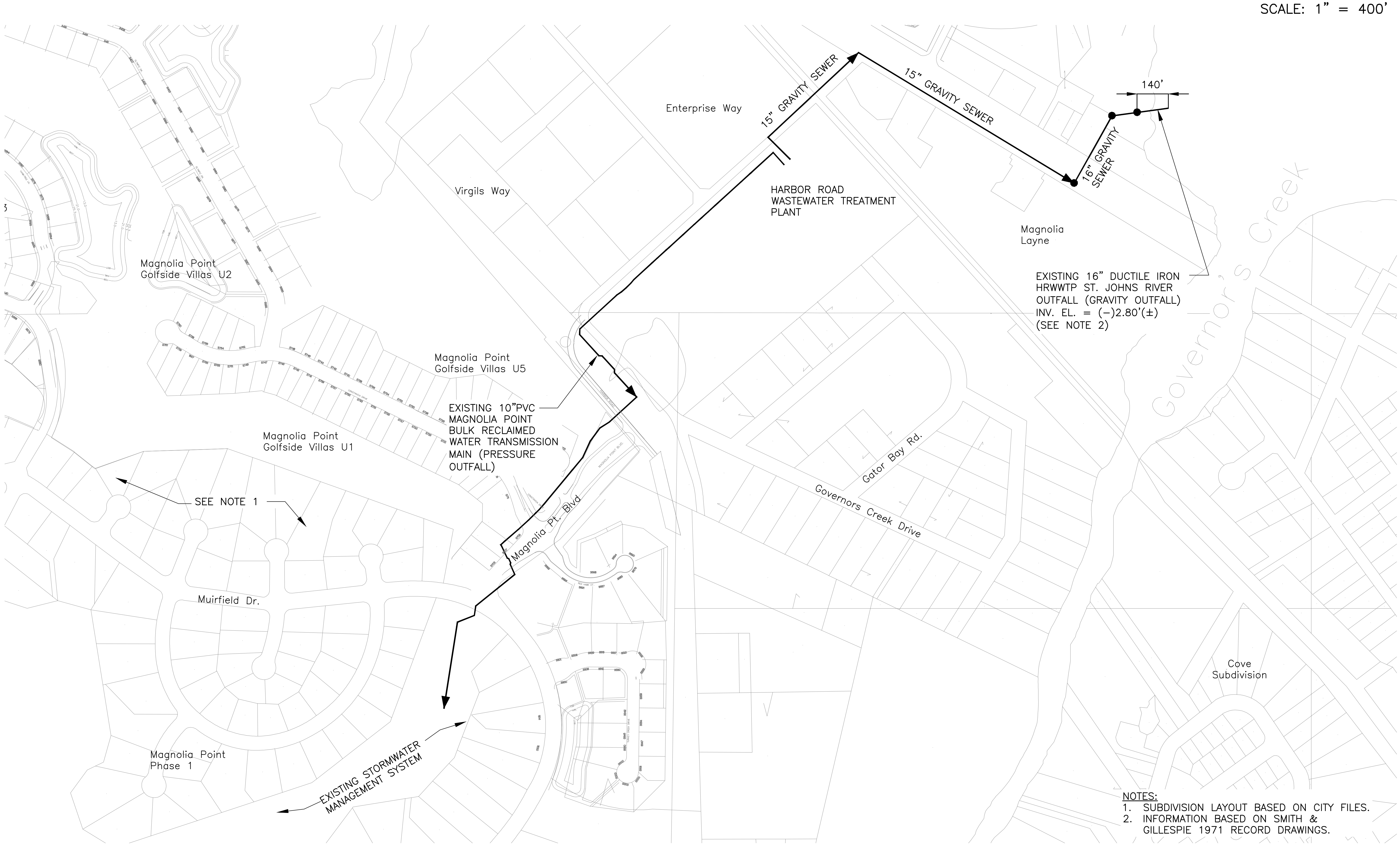
The City operates a permitted public-access reclaimed water system ("reuse system"), R-001. Per the City's Reuse Operating Protocol, the reuse system is the primary means of effluent disposal, with the surface water discharge available for wet weather conditions or circumstances when the treatment system does not meet public-access requirements.




MITTAUER & ASSOCIATES, INC.
CONSULTING ENGINEERS
580-1 WELLS ROAD, ORANGE PARK, FLORIDA 32073
TEL. (904) 278-0030 FAX. (904) 278-0840 FLORIDA RY NO. 6569

CITY OF GREEN COVE SPRINGS
Water Facilities Plan
Water System Schematic Layout
Clay County, Florida

FIGURE
II–3
May 2023
Project No.
8905-61-1




MITTAUER & ASSOCIATES, INC.
CONSULTING ENGINEERS
580-1 Wells Road, Orange Park, Florida 32073
Tel. (904) 278-0030 Fax. (904) 278-0840 Florida RY No. 6569

CITY OF GREEN COVE SPRINGS
Water Facilities Plan
HRWWTF Existing Outfall Locations
Clay County, Florida

FIGURE II−4
May 2023
Project No. 8905−61−1


MITTAUER & ASSOCIATES, INC.
CONSULTING ENGINEERS
580-1 WELLS ROAD, ORANGE PARK, FLORIDA 32073
TEL. (904) 278-0030 FAX. (904) 278-0840 FLORIDA RY NO. 6569

CITY OF GREEN COVE SPRINGS
Water Facilities Plan
SWWTF Existing Outfall Location
Clay County, Florida

FIGURE
II–5
May 2023
Project No.
8905-61-1

The current HRWRF permitted capacities are as follows:

- Treatment: 0.75 MGD on an annual average daily flow (AADF) with current nutrient removal requirements that limit treatment capacity to 0.65 MGD AADF.
- Reuse: 0.75 MGD AADF.
- Surface Water Discharge: 0.65 MGD AADF.

The SWWTF Surface Discharge Point (D-001) is located near Reynolds Park and is a pressurized force main. The outfall was constructed in 1991/1992 with the original

SWWTF as a 14" outfall. The force main extends approximately 122 feet in length from the shoreline and discharges at a depth of approximately three (3) feet (coordinates are approximately latitude 29°59'27"N, longitude 81°39'34"W).

The current SWWTF permitted capacities are as follows:

- Treatment: 0.50 MGD on an AADF with current nutrient removal requirements that limit treatment capacity to 0.35 MGD AADF.
- Reuse: 0.5 MGD AADF (no current end users, not in service).
- Surface Water Discharge: 0.35 MGD, AADF (interim permitted), 0.5 MGD (ultimate permitted).

1. **Aggregate Total Maximum Daily Load (TMDL):** The HRWWTF and SWWTF interim capacities are limited to 0.65 MGD (AADF) and 0.35 MGD (AADF), respectively, to ensure compliance with the City of Green Cove Springs Aggregate Permit (FL0635618) for Total Nitrogen ("TN") and Total Phosphorus ("TP"). The limited capacities were the projected limitations to meet the City's annual limits for TN and TP that are 17,055.5 and 4,244.2 pounds per year (ppy), respectively.

## C. RECLAIMED WATER SYSTEM

Both WRFs have capabilities to produce public-access reclaimed water ("reuse"), but only the HRWRF has a bulk-use customer located at the Magnolia Point Golf

Course. The HWRF has the following treatment system components that allow for reclaimed water production:

- Disk Filter;
- High-Level Disinfection Equipment;
- Effluent Monitoring Equipment; and
- Reclaimed Water Deliver (“Reuse”) Pumps.

In 2020, the HRWRF completed construction which included construction of a reuse water storage tank and increase to reclaimed water pumping capacity.

The 2020 reclaimed water system added:

- Two (2) 75-Hp split-case, pressure-controlled pumps each with a hydraulic capacity of 1,400 gallons per minute (gpm).

- A 10,000-gallon hydropneumatic tank.

- A 1.24 million gallon (MG) reclaimed water ground storage tank with provisions for additional storage capacity.

Current HRWRF components under construction will complete the upstream treatment infrastructure that will be tied into the 2020 reclaimed water system improvements outlined above.

# III. GROWTH REVIEW AND PROJECTIONS

## A. OVERVIEW

The City's overall Service Area is mostly developed with scattered vacant parcels, including some large tracts of land, throughout the Service Area that could be developed. With the exception of the Reynolds Park property in the southern portion of the City and Magnolia Point/Magnolia West in the northern portion of the City, the majority of the land in the City Limits is platted into small parcels (≤ ½ Ac), and the majority of these platted parcels are proposed for 'in-fill' residential development. Larger platted parcels exist in the area north of the City Limits to Black Creek and are anticipated to be future residential developments. The City has developed a '2040 Urban Boundary Plan' that delineated a *potential* future service area. The current City limits and existing Water and Sewer Service Area are shown within the 2040 Urban Boundary on **Figure III-1**. As the City considers potable water needs into 2040, the anticipated build-out of the City's service area and transition to reclaimed water for irrigation needs to be considered.

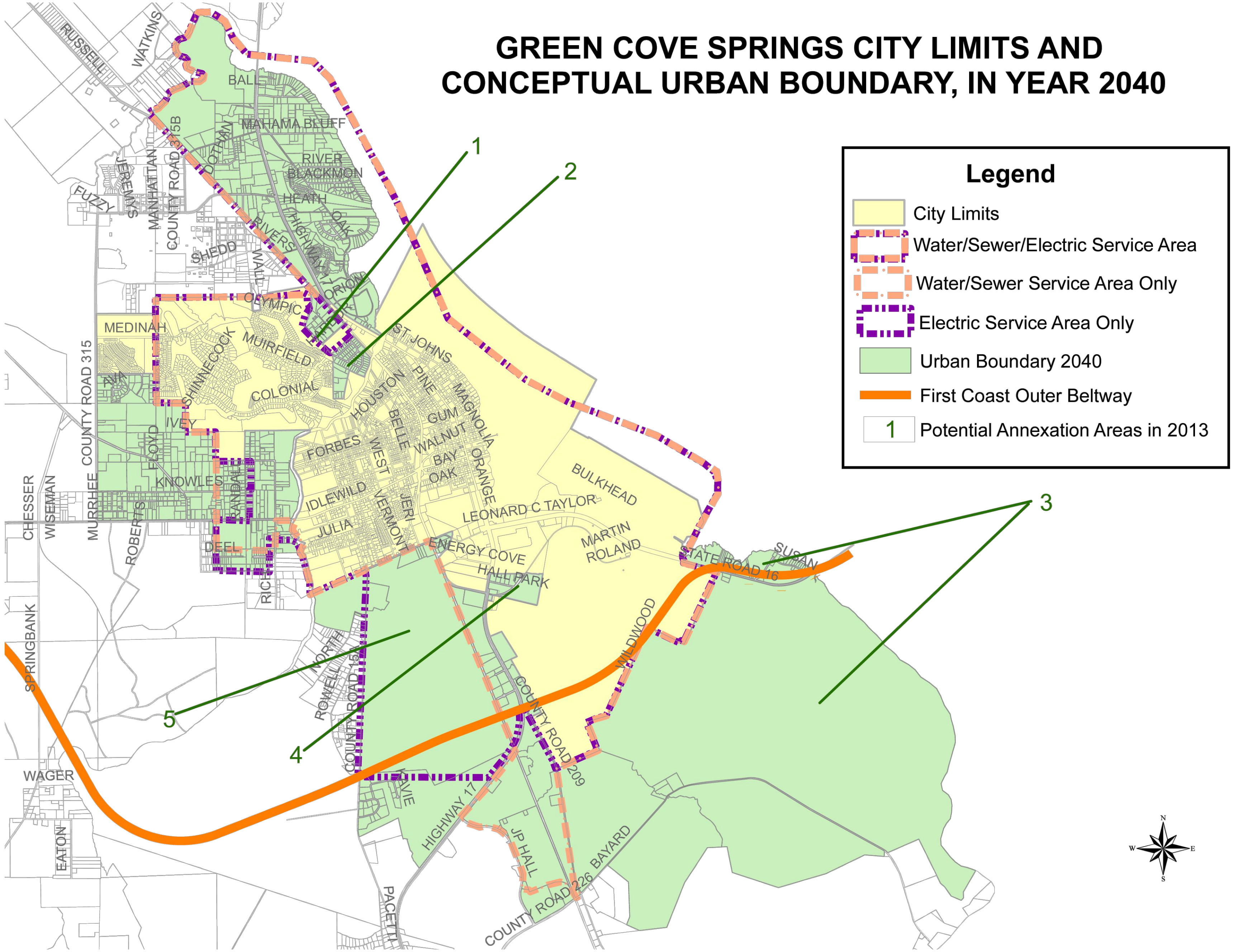
**Section VI** will review reclaimed water demands based upon population projections, and this section will focus on various dynamics that will affect population growth within and around the City. In particular, the following resources will be reviewed, discussed, and analyzed regarding population growth potential and projections within the City's 2040 Urban Boundary:

- Reynolds Future Land Use Map (FLUM) Amendment
- University of Florida Bureau of Economic and Business Research (BEBR) Population Projections

## B. REYNOLDS FLUM AMENDMENT

In 2009, Clay Port, Inc. submitted an application to amend the City's Comprehensive Plan and associated future land use map to promote the redevelopment of Reynolds Park ("Reynolds"). Clay Port submitted the text and map amendment to the City for review and approval, and subsequently to the Department of Community Affairs (DCA) [now the Department of Economic Opportunity (DEO)] and other reviewing agencies. The Reynolds Property is

# GREEN COVE SPRINGS CITY LIMITS AND CONCEPTUAL URBAN BOUNDARY, IN YEAR 2040




MITTAUER
& ASSOCIATES, INC.
CONSULTING ENGINEERS
580-1 Wells Road, Orange Park, Florida 32073
Tel. (904) 278-0030 Fax. (904) 278-0840 Florida RY No. 6569

CITY OF GREEN COVE SPRINGS
Water Facilities Plan
2040 Urban Boundary
Clay County, Florida

FIGURE
III–1
May 2023
Project No.
8905–61–1

located on U.S. 17 and State Road 16 in the City of Green Cove Springs and contains five (5) City parcels within the larger boundary of the Reynolds Property. **Figure III-2** depicts the limits of Clay Port's ownership and defines the land that is called "Reynolds" throughout the remainder of the Plan.

The purpose of the "Amendment" was to revise the Future Land Use designation of the Reynold's parcel through amendment of the future Land Use Element to allow redevelopment under a mixed-use land use designation. The amendment also changed the land use category for five (5) parcels of land owned by the City of Green Cove Springs. The Amendment changed the Reynold's land use categories from Residential Medium Density, Commercial Medium Intensity, Commercial High Intensity, Conservation, and Industrial to land use categories of Reynolds Park Mixed Use Redevelopment District (MU-RP) and Conservation. In sum, the proposed changes:

- Added a new land use category to the City's Future Land Use Element;
- Amended the Future Land Use Map to change the land use on 1,600 acres owned by Clay Port to MU-RP category and retain the Conservation designation on 142 acres;
- Amended the adopted Future Land Use Map to change the land use on 1.5 acres of land owned by the City to the MU-RP category;
- Amended the Future Transportation Map to reflect the alignment of the First Coast Expressway;
- Added a policy to the Future Land Use Element that addresses the location of existing wellheads within the City; and
- Amended the adopted Existing and Future Recreation map to delete the Reynolds Golf Course.


MITTAUER & ASSOCIATES, INC.
CONSULTING ENGINEERS
580-1 WELLS ROAD, ORANGE PARK, FLORIDA 32073
TEL. (904) 278-0030 FAX. (904) 278-0840 FLORIDA RY NO. 6569

CITY OF GREEN COVE SPRINGS
Water Facilities Plan
Reynolds Property Map
Clay County, Florida

FIGURE
III–2
May 2023
Project No.
8905–61–1

The MU-RP land use category provided flexibility to redevelop the land under several scenarios via the establishment of minimum and maximum development entitlements. The maximum percentage of developable land in the residential, commercial, or industrial/offices uses sets up the potential for the following three (3) different development scenarios under the MU-RP category:

1. 'Maximum Residential': 65% Residential (834 acres/3,920 ERUs)
   18% Commercial (231 acres/4.0 million SF)
   12% Industrial (154 acres/3.3 million SF)
   3% Office (38 acres/0.8 million SF)
   2% Institutional (26 acres/0.2 million SF)

2. 'Maximum Commercial': 50% Residential (641 acres/3,014 ERUs)
   33% Commercial (423 acres/7.3 million SF)
   12% Industrial (154 acres/3.3 million SF)
   3% Office (38 acres/0.8 million SF)
   2% Institutional (26 acres/0.2 million SF)

3. 'Maximum Industrial': 30% Residential (385 acres/1,809 ERUs)
   23% Commercial (295 acres/5.1 million SF)
   36% Industrial (462 acres/10.0 million SF)
   9% Office (115 acres/2.5 million SF)
   2% Institutional (26 acres/0.2 million SF)

As discussed further in the Plan, the redevelopment of the Reynolds area is the most dynamic variable in the City's long-term water service needs. The timing associated with the redevelopment is difficult to estimate, but the City will need to make long-term provisions to service this corridor. Some near-term objectives are discussed in **Section III** and long-term flow projections are reviewed in **Section VI**.

## C. GREEN COVE SPRINGS BUILD-OUT STUDY

The Build-Out Study prepared by Fleet & Associates in 2006 noted that many parcels in the Service Area are underdeveloped and can be developed with higher densities and intensities than currently exist. This work preceded the Reynolds FLUM Amendment but is still applicable since the FLUM Amendment kept the intensities and densities less than, or equal to, what was available under the previous land use categories.

For purposes of this Plan, the summary findings will be presented and discussed.

The Build-Out Study conclusions related to maximum build-out potential is summarized in **Table III-1**.

| TABLE III-1<br>SUMMARY OF SERVICE AREA DEVELOPMENT POTENTIAL | | | | | |
|---|---|---|---|---|---|
| **Area/Project** | **Dwelling Units (Ea)** | **Office Space (SF)** | **Commercial Space (SF)** | **Hotel Rooms (Ea)** | **Restaurants (seats)** |
| Vacant Parcels over 2 Acres | 1,040 | - | - | - | - |
| Vacant Parcels under 2 Acres | 669 | - | - | - | - |
| Underdeveloped Parcels over 2 Acres | 1,332 | - | - | - | - |
| Magnolia Point Phase 7 & 8 | 222 | | | | |
| Reynolds[a] | 3,600 | 50,000 | 250,000 | 1,200 | - |
| JM/Huntley | 400 | 360,000 | - | 60 | 50 |
| Governors Point PUD | 49 | - | - | - | - |
| Pyramid Property | 90 | - | - | - | - |
| St. Johns Landing | 800 | - | - | - | - |
| **Total** | **8,202** | **410,000** | **250,000** | **1260** | **50** |

a: *Since publication of the Build-out Study, the Reynolds FLUM Amendment was completed and reviewed maximum 'entitlements' per land use designations that differed from this projection.*

The Reynolds FLUM Amendment discussed in **Section III.B.** reviewed the existing land use designations along with the proposed mixed-use options at their maximum intensities and densities. Those values are provided in comparison to the Build-Out Study in **Table III-2**.

| TABLE III-2<br>REYNOLDS DEVELOPMENT POTENTIAL COMPARISON | | | | | | |
|---|---|---|---|---|---|---|
| **Reynolds Review Basis** | **Dwelling Units (Ea)** | **Office Space (SF)** | **Commercial Space (SF)** | **Hotel Rooms[a] (Ea)** | **Institutional (SF)** | **Industrial (SF)** |
| Build-out Study | 3,600 | 50,000 | 250,000 | 1,200 | - | - |
| FLUM Amendment Max Residential | 3,920 | 800,000 | 4,000,000 | 1,500 | 200,000 | 3,300,000 |
| FLUM Amendment Max Commercial | 3,014 | 800,000 | 7,300,000 | 1,500 | 200,000 | 3,300,000 |
| FLUM Amendment Max Industrial | 1,809 | 2,500,000 | 5,100,000 | 1,500 | 200,000 | 10,000,000 |

*a: Within the Reynolds FLUM Amendment, the materials reference 'time-share' units.*

This data, along with the different development potentials for Reynolds, is further summarized and expanded in the context of potential impacts to the City's existing and proposed reclaimed water infrastructure within **Section VI**.

## D. BEBR POPULATION PROJECTIONS

The year 2010 census counts for each were 190,865 and 6,908, respectively. The year 2020 census counts for Clay County and Green Cove Springs were 218,245 (+14.3% change or 1.4% per year) and 9,786 persons (+41.7% change or 4.2% per year), respectively. The 2023 University of Florida's Bureau of Economic and Business Research (BEBR) population projections for Clay County are provided in **Table III-3**. The percentage growth between each 5-year period is shown for a low-growth, medium-growth, and high-growth projection as well as an annualized value for average growth per year.

| TABLE III-3<br>2025 THROUGH 2050 CLAY COUNTY POPULATION PROJECTIONS[b] | | | | | | |
|---|---|---|---|---|---|---|
| Year | Low Growth | | Medium Growth | | High Growth | |
| | (Pop) | 5-yr \| Avg/yr (% Δ) | (Pop) | 5-yr \| Avg/yr (% Δ) | (Pop) | 5-yr \| Avg/yr (% Δ) |
| 2020[a] | 209,500 | ------ | 223,400 | ----- | 235,000 | ----- |
| 2025 | 221,200 | 5.6% \| 0.9% | 235,400 | 5.4% \| 1.1% | 249,500 | 6.2% \| 1.2% |
| 2030 | 224,800 | 1.6% \| 0.7% | 249,800 | 6.1% \| 1.2% | 274,800 | 10.1% \| 2.0% |
| 2035 | 225,500 | 0.3% \| 0.5% | 261,400 | 4.6% \| 0.9% | 297,400 | 8.2% \| 1.6% |
| 2040 | 223,700 | -0.8% \| -0.2% | 270,300 | 3.4% \| 0.7% | 316,900 | 6.6% \| 1.3% |
| 2045 | 220,800 | -1.3% \| -0.3% | 277,700 | 2.7% \| 0.5% | 334,700 | 5.6% \| 1.1% |
| 2050 | 217,800 | -1.4% \| -0.3% | 284,700 | 2.5% \| 0.5% | 351,600 | 5.0% \| 1.0% |

*a: 2020 BEBR Projections by County for 2020-2045 (Bulletin 177)*
*b: 2023 BEBR Projections by County for 2025-2050 (Bulletin 195)*

As shown in the **Table III-3**, the percentage growth decreases for each of the three options as one approaches the 'out' years, but sustains some larger growth through the near-term periods. For purposes of this analysis, the 'medium-growth' projections will be utilized for the City.

For purposes of this analysis, the estimated population being served by the City's water system will be maintained at 9,786 persons in 2020. Applying the 'Medium-Growth' and 'High-Growth' criteria, the following population estimates are calculated for the City as shown in **Table III-4**.

| TABLE III-4<br>2016 THROUGH 2045 CITY SERVICE AREA POPULATION PROJECTIONS | | |
|---|---|---|
| Year | Medium Growth (% Δ)[a] | Medium Growth Population (capita) |
| 2020 | - | 9,786 |
| 2025 | 5.4% | 10,314 |
| 2030 | 6.1% | 10,944 |
| 2035 | 4.6% | 11,447 |
| 2040 | 3.4% | 11,836 |
| 2045 | 2.7% | 12,156 |
| 2050 | 2.5% | 12,460 |

*a: Noted percentage changes are over a five-year period and are not annualized values.*

The previous population projections (medium-projection) will be maintained to determine water flow demands per year within **Section V**. However, the analysis will also review possible development scenarios which could modify and increase time lines for infrastructure construction.

For analysis purposes, the City's Service Area population projections are converted to single-family dwelling unit counts based on an estimated density of 2.2 capita per unit. The result of this calculation is provided in **Table III-5**.

**TABLE III-5**

**2018 THROUGH 2045 DWELLING UNIT PROJECTIONS**

| | Service Area Projection | |
|---|---|---|
| **Year** | **(Capita)** | **(ERU)[a]** |
| 2020 | 9,786 | 4,448 |
| 2025 | 10,314 | 4,688 |
| 2030 | 10,944 | 4,974 |
| 2035 | 11,447 | 5,203 |
| 2040 | 11,836 | 5,380 |
| 2045 | 12,156 | 5,525 |
| 2050 | 12,460 | 5,664 |

*a: ERU = 2.2 capita/unit.*

As noted in **Table III-1**, the Build-Out Study anticipates that the development and redevelopment potential of the entire Service Area results in approximately 8,200 units.

These projections will be further expanded upon in **Section VI**.

# IV. OPERATION AND MAINTENANCE CONSIDERATIONS

The cost associated with operation of reclaimed water system are currently recorded as part of the Wastewater Fund and are not tracked separately. However, if the City were to create a separate fund for the reclaimed water system, expenditures that should be included are summarized as follows:

1. Operation & Maintenance (O&M) Costs
2. Debt Service Related to Capital Improvements
3. Reserve
4. Non-financed Capital Improvements
5. Inter-fund Transfers

An estimation of the O&M costs related to the Reclaimed Water System are provided in **Table IV-1**.

**TABLE IV-1**

**ESTIMATED ANNUAL OPERATING O&M BUDGET FOR EXISTING RECLAIMED WATER SYSTEM**

| Item | Average |
|---|---|
| Labor, Taxes & Fringes | $15,000 |
| Utilities - Electric | $7,500 |
| Utilities - Water, Sewer | $0 |
| Professional Fees | $1,000 |
| Office & Lab Expenses/Supplies | $10,000 |
| Gas & Oil | $0 |
| Repairs & Maintenance | $5,000 |
| Safety Equip./Uniforms | $500 |
| Contract Analysis & Testing | $10,000 |
| Travel/Books/Prof. Development | $500 |
| Insurance | $1,500 |
| Communication, Freight & Postage | $500 |
| Other Charges - Claim | $0 |
| Other expenses (Lake Maintenance) | $15,000 |
| **TOTAL** | **$66,500** |

# V. REGULATORY AND POLICY CONSIDERATIONS

## A. OVERVIEW

The most dynamic regulatory areas which could impact the City's water system infrastructure planning are related to alternative water supply needs/demands (non-potable irrigation), groundwater allocation, restrictions, and water conservation requirements. Each of these topics are discussed in further detail in relation to the following areas:

- SJRWMD Regional Review and City's CUP;
- Water Conservation;
- Reclaimed Water Use; and
- Regional Interconnects.

## B. SJRWMD REGIONAL STUDIES AND CITY'S CUP | WATER CONSERVATION

Within this subsection, a brief discussion of some larger regional work within Northeast Florida will be reviewed and summarized as it applies to the City's long-term planning as well as the City's requirements within their Consumptive Use Permit ("CUP").

1. **Regional Studies:** The City is currently part of the North Florida Regional Water Supply Partnership. This partnership is a result a joint agreement between the St. Johns River Water Management District ("SJRWMD"), Suwannee River Water Management District ("SRWMD"), and FDEP. Collectively, these entities have created a water supply planning area that extends west to Suwannee and Gilchrist Counties; south to Alachua, Putnam, and Flagler Counties; north to the state line; and east to the Atlantic Ocean. Work is primarily focused on water supply planning which includes, but is not limited to, groundwater modeling, springs protection, minimum flows and levels, water quality in surface water bodies, wetland protection, water conservation opportunities, water supply development, etc. On January 17, 2017, the SJRWMD approved the North Florida Regional Water Supply Plan (NFRWSP). The applicable findings for the City are outlined as follows:

   - The Districts determined fresh groundwater alone cannot supply the projected 117 million gallons per day increase in water demand during the 20-year planning horizon without causing unacceptable impacts to water resources.

- One of the major highlights is focus on conservation. The NFRWSP illustrates water conservation efforts which could potentially reduce the projected 2035 water demand by as much as 54 million gallons per day (MGD). This represents 46% of the projected 117 MGD increase in demand over the 20-year planning horizon.

  - Project options range from aquifer recharge, rehydration of wetlands and potable reuse, to alternative water supply sources like reclaimed and stormwater.

- Total water demand in the NFRWSP area is anticipated to increase from 551 million gallons per day (MGD) in 2010 to 667 MGD in 2035 (21%). Public supply represents the largest demand in the NFRWSP area (38%), followed by agriculture (23%) and CII/MD (20%).

- The Districts' total population for the NFRWSP area is expected to increase by 676,000 people (35%, to approximately 2.63 million people) by 2035 (approximately 2% per year growth projection).

- From 2010 to 2015, reclaimed water flow in the NFRWSP area as increased by almost 20 MGD, or 15%, and the beneficial use of reclaimed water has increased by almost 5 MGD or 12%.

- Average public water supply use has decreased by 5%, resulting in a reduction of gross per capita from 138 gpcd to 130 gcpd.

- The FDEP has a statewide reuse utilization goal of 75% (FDEP, 2003).

- The NFRWSP estimates approximately 84 gpcd of average wastewater generation to local WWTFs.

- Analyses indicated that the adopted MFLs for lakes Brooklyn (Clay County), Cowpen (Putnam County), and Geneva (Clay County) are not met under existing conditions. However, MFLs for these waterbodies were developed and adopted in the 1990s using methods that current science indicates are not applicable to sandhill lakes with extremely high ranges of stage fluctuation. As such, re-evaluation of these MFLs is in progress so that the revised MFLs reflect current methods and the best available science. The Lake Cowpen Notice of Proposed Rule was approved for publication in December 2016; Lakes Brooklyn and Geneva are scheduled for 2017.

- The wetland assessment identified 20,175 acres at a moderate or high potential for adverse change based on 2035 conditions within the NFRWSP area.

  - Conservation strategies included: Tiered public supply billing rates; Implementation of landscape irrigation restrictions; Landscape and irrigation design codes; Outreach and Education; Water use audits for residential customers; Enhanced meter reading technology; and Water conservation rebate programs.

2. **<u>City's Consumptive Use Permit (CUP) | Water Conservation</u>:** The City's CUP primarily defines how much groundwater the City can pump from the aquifer to supply the needs of the City's Service Area. A number of technical aspects go into the review and approval of a CUP application that are beyond the scope of this Study. However, one (1) relevant issue is related to reclaimed water use and how it relates to decreasing potable water use for irrigation purposes. The City completed a 'five-year compliance review' with the SJRWMD in January 2012. This review included a number of items associated with the City's water system but also included discussion related to water conservation and reuse projections. The items to note, as they relate to the sewer/reuse system, include the following:

   - Permit Expiration Date is July 13, 2024. City is currently preparing a renewal application.

   - The permittee must continue implementation of the water conservation program measures and schedule as referenced in the Water Conservation Plan submitted to the District on September 28, 2011, for permit duration.

- If at any time within permit duration it becomes practical, economically feasible, and permissible under applicable state and federal statutes or regulations promulgated thereunder, *the District may require the permittee to become a reclaimed water purveyor* or increase the availability of reclaimed water for use at a permissible application site.

- The permittee must conduct a detailed water audit every 3 years and submit it to the District by January 31 of 2015, 2018, and 2021. All water uses given in the audit must be for the previous calendar year and documentation provided on how the amounts were metered or determined. If the water audit shows that the system losses and unaccounted for water utility uses exceed 10%, a leak detection and repair program must be implemented. This review will include considerations of 'potable irrigation' use that may lead to reclaimed water supply considerations.

- The lowest quality water sources, such as reclaimed water and surface/storm water, must be used as an irrigation source when available pursuant to District rules and applicable state law and deemed feasible by the District.

The majority of the potable irrigation demand is located within Magnolia Point, which may be a future reclaimed water expansion project option as explored within **Section VI**.

The following table provides a high-level review of water consumption changes between 2011, 2015, and 2017 for 3/4" connections, which are the largest connection category accounting for over 75% of the City's total demand.

**TABLE V-1**

**TOTAL 3/4" METERED WATER USE SUMMARY FOR 2011, 2015, AND 2017 (Includes Irrigation Meters)**

| Year | Number of 3/4" Connections | Average Use per Connection (gallons per month-AADF) |
|---|---|---|
| 2011 | 2,422 | 5,712 |
| 2015 | 2,594 | 5,758 |
| 2017 | 2,992 | 5,615 |

If the irrigation meters are separated from the totals, the water use for those higher water users as summarized in **Table V-2**

| TABLE V-2<br>3/4" IRRIGATION WATER METER USE SUMMARY<br>FOR 2011, 2015, AND 2017<br>(3/4" Irrigation Meters Only) | | |
|---|---|---|
| **Year** | **Number of 3/4" Irrigation Connections** | **Average Use per Connection (gallons per month-AADF)** |
| 2011 | 437 | 15,398 |
| 2015 | 438 | 11,073 |
| 2017 | 491 | 12,700 |

As shown in **Table IV-2**, the water use since the tiered rate structure (2015 and 2017) were 28% and 17.5% less than the irrigation demands in 2011. Increasing irrigation consumption cost per thousand gallons of water for the higher tiers of consumption will result in additional conservation, which may be required in the future to reduce non-essential water use.

## C. RECLAIMED WATER USE CONSIDERATIONS

The City completed a Reclaimed Water System Master Plan in 2016. The findings from the Plan are summarized as follows:

- Providing reclaimed water to the Magnolia Point Golf Course is a critical component of the City's wastewater/reclaimed water infrastructure. The reclaimed water use at this location allows the City to remain in compliance with the current TMDL restrictions. Without this reclaimed water demand, the City would have difficulty meeting their Total Phosphorus loading requirements and Total Nitrogen would be near the compliance limit.

- A range of 0.15 to 0.20 MGD (ADF) was utilized within the Plan for future system modification considerations.

- The existing WRFs do not currently have sufficient provisions to supply reclaimed water to residential customers. If one of the WRFs were to provide service to residential customers for irrigation, then storage tank(s), high service pumping units, hydropneumatic tank(s), and controls will be required. In addition, a separate billing system with consideration of a separate utility fund would need to be addressed before such a system could be made operational.

- The City's 2016 Wastewater System Master Plan defined wastewater projections through 2040. Based on a constant 0.20 MGD reclaimed water demand from the Magnolia Point Golf Course, **Table V-3** summarizes the anticipated reclaimed water supply availability through 2040.

**TABLE V-3**

**2015 THROUGH 2040 SUMMARY OF W&S SERVICE AREA WASTEWATER PROJECTIONS & RECLAIMED WATER SUPPLY**

| Year | W&S Service Area Wastewater Demand (MGD-AADF) | Mag Pt GC Reclaimed Irrigation Demand (MGD-AADF) | Reclaimed Water Supply (MGD-AADF) |
|---|---|---|---|
| 2015 | 0.712 | 0.200 | 0.512 |
| 2020 | 0.796 | 0.200 | 0.596 |
| 2025 | 0.878 | 0.200 | 0.678 |
| 2030 | 0.963 | 0.200 | 0.763 |
| 2035 | 1.046 | 0.200 | 0.846 |
| 2040 | 1.129 | 0.200 | 0.929 |

In the near-term, the City has considered reclaimed water service to the following developments/project areas that were considered in this section:

- Reynolds Park [Future Land Use Map (FLUM) Amendment area];
- Edgewater Landing;
- Black Creek Marina;
- Magnolia Point Phase 8; and
- Existing Magnolia Point residential development areas.

The estimated reclaimed water demands for each location are summarized in **Table V-4**.

| TABLE V-4<br>CONCEPTUAL DEVELOPMENT<br>RECLAIMED WATER DEMAND PROJECTION SUMMARY | | | | |
|---|---|---|---|---|
| **Location** | **Units (ERU)** | **Average Daily Irrigation Demand (MGD-ADF)** | **Max. Month Irrigation Demand (MGD)** | **Peak Hour Irrigation Demand (gpm)** |
| Reynolds Park (Min) | 1,080 | 0.540 | 2.160 | 3,750 |
| Reynolds Park (Max) | 2,340 | 1.170 | 4.680 | 8,125 |
| Edgewater Landing | 190 | 0.095 | 0.380 | 660 |
| Black Creek Marina | 75 | 0.038 | 0.152 | 265 |
| Mag Pt Phase 8 | 121 | 0.061 | 0.244 | 450 |
| Existing Magnolia | 715 | 0.358 | 1.432 | 2,500 |

It is anticipated that the City will experience additional pressures to create a reclaimed water system, if not already in operation, when the City's current CUP expires and requires an updated application. The SJRWMD will likely desire consideration of mechanisms to reduce non-essential potable water demands (i.e., irrigation) through extension/expansion of reclaimed water systems. Creation and operation of a reclaimed water system will assist in mitigating these pressures.

As a result of the review, the City adopted Reclaimed Water Service Areas (RWSA) as follows:

- North RWSA bound by Harbor Road to the South, US 17 to the east, Black Creek to the north, and the City's Utility Service Area to the west (generally the railroad). Service into CCUA territory can be considered on a case-by-case basis, and the enclosed Plan does contemplate service to Traceland.

- West RWSA bound by the limits of Magnolia Point Phase 8 and those lots within Magnolia Point that may abut the final reclaimed water transmission main location.

- The City also committed to construct the reclaimed water delivery system components to begin retail service to the North RWSA, which included a reclaimed water ground storage tank and high service pumping system.

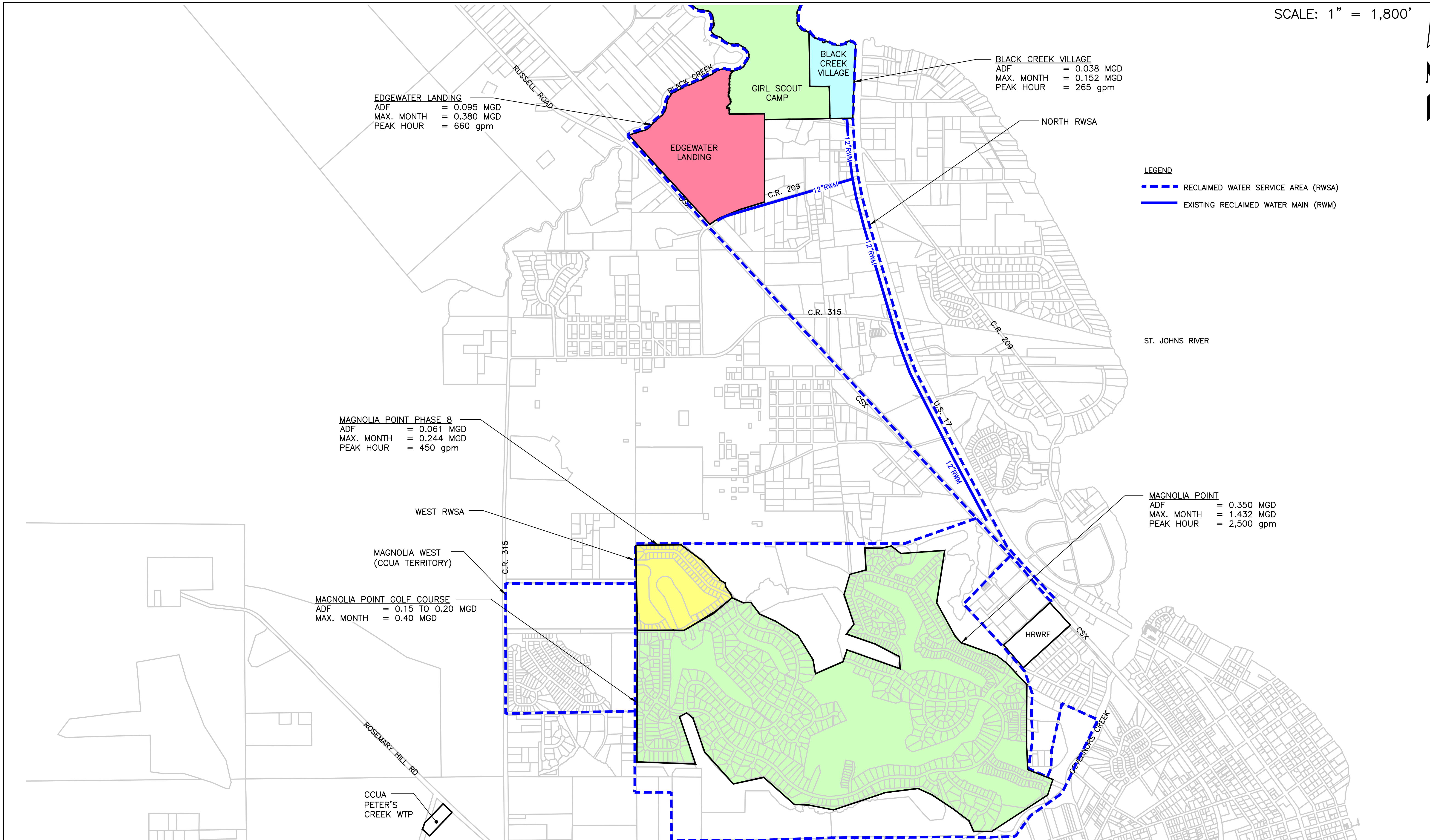
**Figure V-1** defines these areas and associated reclaimed water demands.

## D. REGIONAL INTERCONNECTS

The City currently has interconnects with CCUA and St. Johns Landing. As portions of the City's Service Area grow and extend further to the service area boundaries, additional interconnects may be necessary to economially provide service to customers. In addition, extension and interconnection of reclaimed water distribution systems will be critical to assist in decreasing potable water demands.

## E. SUMMARY

The City must continue to monitor their tiered rate structure to determine if modifications are warranted to further reduce non-essential water use to reasonable levels. In addition, expansion of the City's reclaimed water distribution system will be necessary to reduce non-essential water demands. Both of these management components will likely be required to assist the City's efforts to meet their long-term water allocations from the SJRWMD. The City's permit renewal in 2024 will begin to further define groundwater limitations and the District's requirements as it relates to non-essential water use.




MITTAUER & ASSOCIATES, INC.
CONSULTING ENGINEERS
580-1 Wells Road, Orange Park, Florida 32073
Tel. (904) 278-0030 Fax. (904) 278-0840 Florida RY No. 6569

CITY OF GREEN COVE SPRINGS
Water Facilities Plan
North & West Reclaimed Water Service Area (RWSA)
Clay County, Florida

FIGURE
V–1
May 2023
Project No.
8905-61-1

# VI. PROJECTED RECLAIMED WATER DEMANDS

## A. OVERVIEW

**Section III** developed various background information related to growth variables that are anticipated to affect the City within the current Planning Period. Redevelopment of Reynolds, the construction of the First Coast Expressway, and associated regional growth within the County are major variables that will impact the City's infrastructure needs. This information should be compared against population projections that will provide annual 'demand' curves based on historical information and potential population growth. The Reynolds Redevelopment, for example, presents a significant 'supply' of housing, industrial uses, commercial uses, etc., but these components will not develop until 'demand' for the products are anticipated. Accordingly, **Section III** concluded with a review of the UF BEBR estimates for population growth utilizing the 'Medium-Growth' curves as the basis of estimates going forward. The information presented in **Section III** will be developed into flow demands herein that will provide a basis for subsequent infrastructure planning.

## B. BUILD-OUT STUDY: MAXIMUM WATER DEMANDS | RECLAIMED WATER SUPPLY

The dwelling unit flow basis is a planning value and will likely project a larger demand than will be realized as development occurs. The industry continues to move into a 'water conservation' mindset where more low-flow fixtures are used in homes which results in lower water demands. Further, the City is already developing their Reclaimed Water infrastructure allowing capabilities to serve developments with reclaimed water, in lieu of potable water, for non-essential irrigation demands. This will not only conserve groundwater supplies, but will also reduce peak hourly demands in the potable water delivery systems.

In **Section III**, the level of service for water based on Clay County's and the City's Comprehensive Plan were respectively 311 gpd/ERU and 150 gpcd. The City's Ordinance defines an ERU as 350 gpd resulting in a household density of 2.33 persons (350 gpd/150 gpcd).

The HRWTF and RWTF are interconnected, and the HRWTF feeds the 'larger' distribution system through the control valve located at the Harbor Road site.

However, the HRWTF primarily serves the Magnolia Point development which is built out. The amount of flow that is delivered from the HRWTF is master metered for both Magnolia Point and City Distribution System. However, flow to the City's distribution system is not sub-metered. Therefore, demands from both facilities will be aggregated to determined current per capita demands.

Based on meter records for 2017, the weighted average use per residential connection type and size is summarized as follows:

- 3/4" Residential = 200 gpd/ERU [2,837 Connections Total]
- 1" Residential = 180 gpd/ERU [257 Connections Total]
- 3/4" Residential Irr. = 373 gpd/ERU [569 Connections Total]
- 1" Residential Irr. = 467 gpd/ERU [30 Connections Total]

The 'Residential Irr.' meters are largely located within Magnolia Point.

FDEP recommends a planning value of 100 gpcd, but irrigation demands can increase these values based on non-potable demands. A traditional household density is 2.4 capita per household.

As illustrated from the 2017 water use records and estimated population density, irrigation demand is a significant driver related to water use. A home with a separate 3/4" irrigation meter likely has an average water demand of nearly 573 gpd or 230 gpcd, while a home without irrigation has a demand of approximately 80 gpcd. Thus, homes using potable water for irrigation are expected to use approximately 65% more water than a home that is only using potable water for essential uses.

In order to provide a review of potential demand variations, the following projections will be utilized within the Plan:

- 'Low-Demand' Projection: 250 gpd/ERU (100 gpcd * 2.5 capita/unit)
- 'Medium-Demand' Projection: 350 gpd/ERU (City Ordinance)
- 'High-Demand' Projection: 575 gpd/ERU (230 gpcd * 2.5 capita/unit)

Based on meter records for 2017, the weighted average use per residential connection type and size is summarized as follows:

- 3/4" Residential = 200 gpd/ERU [2,837 Connections Total]
- 1" Residential = 180 gpd/ERU [257 Connections Total]
- 3/4" Residential Irr. = 373 gpd/ERU [569 Connections Total]
- 1" Residential Irr. = 467 gpd/ERU [30 Connections Total]

The 'Residential Irr.' meters are largely located within Magnolia Point.

FDEP recommends a planning value of 100 gpcd, but irrigation demands can increase these values based on non-potable demands. A traditional household density is 2.4 capita per household.

As illustrated from the 2017 water use records and estimated population density, irrigation demand is a significant driver related to water use. A home with a separate 3/4" irrigation meter likely has an average water demand of nearly 573 gpd or 230 gpcd, while a home without irrigation has a demand of approximately 80 gpcd. Thus, homes using potable water for irrigation are expected to use approximately 65% more water than a home that is only using potable water for essential uses.

In order to provide a review of potential demand variations, the following projections will be utilized within the Plan:

- 'Low-Demand' Projection: 250 gpd/ERU (100 gpcd * 2.5 capita/unit)
- 'Medium-Demand' Projection: 350 gpd/ERU (City Ordinance)
- 'High-Demand' Projection: 575 gpd/ERU (230 gpcd * 2.5 capita/unit)

**Table III-1** summarized the Build-Out Study's projection for maximum development within the City's Service Area. Those values will now be converted into water demand projections. The demand projections will be based on the following planning values:

- Dwelling Unit (ERU) = See above for low, medium, and high basis;
- Office Space = 0.15 gpd/SF (Rule 64E-6.008, F.A.C.);
- Commercial Space = 0.15 gpd/SF (Rule 64E-6.008, F.A.C.);
- Industrial Space = 0.14 gpd/SF (Rule 64E-6.008, F.A.C.);
- Hotel = 100 gpd/room (Rule 64E-6.008, F.A.C.); and
- Restaurant = 20 gpd/seat (Rule 64E-6.008, F.A.C.).

Utilizing the above and the build-out summary provided in **Table III-1**, the 'build-out' water demand calculations are summarized in **Table VI-1**.

**TABLE VI-1**

**SUMMARY OF ANTICIPATED WATER BUILD-OUT DEMANDS**

| Item | Units | Quantity | Water Demand (gpd) | | |
|---|---|---|---|---|---|
| | | | Low | Medium | High |
| Residential Units | Ea | 8,930 | 2,232,500 | 3,125,500 | 5,134,750 |
| Office Space | SF | 410,000 | 61,500 | 61,500 | 61,500 |
| Commercial Space | SF | 250,000 | 37,500 | 37,500 | 37,500 |
| Hotel | Rm | 1,260 | 126,000 | 126,000 | 126,000 |
| Restaurant | Seat | 50 | 1,000 | 1,000 | 1,000 |
| Exist. Water Service Area Demand[a] | - | - | 1,158,000 | 1,158,000 | 1,158,000 |
| | | **Total -** | **3,616,500** | **4,509,500** | **6,518,750** |

a: *It is anticipated that existing services would be redeveloped, thus there is some inherent overlap in the water values. However, given the status of the proposed developments and the time horizon for potential developments, the overlap is not considered significant in the context of this study.*

As noted in **Section III**, the Reynolds build-out variables differ when comparing the Build-Out Study and the FLUM Amendment Materials. A summary of the total water demand for each condition is summarized in **Table VI-2**.

**TABLE VI-2**

**COMPARISON OF REYNOLDS BUILD-OUT DEMAND POTENTIALS**

| Scenario | Water Demand (gpd) | | |
|---|---|---|---|
| | Low | Medium | High |
| Build-Out Study | 1,065,000 | 1,425,000 | 2,235,000 |
| FLUM Amendment-Max Residential | 2,389,400 | 2,781,200 | 3,662,900 |
| FLUM Amendment-Max Commercial | 2,666,200 | 2,967,600 | 3,645,800 |
| FLUM Amendment-Max Industrial | 3,219,600 | 3,400,500 | 3,807,400 |

When the Medium Water Demand values are averaged, the resulting Reynolds projection is approximately 3.05 MGD (AADF) which is 1.625 MGD (AADF) greater than the Build-Out Study projection. However, the FLUM Amendment assumes 100% utilization of available densities and intensities which is unlikely. For purposes of this Plan, a 70% effective value will be utilized based on the average Medium Water Demand projection. Therefore, the Reynolds ‘build-out’ demand will be capped at 2.135 MGD-AADF (3.05 MGD * 0.70).

**Table VI-1** identified a potential water build-out demand range between 3.6 and 6.5 MGD (AADF) with 4.51 MGD (AADF) being the ‘medium’ projection. The 4.51 MGD demand included a less dense/intense Reynolds build-out. The difference between the Reynolds Projection is 0.71 MGD-AADF (2.135 MGD - 1.425 MGD). As a result, the build-out demand could approach a maximum of approximately 5,200,000 gpd-AADF (4.5 MGD + 0.70 MGD) with a maximum daily flow of 10.4 MGD (MDF).

The City’s 2015 Wastewater Master Plan estimated a build-out demand of approximately 3.5 MGD (AADF). Due to non-essential uses, water demands will exceed wastewater production as long as infiltration and inflow into the sewer system is not excessive. The City’s current wastewater flows are approximately 0.75 MGD (AADF) total resulting in a water production to wastewater treatment ratio of 1.54 (1.158 MGD/0.75 MGD). If this ratio was maintained, the anticipated build-out capacity needs for the water system would be 5.4 MGD (AADF) [3.5 MGD * 1.54].

For purposes of the Study, a build-out demand of 5.2 MGD (AADF) and 10.4 MGD (MDF) will be utilized. This demand is not expected by 2040, and further considerations of demands within the current planning period will be reviewed further herein.

## C. WATER DEMANDS THROUGH THE PLANNING PERIOD

The Build-Out Study and the aforementioned analysis allows the City to determine the ultimate build-out of the Service Area. However, the study did not place a time line on the anticipated demand/flow per year. In order to review the potential pace of development within the Service Area and associated needs for infrastructure construction, previous growth projections will be reviewed to determine flow rates through the Year 2040. The ultimate water demand will be a direct function of the development rate (which is a function of the prevailing market for commercial, office, and recreational developments) along with potential migration of persons to the City from other areas. In addition, water conservation measures and expansion of reclaimed water service will also affect long-term water demands by decreasing the non-essential water demands that drive large portions of potential demands. Therefore, the actual demand time lines, or demand needs, could vary drastically if the market conditions, or non-essential watering needs, were to significantly change.

Within the enclosed flow projections, specifically within Reynolds, some consideration was given to actual time lines the City should expect before one of the larger developments is in a position to begin construction. The total entitlement process would likely take two (2) to four (4) years before the necessary approvals (re-zoning approval, site planning, engineering design, and permits) are “in-hand” for construction of these projects. Actual construction of the required infrastructure to serve the development(s) would likely take a minimum of two (2) years before the first unit was on-line for service. Therefore, the total time frame would extend over three (3) to five (5) years if no issues are encountered during the process.

The following analysis takes the above discussion into further consideration and applies these concepts to each Service Area. The flow projections displayed in **Table VI-3** are based on the Medium-Growth Population Projections presented in **Section III**.

**TABLE VI-3**

**2020 THROUGH 2050 SERVICE AREA WATER PROJECTIONS**

| Year | Medium Growth Population (capita \| ERUs) | Low-Demand Projection (MGD-AADF) | Medium-Demand Projection (MGD-AADF) | High-Demand Projection (MGD-AADF) |
|---|---|---|---|---|
| 2020 | 9,876 \| 4,448 | 1.11 | 1.56 | 2.56 |
| 2025 | 10,314 \| 4,688 | 1.17 | 1.64 | 2.70 |
| 2030 | 10,944 \| 4,974 | 1.24 | 1.74 | 2.86 |
| 2035 | 11,447 \| 5,203 | 1.30 | 1.82 | 2.99 |
| 2040 | 11,836 \| 5,380 | 1.35 | 1.88 | 3.09 |
| 2045 | 12,156 \| 5,525 | 1.38 | 1.93 | 3.18 |
| 2050 | 12,460 \| 5,664 | 1.42 | 1.98 | 3.26 |

Pending actual population growth rates, future water demands per ERU are anticipated to be less than the Medium Demand projections due to reductions from water conservation measures as well as expansion of the City's reclaimed water system. However, for purposes of this Plan, the Medium-Growth Population Projections presented in **Table VI-3** will be utilized going forward to determine capital expenditures associated with the Water System improvements/modifications.

**Table VI-4** illustrates the projected demands with the City's current CUP allocations. As shown in the table, the CUP allocations exceed the projected values, so reallocation of the supply may occur when the permit is renewed.

**TABLE VI-4**

**2020 THROUGH 2040 SERVICE AREA WATER PROJECTIONS**

| Year | Medium Growth Population (capita \| ERUs) | Medium-Demand Projection (MGD-AADF) \| (MGD-MDF[b]) | Current CUP Allocations (MGD-AADF) |
|---|---|---|---|
| 2020 | 9,876 \| 4,448 | 1.56 \| 3.12 | 2.135[a] |
| 2025 | 10,314 \| 4,688 | 1.64 \| 3.28 | 2.135[a] |
| 2030 | 10,944 \| 4,974 | 1.74 \| 3.48 | 2.135[a] |
| 2035 | 11,447 \| 5,203 | 1.82 \| 3.64 | 2.135[a] |
| 2040 | 11,836 \| 5,380 | 1.88 \| 3.76 | 2.135[a] |
| 2045 | 12,156 \| 5,525 | 1.93 \| 3.86 | 2.135[a] |
| 2050 | 12,460 \| 5,664 | 1.98 \| 3.96 | 2.135[a] |

*a: The City's existing CUP expires in 2024. The listed groundwater allocations project the 2024 demand forward. It is likely the allocations will be reduced when the permit is renewed.*
*b: MDF was assumed to be 2x AADF.*

# VII. DEVELOPMENT OF ALTERNATIVES

Based on the reuse water demands and influent flow projections for the HRWRF, the following alternatives were evaluated to eliminate non-beneficial surface water discharges by 2032.

## A. RECLAIMED WATER ALTERNATIVES

1. **Reject Water Storage Expansion:** Current operating conditions include disposal of reject water via surface water discharge. The modifications to the HRWRF will allow for the existing package WWTF to be converted to a reject storage tank. The modified tank would provide up to 580,000 gallons of reject storage, which will address current influent flows but will not meet FDEP's rule requirement for one day's storage at the HRWRF permitted capacity.

   This improvement would allow for near-term storage and subsequent recirculation of reject water to enhance elimination of surface water discharge.

   The estimated conceptual capital cost for the improvements is $1,900,000.

2. **Reclaimed Water Storage Expansion:** The HRWRF Improvements include a 1.24-MG reclaimed water ground storage tank with provisions for additional storage capacity. Since the permitted capacity of the HRWRF following the expansion will be 1.25 MGD, the ground storage tank would provide one (1) day of storage. To eliminate surface water discharge, the reuse water storage capacity at the HRWRF could be increased.

   An identical 1.24-MG reclaimed water ground storage tank would increase the reclaimed water storage to two (2) days. The estimated capital cost for the improvements is $4,500,000.

3. **Reuse Water Distribution System Expansion:** Increasing the availability of reuse water within the City's Water & Sewer Service Area will help eliminate surface water discharge. The potential reuse service areas within the city are the following:

   - North Reclaimed Water Service Area (RWSA);
   - West RWSA; and
   - South RWSA.

All reuse customers are listed in **Table VII-1** with further analysis herein.

| TABLE VII-1<br>ALL CURRENT AND POTENTIAL REUSE WATER CUSTOMERS | | | | | | |
|---|---|---|---|---|---|---|
| **Customer** | **Connections** | **Reuse Demand (MGD-AADF)** | **Service Area** | **Existing Reuse Customer (Y/N)** | **Permitted (Y/N)** | **Developed (Y/N)** |
| Magnolia Point Golf Course | N/A | 0.36 | West | Y | Y | Y |
| Edgewater Landing | 98 | 0.030 | North | N | Y | Y |
| Black Creek Village | 83 | 0.016 | North | N | Y | Y |
| Magnolia Point Phase 8 | 121[a] | 0.061[2] | West | N | N | N |
| Magnolia Point - Retrofit | 715[b] | 0.43[2] | West | N | N | Y |
| Reynolds Park - Future Development (Min)[1] | 1,080 | 0.54 | South | N | N | N |
| Reynolds Park - Future Development (Max)[2] | 2,340 | 1.17 | South | N | N | N |

*a Estimated minimum and maximum of future irrigation connections are based on total acreage. Actual future parcel use is unknown.*
*b Estimated demand, actual number of connections may be greater.*

4. **Current Permitted Customers**: Reclaimed water service to current permitted customers is planned to begin when HRWRF AWT improvements are complete. The reuse water distribution systems within each development have already been designed, permitted, and constructed by the developers. Edgewater Landing and Black Creek Village are currently developed with irrigation demands serviced via potable water. Both developments are part of the North RWSA and will be served by an existing 12-inch reclaimed water main.

5. **Magnolia Point Phase 8**: The Magnolia Point Phase 8 development includes a reuse water distribution system that is currently served via potable water. The City's reclaimed water distribution system would require extension to Phase 8. The estimated capital cost for reclaimed water main extension is $3,350,000.

6. **Magnolia Point Retrofit:** The Magnolia Point development irrigation demand is currently serviced via potable water. There is no existing reuse water distribution system. In order to service the existing Phases 1 through 8 development areas, a reclaimed water distribution system with 16-inch reuse water main header from the HRWRF is proposed. The estimated capital cost for the reclaimed water main and distribution system retrofit is $9,150,000.

7. **Future Reynolds Park Development:** The Reynolds property is located on U.S. 17 and State Road 16 in the City of Green Cove Springs and contains five (5) City parcels within the larger boundary of the Reynolds property. The land use of each parcel is categorized as 'Reynolds Park Mixed Use Redevelopment District and Conservation'. The property is adjacent to the First Coast Expressway Project. The timing associated with redevelopment is unknown, so all demand projections are estimated.

   In order to serve the future Reynolds Park development with reuse water, the following infrastructure improvements were conceptualized:

   - Construct a 16-inch reuse water main from the HRWRF to the SWWTF;
   - Convert the existing 0.56MG treatment tank at the SWWTF to a ground storage tank with aluminum cover;
   - Convert the existing 0.16 MG redundant clarifier at the SWWTF to a ground storage tank with aluminum cover;
   - Construct a new 1.24 MG reuse water ground storage tank; and
   - Modifications to existing reclaimed water delivery system to provide public-access reclaimed water delivery capabilities including, but not limited to: piping modifications, pump modifications, hydropneumatic tank improvements, control enhancements, and other miscellaneous electrical improvements.

   The estimated capital cost for the Reynolds Park infrastructure is $10,000,000.

8. **CCUA Distribution System Interconnect:** A reuse water interconnect with the CCUA service area adjacent to Magnolia Point Phase 8 could be constructed. This connection point could receive up to 1.24 MGD from the HRWRF, so pipe sizes in the CCUA service area would need to be capable of handling large flows for this option to be feasible.

This alternative could be extended from either the Phase 8 or Magnolia Point reclaimed water distribution system extension alternatives.

9. **CCUA RWTP Interconnect:** As another alternative, the City could extend bulk-reclaimed-water transmission mains to CCUA reclaimed water storage or treatment facilities. CCUA has several main potential connection points which are:

- Peter's Creek Reclaimed Water Treatment Plant (RWTP);
- Governor's Creek RWTP; or
- Mid-Clay RWTP.

The distance between HRWRF and the Mid-Clay RWTP is over nine (9) miles. The Peter's Creek RWTP and Governor's Creek RWTP are located closer to the HRWRF, but neither CCUA RWTP has been constructed at this time. Each of these locations are awaiting new development before they will move into design, permitting, and construction.

The Peter's Creek RWTP will be located approximately 9,000 lineal feet from the limits of the Phase 8 development. From the HRWRF, a 22,600 lineal foot reuse along CR 315 could be constructed to interconnect the City's and CCUA's reuse water infrastructure.

The anticipated locations for the Governor's Creek RWTP are approximately 25,000 to 30,000 feet away from the SWWTF. In order to interconnect the HRWRF with the Governor's Creek RWTP, a greater length of piping along with more pumping systems would need to be constructed with respect to the possible Peter's Creek RWTP interconnect.

Given CCUA's current demands and available infrastructure, this option is not a near-term solution since CCUA does not have the demand for additional reclaimed water supplies. However, this option could prove viable in the future as both CCUA and the City grow their reuse infrastructure footprints.

## B. EFFLUENT DISPOSAL ALTERNATIVES

The City has also explored other effluent disposal options to eliminate surface water discharge.

1. **Sprayfields:** For this option, the treated effluent would be pumped to a location where a fixed-head or center-pivot style irrigation system is available to deliver the reclaimed water in accordance with FDEP requirements. The main driver related to this disposal option is the underlying hydraulic conductivity of the soils since it defines how much area is required to irrigate the effluent flows. FDEP typically defines an initial 'maximum' sprayfield capacity of two (2) inches per week. As discussed further herein, the soils within this region are not highly 'conductive' and could result in hydraulic capacity being limited to values less than two (2) inches per week. Confirmation of a 'reasonable' application rate via a geotechnical exploration would be prudent if a sprayfield system were selected as an effluent disposal solution.

   The sprayfield land area requirements become excessive as effluent flow rates increase. The sprayfield option could be an interim step until enough public-access reclaimed water customers become available to eliminate surface water discharge. The 2015 estimated capital cost for the sprayfields was $6,976,000 and was based on a regional WRF located approximately 1.5 miles from the sprayfield site. The estimate did not include property acquisition costs, nor any environmental costs that could be encountered for land development. Based on the current market conditions, property acquisition costs, and location of the regional facility at the Harbor Road site, the conceptual costs to acquire, develop, and deliver effluent to an offsite sprayfield would likely exceed $22,000,000.

2. **Constructed Wetlands:** Many of the lands near the SWWTF are low lying areas that contain wetlands or are adjacent to wetland areas. While these areas are unsuitable for sprayfield development, they could be utilized for the option of constructing wetlands for effluent disposal.

   Through an analysis, it was determined that the required land area would be limited based on hydraulic loading and Total Nitrogen ("TN") loading (at a concentration of 3.0 mg/l). At 1.00 MGD AADF of permitted capacity, it is anticipated 50 acres of land would be needed just for effluent disposal needs without the WWTP site, buffers, construction tie-ins, etc. The wetland system would be developed with 40% of the land area as lined wetland cells and 60% as unlined. Additional site specific, water balance, nutrient loading, etc. analyses would need to be done to determine final treatment aspects, but the aforementioned review provides an overall land area basis. The 2015 estimated capital cost for the constructed wetlands is $7,039,000. Similar to sprayfield option, the conceptual costs to acquire, construct, and deliver effluent to an offsite constructed wetland would likely exceed $25,000,000.

3. **Rapid Infiltration Basins:** Due to the site limitations (i.e., general poor soils) determined during analysis of the sprayfield and wetland disposal options, rapid infiltration basins (RIBs) were assumed to have similar limitations. Compared to the aforementioned options, RIBs can reduce land area needs, since application rates can be permitted as high as three (3) inches per day (21 inches per week) or higher. However, RIBs also require site specific geotechnical testing and modeling/analysis. Given the parcel findings, the RIB disposal option was not considered feasible at this time. The only parcels that may provide some capabilities for RIB disposal are located outside of the City's Service Area along SR 16 heading west toward Penney Farms. In this area, the topographic elevations climb and soils improve.

4. **Deep Well Injection:** Many neighboring utilities are considering deep well injection as an option to alleviate surface water outfalls. Deep well injection involves disposal of treated effluent underground without causing or allowing movement of fluid into an underground source of drinking water (USDW). The USDW for the City of Green Cove Springs is the Upper Floridan Aquifer (UFA), located approximately 400 feet below land surface (bls) and extends over 1,000 feet (bls).

   Deep injection well would require construction of an FDEP Class I well. The following summary is from the FDEP website:

   > “There are more than 180 active Class I wells in Florida. The majority of the Class I injection facilities in Florida dispose of non-hazardous, secondary-treated effluent from domestic wastewater treatment plants. At locations where hydrogeologic conditions are suitable and where

> other disposal methods are not possible or may cause contamination, subsurface injection below all USDWs is considered a viable and lawful disposal method. There are favorable hydrogeologic conditions in Florida where the underground formations have the natural ability to accept and confine the waste. See an illustration of a Class I municipal well.
>
> The injection wells are required to be constructed, maintained and operated so that the injected fluid remains in the injection zone, and the unapproved interchange of water between aquifers is prohibited. Class I injection wells are monitored so that if migration of injection fluids were to occur it would be detected before reaching the USDW. Permitting for these wells is done in our Tallahassee office. Testing is conducted on all Class I injection wells at a minimum of every five years to determine that the well structure has integrity."

At this time, a permitted, operating Class I injection well for municipal wastewater does not exist in Northeast Florida. Various test wells and preliminary engineering is occurring, but a permitted system is not available for review at this time. Preliminary conversations with a professional geologist working in Clay, Nassau, Duval, and St. Johns Counties has indicated areas west of the St. Johns River have been difficult to locate a suitable injection zone. If the City were to consider this approach, conversations with FDEP and the SJRWMD along with a professional geologist will be required to develop a preliminary approach for review and approval by the regulatory agencies. Test wells would be required to determine if an injection zone could be found with the associated depth. Capital estimating could be provided once the above preliminary efforts were completed to define the work effort. However, it is anticipated the project would be in excess of $5,000,000.

## C. REYNOLDS WATER TREATMENT FACILITY IMPROVEMENTS

1. **Jockey and High Service Pumps:** It is recommended to increase the high service pump capacity to meet future demand needs. Given the unknown time frame related to the Reynolds Redevelopment, the improvements may be able to be delayed until the City begins to see the demand based on development plans and/or changes in the distribution system. The inclusion

of the St. Johns Landing development onto the City's distribution system could affect the need, but can be mitigated from additional flow from the HRWRF.

Pending development needs, the recommended approach is to construct two jockey pumps (250 gpm) and three high service pumps (1,000 gpm). This would correspond to a firm capacity of 2,000 gpm and a total capacity of 3,000 gpm. The anticipated project cost for this alternative is $1,200,000.

2. **Ground Storage Tank:** A 200,000 gallon pre-stressed ground storage tank is proposed with a conventional-top-mounted-tray-aerator. The proposed tank would be placed near the existing improvements with associated piping and instrumentation improvements. The anticipated project cost for this alternative is $1,380,000.

# VIII. THE SELECTED PLAN

The following section summarizes the selected alternatives and implementation schedule for the elimination of surface water discharge by 2032.

## A. RECLAIMED WATER ALTERNATIVES

The City will be moving forward with the following improvements:

- Construction of Reject Storage System;
- Retrofit the Magnolia Point Development with a public-access reclaimed water distribution system for irrigation; and
- Connection of reclaimed water distribution system with CCUA.

It is anticipated additional growth within and around the City will require additional reclaimed water for irrigation needs. These locations are not known, but the City will continue to maximize this potential and coordinate with CCUA to ensure reclaimed water delivery is maximized between neighboring utilities.

The extension of reclaimed water distribution systems into Magnolia Point and future developments provides the City with the following benefits:

- Reclaimed water is a commodity and provides a revenue stream in comparison to other effluent disposal options that have no revenue capabilities;
- Maximizing reclaimed water use decreasing use of the Floridan Aquifer, thus limiting withdrawals for non-essential water use;
- Extending reclaimed water infrastructure into Magnolia Point enhances opportunities to create interconnects with the CCUA reclaimed water infrastructure; and
- Serving irrigation demands from the reclaimed water system will 'offload' large hydraulic peak demands from the potable water system allowing for more consistent service pressures.

| TABLE VIII-1<br>REUSE WATER INFRASTRUCTURE EXPANSION COSTS | | | |
|---|---|---|---|
| Service Area | Customer(s) | Capital Cost | Reuse Demand (MGD ADF)[a] |
| North | Edgewater Landing; Black Creek Village | Complete | 0.046 |
| West | Magnolia Point - Retrofit with Magnolia Point Phase 8 | $9,150,000 | 0.420 |
| CCUA Interconnect | CCUA | N/A | N/A |
| | | **Total** | **0.470** |

*a: The CCUA interconnect costs and capacity are unknown at this time.*

The City intends to maximize reuse disposal options since they include revenue streams in comparison to the Treated Effluent Disposal options outlined in the next subsection.

## B. EFFLUENT DISPOSAL ALTERNATIVES

| TABLE VIII-2<br>EFFLUENT DISPOSAL EXPANSION ESTIMATED COSTS | | | |
|---|---|---|---|
| Disposal Option | Capacity (MGD-ADF) | Capital Cost[a] | Notes |
| Sprayfields | 1.25 | > $22,000,000 (320 Ac) | Large parcel needs. Would increase O&M Costs. No offsetting revenue. Suitable locations are distant from the Harbor Road AWT WRF. |
| Constructed Wetlands | 1.25 | > $25,000,000 (75 Ac) | Wetland would require an outfall. Would increase O&M Costs. No offsetting revenue. Suitable locations are distant from the Harbor Road AWT WRF. |
| Rapid Infiltration Basins | 0 | N/A | Not viable option due to limiting soils within region. |
| Deep Well Injection | 1.5 | > $5,000,000 | Test well required to determine feasibility and capital needs. |

*a: Capital estimated were reviewed during 2015 master planning efforts, but were based on a regional WRF located near the effluent disposal location. 2021 costs are listed based on existing market conditions.*

## C. REYNOLDS WATER TREATMENT FACILITIES IMPROVEMENTS

The City will be moving forward with the following improvements:

- Construction of jockey and high service pumps; and
- Construction of ground storage tank.

The total estimated cost for these improvements is $2,580,000.

# IX. ENVIRONMENTAL IMPACTS

## A. DESCRIPTION OF PLANNING AREA

1. **<u>Planning Area</u>:** The "Planning Area" is generally the City's Harbor Road Treatment Facility, Magnolia Point Development, and Reynolds Water Treatment Facility. The City is located on the St. Johns River in Clay County, Florida, and lies at the crossroads of State Road 16 and U.S. Highway 17, approximately 30 miles south of the City of Jacksonville, Florida. The U.S. 2010 Census listed the City's population at 6,908 persons, the 2020 Census counted 9,959 persons, and the University of Florida Bureau of Economic and Business Research's ("BEBR") Year 2020 estimate is approximately 9,796 persons. From 2010 to 2020, the population growth was approximately 4.2% per year. Electric, water, and wastewater services are provided by the City and the electric service area varies from the water and sewer service area limits. The water service area ("Service Area") encompasses approximately 6.77 square miles. The City limits and Service Area boundaries differ from one another, and the respective limits are shown in **Figure II-1**.

2. **<u>Climate</u>:** The Planning Area is characterized by long, warm humid summers and mild, dry winters. The average high temperature in the summer is 92 degrees F, and the average low temperature in the winter is 47 degrees F. The annual average temperature is approximately 70 degrees F. The rainy season lasts from June through the September. On average, the City receives 52 inches per year.

3. **<u>Topography and Drainage</u>:** The Planning Area is generally contained within the United States Geological Survey ("USGS") Topographical Map entitled City of Green Cove Springs Quadrangle. Elevations vary between 5 and 65 feet. In general, the City drains to the St. Johns River via Governor's Creek, Peter's Creek, Black Creek, and various wetland sloughs.

4. **<u>Geology, Soils, and Physiography</u>:** The scope of work associated with the selected alternative is limited to areas within established right of ways as well as an existing treatment plant sites. Therefore, no important farmlands or formally classified lands nor will any existing classified lands be affected by this project.

5. **Environmentally Sensitive Areas or Features**:

   a. **Wetlands:** A formal wetland delineation has not been conducted in the project areas as part of this report. Information about wetlands has been obtained from the Natural Resources Conservation Service ("NRCS") maps. However, wetland impacts are not anticipated as a result of the project's construction since all work will occur in existing established right of ways and within existing, developed treatment facility sites. Should a wetland feature encroach the work area, a trenchless construction technique will be utilized to ensure wetland impacts do not occur. Therefore, no existing wetlands will be affected by this project.

   b. **Plant and Animal Communities (Endangered Species):** The proposed project is not expected to have any adverse effects to these species or their habitats as improvements will occur within previously developed sites or established road right of ways.

6. **Floodplain:** Structures such as pump stations, control buildings and above ground pipes are located in areas outside the 100-year and the 500-year floodplains. Floodplains will not be affected by the proposed project.

7. **Air Quality:** Construction activities of the proposed project will have no significant effect on air quality except for intermittent, short-term emissions from vehicles during construction. Proposed construction activities would increase fugitive dust and vehicles emissions. Specifically, excavation, grading, and vehicular traffic at the project site may generate temporary increases in emissions. Construction of the proposed project is anticipated to last twelve (12) to eighteen (18) months. For operational air emissions impacts, some objectionable odors from the plant are anticipated. However, the intensity of the odors should not increase as the plant is sufficiently permitted to handle additional flow.

## B. SOCIO-ECONOMIC CONDITIONS

1. **Population:** The proposed project will serve existing and future City residents and water/sewer customers. The improvements will ensure the City can maintain their adopted level of water service to existing and future customers while also remaining compliant with FDEP requirements.

Systemwide improvements are accomplished via the projects, and do not focus on a particular area of the City. Improvement will have a proportional influence on rate payers.

2. **<u>Land Use and Development</u>:** The proposed project will be constructed within existing City property as well as established right-of-ways or utility easements. No people or housing would be displaced by the proposed project. No land use or zoning changes are required for the project's completion.

## C. WATER QUALITY

Two aquifer systems underlie the project's service area. These are the surficial aquifer system and the underlying Floridan aquifer system. The surficial aquifer system is unconfined, and its upper surface is the water table. It ranges from 10 to 400 feet in thickness. This aquifer is largely recharged through rainfall which usually causes the water table to fluctuate with the rate of precipitation. The Floridan aquifer system is confined and comprised of thousands of feet of Eocene marine limestone, including the Ocala Group. It is the principal source of drinking water in the area. This aquifer system is recharged by the percolation of rainfall through the permeable surficial sands in other areas of the State. Water quality degradation resulting from temporary construction activities will be minimized through the use of turbidity control measures by the contractor as approved by the St. Johns River Water Management District (SJRWMD) and/or FDEP, which have rules in place to control quality of runoff.