DRAFT PENDING COMPILATION OF FINAL REPORT

Phase 1: Regional AWS Feasibility – Cedar Key, Bronson, Otter Creek, and Unincorporated Areas in Levy County

Task 4 – Alternatives Development for Wastewater Reuse and Recharge (Draft)

Prepared for

Suwannee River Water Management District

TWA: 19/20-064.006

July 25, 2022

Prepared by

Wetland Solutions Inc

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Section 1 Wastewater Treatment and Disposal

1.1 Introduction

The Suwannee River Water Management District (SRWMD) is one of five water management districts tasked with four core mission areas: water supply, water quality, flood control/floodplain management, and natural systems. The SRWMD comprises all or portions of 15 counties and encompasses approximately 7,640 square miles. The SRWMD is responsible for managing the needs of both natural systems and water users. To accomplish this, the SRWMD issues water supply permits for water users and develops minimum flows and minimum levels (MFLs) for natural systems within the SRWMD. These efforts are carried out in conjunction with water supply planning to determine where additional water is needed, identify alternative water supplies (AWSs), and implement cost-effective projects to address identified water challenges or shortages.

Within the Waccasassa Basin the City of Cedar Key, unincorporated Levy County, and the Towns of Otter Creek and Bronson have a variety of water and wastewater challenges that they are attempting to address with assistance from the SRWMD. For both Cedar Key and Otter Creek, these include water quality concerns related to their potable water supply wells and treatment requirements. Additionally, Cedar Key is faced with challenging wastewater treatment issues and loss of treated water to a marine ecosystem where it cannot be beneficially recharged or reused. Bronson and Levy County are concerned with water supply and managing increasing demand in a responsible manner. These disparate challenges present potential opportunities for these entities to collaborate to develop regional projects that can help address these concerns, while also providing a reliable and resilient water supply and employing wastewater treatment and reuse strategies that can benefit the region.

The SRWMD is working with the Florida Department of Environmental Protection (FDEP) and the communities to evaluate this study area and the identified water and wastewater issues by developing an alternatives analysis for the specific challenges and needs faced by each community. This effort is evaluating not only current needs, but also anticipated growth in the region and potential medium to long-term water supply challenges. The tasks to complete this project include:

- Task 1: Evaluation of current and future water supply challenges, needs, and limitations for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County.
- Task 2: Alternatives development to address current and future water supply needs.
- Task 3: Evaluation of current and projected wastewater treatment and disposal needs for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County.
- Task 4: Alternatives development for wastewater reuse and recharge.
- Task 5: Cost estimation and cost-effectiveness calculation for the identified alternatives.

This report is focused on Task 4 and wastewater treatment and disposal alternatives for the study area.

1.1.1 Study Area

The study area for this project is the portion of the SRWMD that lies within the Waccasassa River Basin and Levy County. The primary focus of this project is the area between the Town of Bronson and the City of Cedar Key along and within the vicinity of State Road 24 (SR24). This includes the Town of Otter Creek and portions of Unincorporated Levy County along and near SR24 including the communities of Rosewood and Sumner. The relevant boundaries and study area are shown in Figure 1.

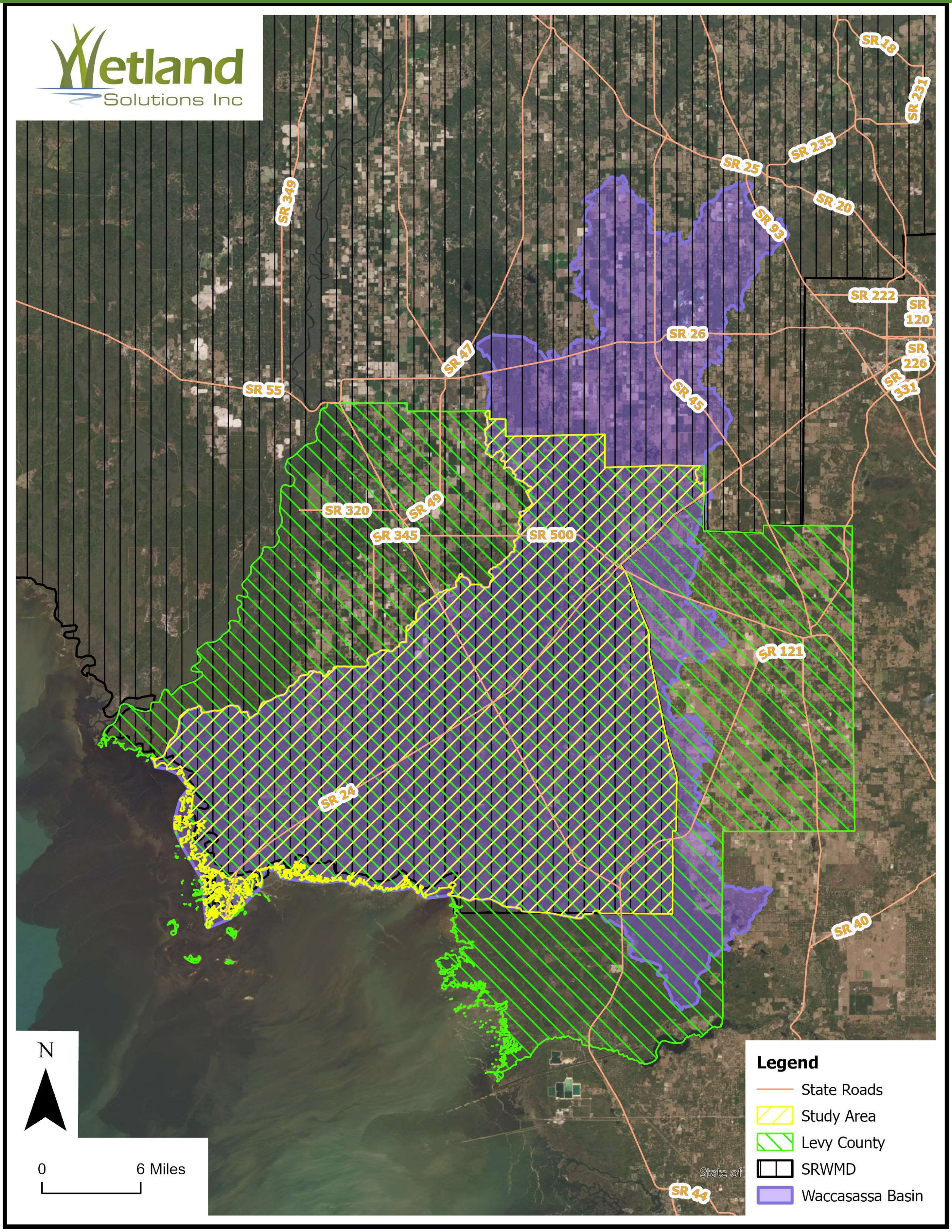

Figure 1. Regional Alternative Water Supply Feasibility Study Area Extents

Section 2 Wastewater Treatment Alternatives

This study is developing alternative wastewater treatment and disposal methods for the communities of interest. Currently, only Bronson and Cedar Key have wastewater facilities to serve their communities. This study is evaluating options for expanding wastewater service to other residents and communities while improving existing wastewater treatment and disposal.

2.1 *Treatment Considerations*

A small portion of the study area lies within the Suwannee River BMAP area (Florida Department of Environmental Protection 2018), with some parcels located in the Fanning and Manatee Springs Priority Focus Area (PFA). Within the BMAP and PFA areas there are requirements that apply to wastewater facilities and to domestic Onsite Sewage Treatment and Disposal Systems (OSTDSs). While not currently mapped it is expected that a portion of the Waccasassa basin lies within the springshed of Levy Blue Springs, as such, there is a chance that some of these same regulations may eventually apply to portions of the study area. These requirements are discussed in additional detail in the following sections along with expected effects on treatment and facility staffing. This section also discusses various treatment considerations for wastewater regionalization.

2.1.1 Wastewater Treatment Requirements

Wastewater facilities developed in the study area will be required to reach variable treatment standards depending on their location. A portion of the study area lies within the Suwannee River BMAP area, Figure 2. Table 1 summarizes total nitrogen (TN) discharge standards for wastewater facilities in the BMAP area based on their capacity and disposal method.

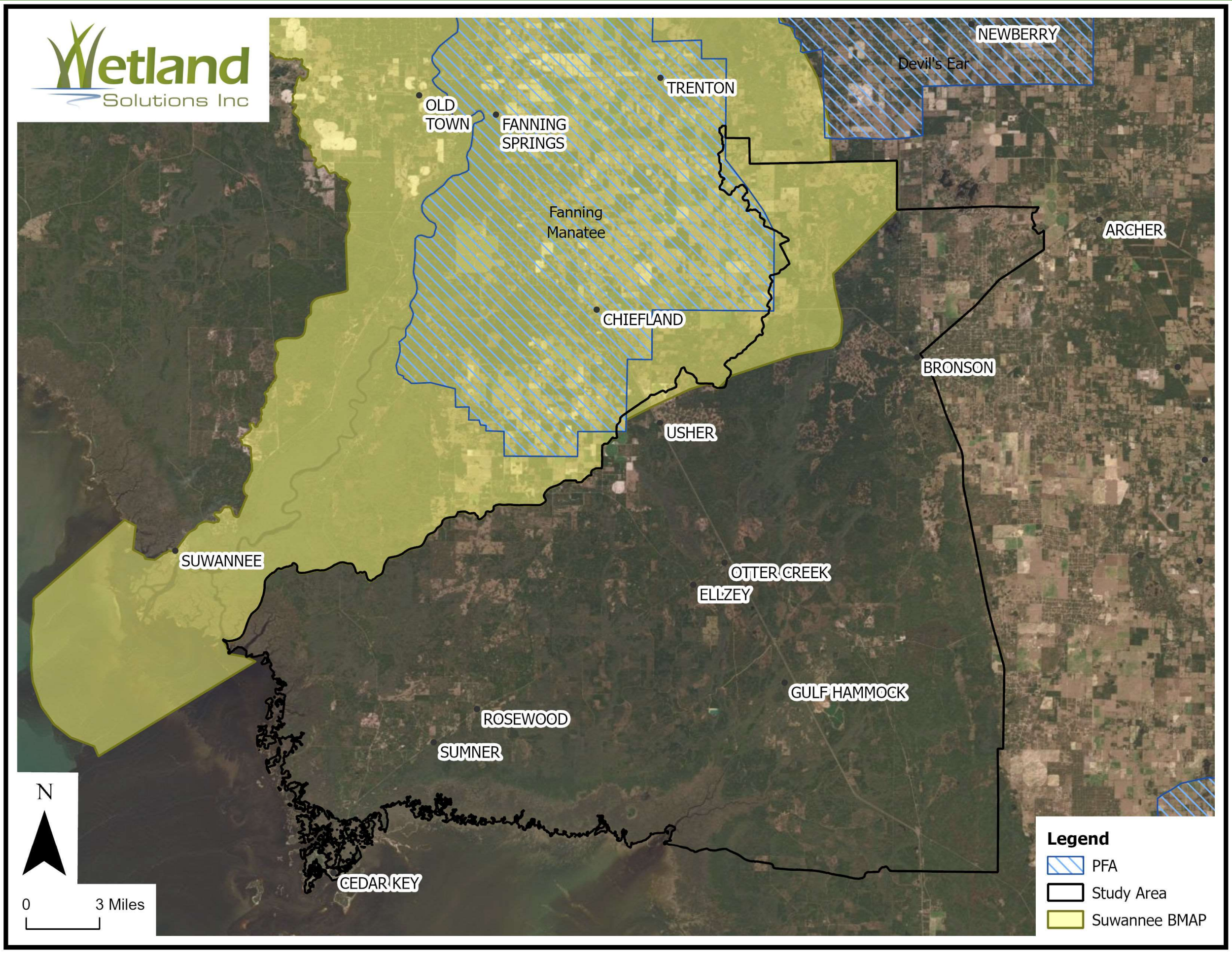

Figure 2. Suwannee River BMAP and PFAs

Table 1. BMAP Land Application Requirements

95% of the Permitted Capacity (gpd)	TN for RIBs and Adsorption Fields (mg/L)	TN for All Other Land Disposal and Reuse (mg/L)
>100,000	3	3
20,000 to 100,000	3	6
<20,000	6	6

2.1.2 Onsite Sewage Treatment and Disposal System Requirements

New, conventional OSTDSs located on parcels less than one acre within the Fanning and Manatee PFAs are prohibited. Any new OSTDS is required to provide additional nitrogen reduction or connect to central sewer. Allowable alternatives to conventional OSTDSs include:

- Nitrogen reducing systems including: in-ground nitrogen-reducing biofilters (INRBs), aerobic treatment units (ATUs), or performance-based treatment systems (PBTSs).
- Connection to sewer (if available).

- Demonstration that sewer will be available within 5 years.

2.1.3 Facility Staffing

Wastewater facility staffing is based on permitted treatment capacity, treatment process configuration, and whether water is supplied for reuse. As plant complexity or treatment capacity increases the level of staffing and required "Class" of operator also increases. It is expected that a facility being constructed to serve a regional area will be larger and potentially require increased staffing compared to the currently smaller facilities. However, this staffing will replace separate staffing at multiple facilities. Staffing is summarized for anticipated configurations in Table 2.

Staffing requirements for systems that provide reuse are generally the same as for other facilities and require staffing by a Class C or higher operator. However, reuse systems require provisions for increased facility reliability and staffing is required whenever flows are sent to the reuse system. Furthermore, only facilities with an average design flow greater than or equal to 0.1 MGD can provide reclaimed water to slow-rate public access areas.

Table 2. Wastewater Facility Staffing Requirements

Category	Class A	Class B	Class C	Class D
I (Nutrient or Membrane)	≥3.0 MGD, 24H/7D, Staff C, Lead A	0.5 - ≤3.0 MGD, 16H/7D, Staff C, Lead B	0.1 - ≤0.5 MGD, 6H/5:1D 0.05 - ≤0.1 MGD, 3H/5:1D ≤0.05 MGD, 1H/5:1D Staff/Lead C	N/A
II (Activated sludge)	≥5.0 MGD, 24H/7D, Staff C, Lead A	1.0 - ≤5.0 MGD, 16H/7D, Staff C, Lead B	0.25 - ≤1.0 MGD, 6H/5:1D 0.1 - ≤0.25 MGD, 3H/5:1D ≤0.1 MGD, 0.5H/5:1D Staff/Lead C	N/A
III (Extended aeration)	≥8.0 MGD, 24H/7D, Staff C, Lead A	2.0 - ≤8.0 MGD, 16H/7D, Staff C, Lead B	0.5 - ≤2.0 MGD, 6H/5:1D 0.25 - ≤0.5 MGD, 3H/5:1D 0.025 - ≤0.25 MGD, 0.5H/5:1D Staff/Lead C	0.01 - ≤0.025 MGD, 1.5H/WK, 3D NC[1] 0.002 - ≤0.01 MGD, 1H/WK, 2D NC, ≤5D BV[2] Staff/Lead D
IV (Trickling Filters, RBC)	≥10.0 MGD, 24H/7D, Staff C, Lead A	3.0 - ≤10.0 MGD, 16H/7D, Staff C, Lead B	2.0 - ≤3.0 MGD, 6H/5:1D 0.75 - ≤2.0 MGD, 3H/5:1D 0.025 - ≤0.75 MGD, 0.5H/5:1D Staff/Lead C	0.002 - ≤0.025 MGD, 1H/WK, 2D NC, ≤5D BV Staff/Lead D

[1]NC – Non-consecutive
[2]BV – Between visits

2.1.4 Wastewater Treatment Considerations

Likely regional alternatives that may be a part of this project are expected to include conveyance of wastewater over long distances to reach treatment facilities. Long sewer residence times can result in undesirable septic conditions that cause a variety of problems in the collection, transmission, and treatment systems. Primary concerns are with anaerobic conditions causing the formation of hydrogen sulfide gas, corrosion of wastewater transmission systems and equipment, and odors. Several alternatives were considered as part of this study. All scenarios for regional treatment are expected to include some degree of collection and centralization. Following centralization, the raw sewage could receive one of four treatments: no treatment, screening and grit removal, partial treatment, or full treatment. Each of these alternatives is expected to have implications for conveyance, costs, and subsequent regional treatment.

2.1.4.1 No Pre-Treatment

The first alternative considered was providing no treatment for wastewater before it is conveyed. In this scenario wastewater would be collected and locally regionalized. Following collection, sewage would be pumped from a master lift station into the pressurized transmission system for conveyance. This alternative has several disadvantages including the potential for water to go septic and cause odor and corrosion issues, accumulation of grit and larger materials in the transmission system, and increased equipment and pumping costs. This alternative would require chemical addition or aeration to reduce septic conditions and is likely to require additional booster pumping because of increased head loss.

2.1.4.2 Screening and Grit Removal

The second alternative considered was screening and grit removal followed by conveyance. This alternative would be functionally the same as the no treatment alternative with the addition of screening and a grit removal system. This alternative has the benefit of removing larger solids and grit from the wastewater before conveyance. The addition of this treatment would remove some biological load as well as mineral solids that will cause premature wear and tear to booster pump stations and increase O&M costs. However, this alternative is expected to involve some level of aeration or chemical addition as part of booster pumping along the transmission line.

2.1.4.3 Partial Treatment

The third alternative is central collection with a higher level of treatment before conveyance. This scenario could include a variety of treatment options that could go only through primary clarification or aerobic digestion and secondary clarification to reduce the biochemical oxygen demand (BOD) of the water and decrease opportunities for the effluent to go septic during transmission. Limitations of this alternative include a lack of infrastructure for completing this treatment in all the areas currently on OSTDSs. This would therefore require construction of package plants or small wastewater facilities to treat water from Rosewood, Sumner, Otter Creek, University Oaks, and other unincorporated areas prior to conveyance. Another downside of this alternative is that it maintains a treatment facility in Cedar Key that is vulnerable to weather and climate driven impacts.

2.1.4.4 Full Treatment

The fourth alternative considered was full treatment prior to transmission. This alternative is an extension of partial treatment and provides the best quality water for transmission. This is expected to reduce the cost of transmission and maintenance. However, only Cedar Key and Bronson currently have wastewater treatment plants. This option would be expected to carry the highest overall capital cost because of the need for treatment plants at all of the locations not currently served by wastewater facilities. Operational costs would not be expected to be much lower because of the need for facility O&M at multiple facilities.

2.1.4.5 Hybrid Options

Finally, there are hybrid options that could be implemented possibly at lower capital and O&M costs. One such option would include Cedar Key maintaining some level of treatment at the existing Cedar Key WRF with treated water being placed in the transmission line. Downstream inputs could then receive just screening and grit removal. This alternative would leverage existing equipment and given Cedar Key's flows would provide substantial dilution to downstream additions of poorer quality water. This alternative would also reduce the need for chemical addition or aeration along the transmission line and would reduce the loading on a new regional wastewater facility. However, this alternative maintains a wastewater facility on Cedar Key which is vulnerable to weather-related impacts.

A second hybrid option would be collection of raw water from Cedar Key, Sumner, and Rosewood with a pre-treatment facility located near Rosewood that would provide some level of treatment before water is conveyed to a regional facility. This alternative has the benefit of removing treatment features (except screening and grit removal) from Cedar Key while reducing the need for aeration and chemical addition. However, this alternative still requires the construction, operation, and maintenance of a supplemental treatment system.

2.2 *Independent Wastewater Treatment Systems*

Within the study area Bronson and Cedar Key provide wastewater treatment to all, or a portion of, the customers within their PSAs. Otter Creek and the remainder of unincorporated Levy County within the study area are served by septic systems. This section discusses options relative to provision of wastewater amongst the communities. Current domestic wastewater facilities and septic systems inventoried by the Florida Department of Health (FDOH) are shown in Figure 3.

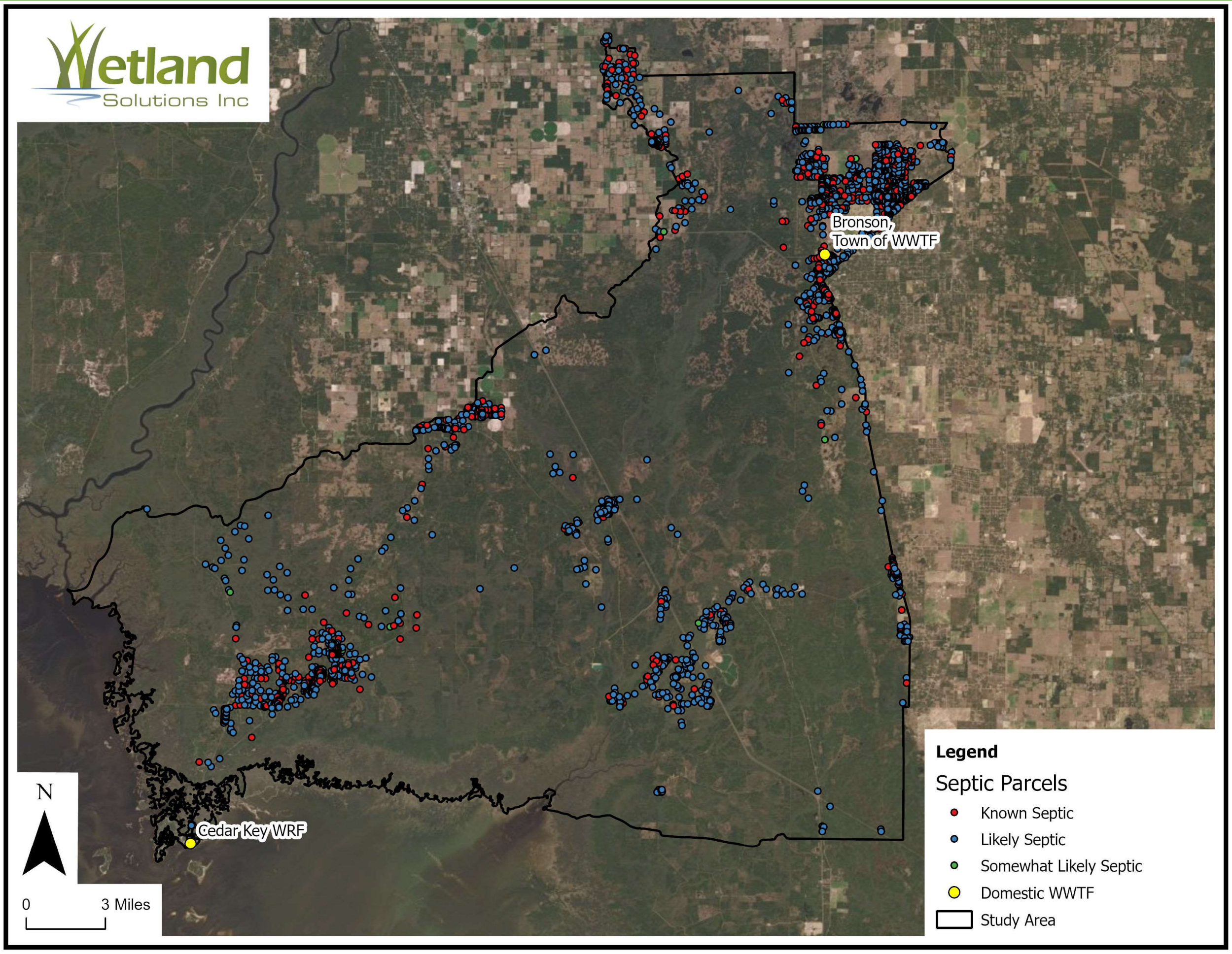

Figure 3. Domestic Wastewater Facilities and Septic Systems

2.2.1 Cedar Key

In the City of Cedar Key virtually all parcels are served by the wastewater treatment facility with only two parcels that have known septic systems listed in the available FDOH data. Cedar Key currently treats and discharges water in substantial compliance with their permit requirements. The existing wastewater facility was constructed in 1993 and is generally in good repair.

The City of Cedar Key could continue to operate their existing wastewater facility which does not have significant issues with compliance. There is also little expectation of population growth meaning that the facility should not need to be expanded to accommodate future customers.

Current challenges facing the continued operation of the wastewater facility are related primarily to storm surge, sea level rise, and occasional inundation of lift stations. There is also a substantial level of risk associated with a potential failure at the facility and a wastewater spill that could impact the City's aquaculture industry. Finally, current disposal practices result in the discharge of fresh, treated water being lost to tide.

2.2.2 Town of Bronson

The Town of Bronson currently provides wastewater service to a portion of the parcels within the PSA. Based on data from the FDOH, 182 parcels within the PSA and the SRWMD remain unserved by the existing wastewater facility. While the Town has had issues with their contracted wastewater operator, a new company has been retained to operate the facility and treatment and reporting are improving. Despite operational challenges the facility is in good repair with limited maintenance needs as of the last Operation and Maintenance Performance Report developed in 2018 for the facility permit renewal.

The Town of Bronson could continue to provide reliable wastewater treatment to the community while expanding their service to parcels within the PSA that are on septic. The existing facility disposes of water in RIBs and on a sprayfield and could be impacted if TMDLs or a BMAP is adopted that requires a reduction in TN concentrations being discharged to the Floridan Aquifer.

2.2.3 Otter Creek and Unincorporated Levy County

Both Otter Creek and other areas of unincorporated Levy County rely on OSTDSs for treatment and disposal of wastewater. These areas currently lie outside of any PSA that has wastewater service. Within the study area there are 1,817 septic systems that lie in unincorporated Levy County outside of any PSA. Additionally, there are 79 septic systems within the Town of Otter Creek and 356 septic systems within the University Oaks PSA.

For these areas there are two options. First, these parcels and new construction could continue to be served by OSTDSs. A second option would be development of centralized wastewater treatment for these areas. This could include separate facilities for Otter Creek, University Oaks, and unincorporated Levy County. Disadvantages of continued treatment and disposal in septic systems includes increased nutrient loading to the Floridan Aquifer; potential contamination of shallow water supply wells in the areas between Otter Creek and Cedar Key; and decreased business opportunities due to lack of water and wastewater services which complicate commercial or industrial development.

2.3 *Regional Wastewater Treatment*

An alternative wastewater management scenario is regionalization of wastewater treatment. This alternative approach could take a variety of forms including directing wastewater from unserved areas to existing wastewater facilities or construction of new regional facilities. Each of these alternatives is discussed in additional detail.

2.3.1 Regionalization to an Existing Facility

Both Cedar Key and Bronson operate existing wastewater treatment facilities. Currently, both facilities generally meet permit criteria. For either of these facilities to treat additional flows development of an MOU or a modification to their existing PSA would be required. With respect to Cedar Key, receipt and treatment of additional wastewater flows is expected to be undesirable, expensive, and potentially infeasible given existing concerns with risks to the local aquaculture industry, sea level rise, and storm surge. Furthermore, directing additional wastewater to Cedar Key would result in highly treated effluent being disposed of in a coastal area and lost as a source of recharge to support freshwater systems.

Unlike Cedar Key, Bronson does not have existing issues with their wastewater process. There is the potential that additional wastewater customers could be connected to the Bronson WWTF to achieve additional nutrient removal and recharge of treated water to the Floridan Aquifer. For regionalization to the Bronson WWTF, alternatives could include redirecting flows from the existing Cedar Key WRF and conversion of septic-to-sewer for a variable number of customers. These conversions could include parcels within the existing Bronson PSA, parcels within the University Oaks PSA, parcels within the Otter Creek PSA, and those parcels in unincorporated Levy County within a reasonable distance of a potential wastewater collection corridor. Redirecting Cedar Key wastewater flows would allow the existing Cedar Key WRF to be converted to a master lift station that would pump untreated wastewater along SR24 and back to Bronson for treatment. This wastewater line could also collect additional wastewater flows along its length and transmit these flows to Bronson for treatment and disposal. Directing extra flows to the Bronson WWTF could result in the need to expand the facility depending on the added volume.

This study considered several groups of potential septic-to-sewer conversions. These groups were identified based on existing PSAs and distances to existing rights-of-way. This analysis included the following areas relative to septic-to-sewer: Bronson PSA, Otter Creek PSA, University Oaks PSA, parcels within 1-mile of SR24, and parcels within 1.5-miles of SR24. Wastewater flows were estimated based on an assumed 50 gallons per person per day (Tchobanoglous et al. 2003) and an estimate of 2.5 people per OSTDS. This equates to 125 gallons per converted OSTDS per day. The number of potential septic-to-sewer conversions available in each area and estimated flows are provided in Table 3 with locations shown in Figure 4 and Figure 5.

Table 3. Septic Parcels in Identified Area

Potential Septic-to-Sewer Areas	Number	Est. Flow (MGD)
Town of Bronson PSA	182	0.023
University Oaks PSA	356	0.045
Town of Otter Creek PSA	79	0.010
Bronson Area (excl. PSA)	502	0.063
SR24 1-mile Buffer	353	0.044
SR24 1.5-mile Buffer (excl 1-mile)	77	0.010
Total	**1,549**	**0.194**

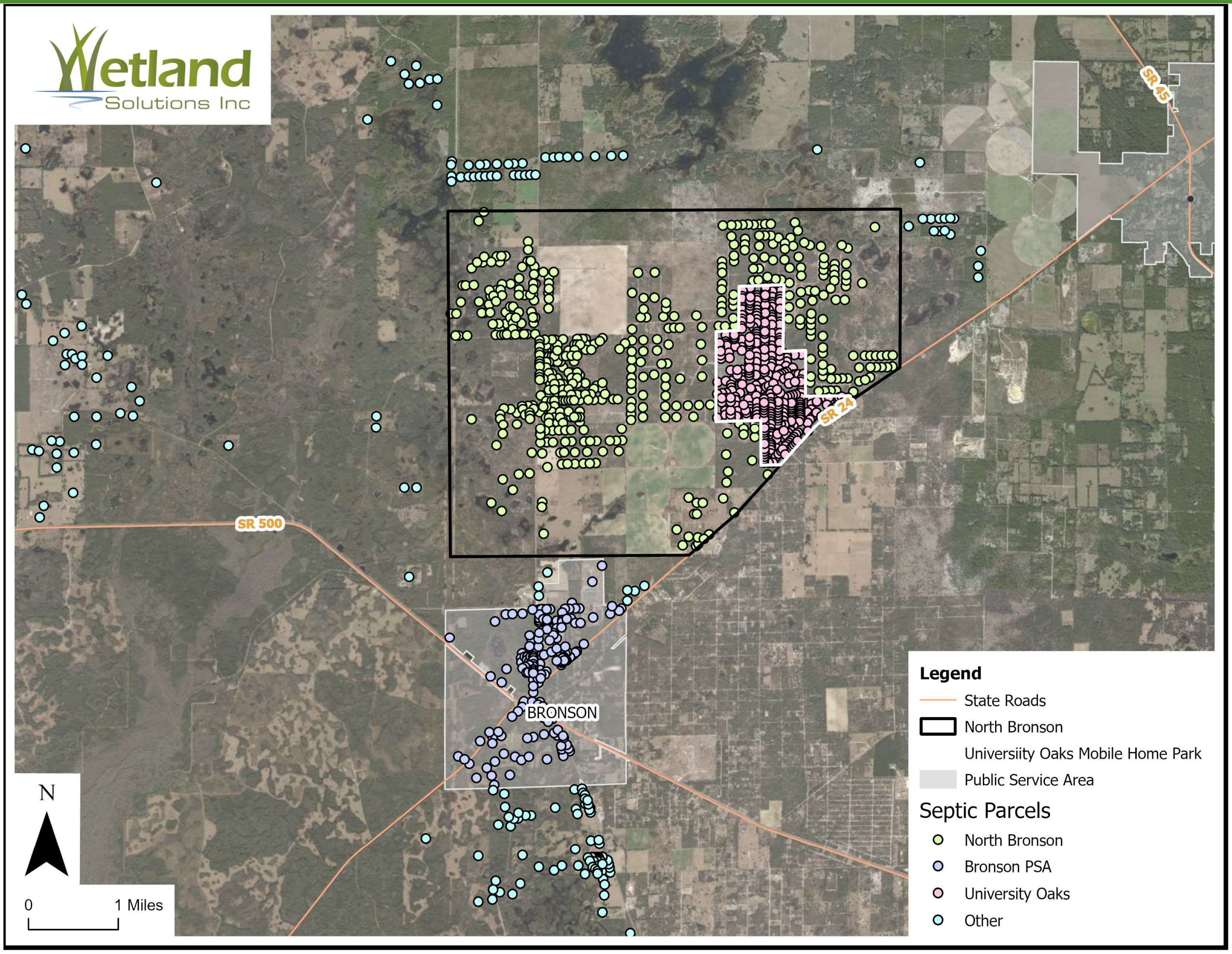

Figure 4. Septic-to-Sewer Parcels Near Bronson

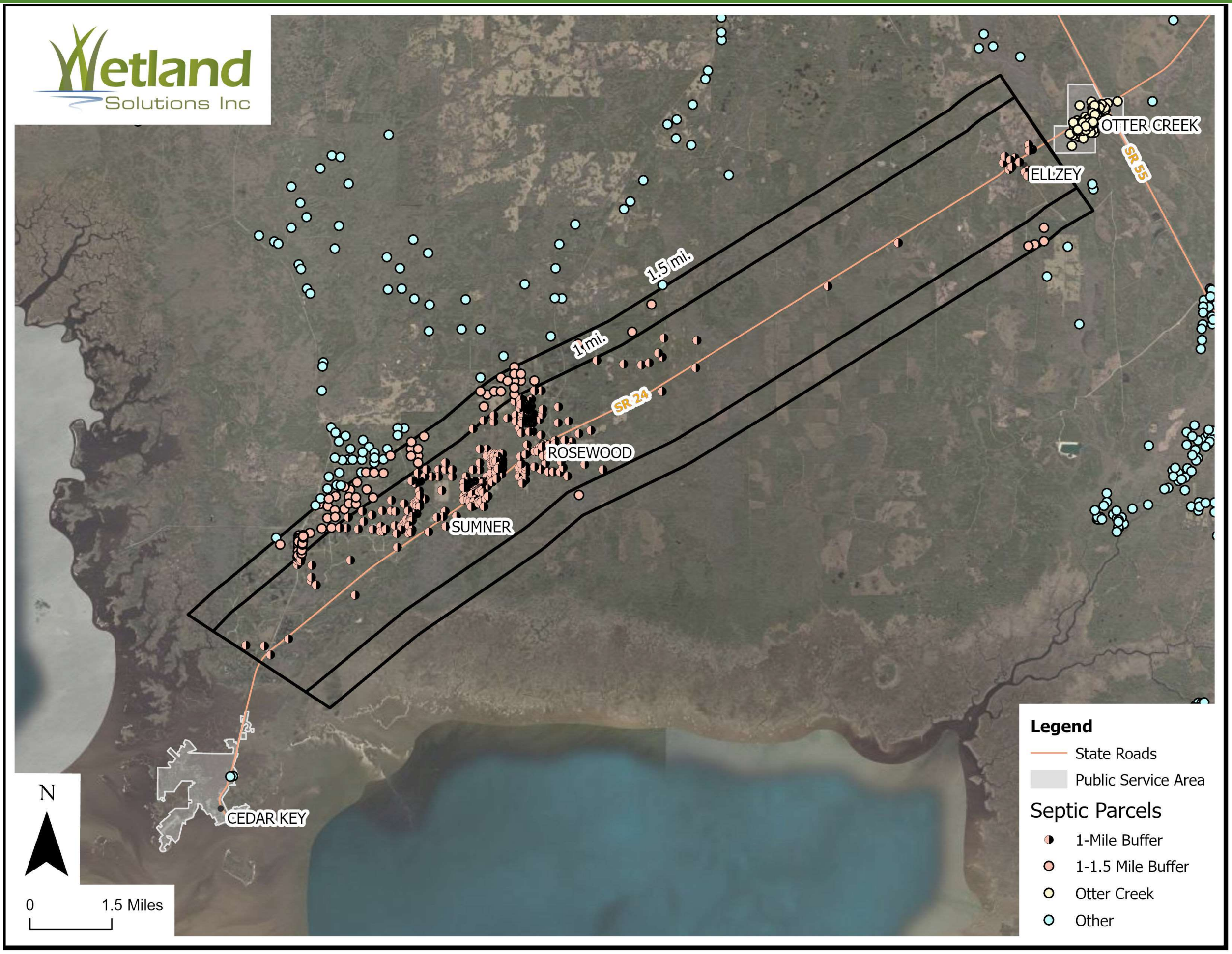

Figure 5. Septic-to-Sewer Parcels Near Otter Creek and Along State Road 24

2.3.2 Regionalization to a New Facility

A second regionalization alternative would have wastewater flows from Cedar Key, Otter Creek, and unincorporated areas of Levy County directed to a new regional wastewater facility. Flows from Bronson could be directed to this same facility, or wastewater from Bronson could continue to be treated in the Town's existing facility. This alternative could include varying degrees of septic-to-sewer conversion. Two alternatives were considered for this scenario: developing two new regional facilities or construction of a single new regional facility to serve all customers.

2.3.2.1 Two Regional Facilities

This scenario considered development of two, new regional facilities. One facility would receive and treat flows from Cedar Key, Otter Creek, and unincorporated areas along SR24 to US19. This facility would be constructed north of SR24 and south of Chiefland, near County Roads 336 and 345, in an area that is expected to have suitable infiltration capacity for disposal. The second regional facility would be either Bronson's existing WWTF or a new facility in this area. If Bronson's existing WWTF was used it would require expansion to receive septic-to-sewer conversion from unserved parcels within the Bronson PSA, the University Oaks PSA, and unserved areas around the Bronson PSA. In this scenario it is expected that the first regional facility would be developed with a capacity of approximately 0.3 MGD to treat and dispose of an estimated 0.157 MGD of flow. Bronson's WWTF or a new facility would be expanded or newly constructed with a capacity of 0.3 MGD to treat an estimated 0.163 MGD of flow. The approximate locations of these facilities and the anticipated pipeline route are shown in Figure 6.

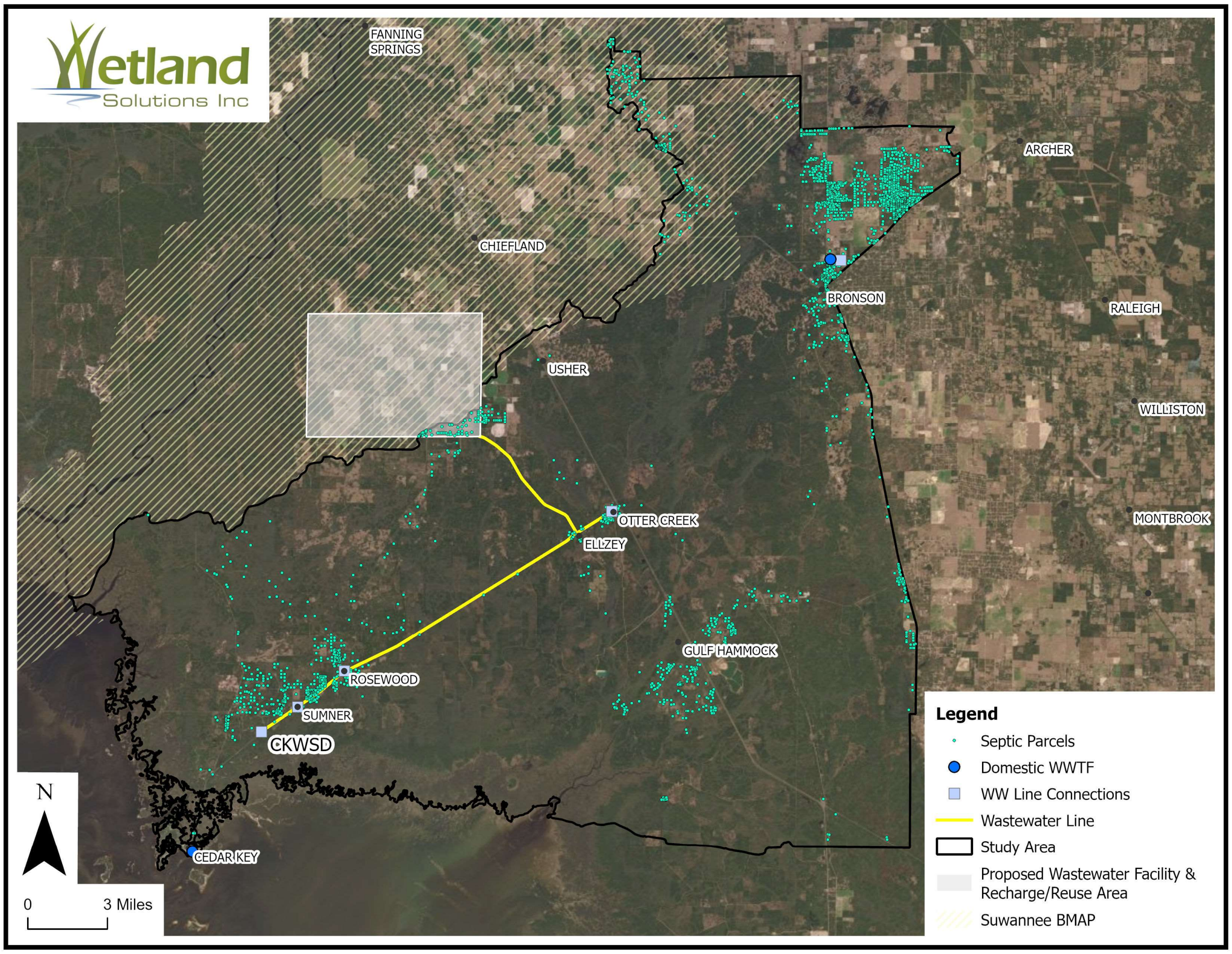

Figure 6. Two Regional Wastewater Facilities and Force Main Routes

2.3.2.2 Single Regional Facility

The second regional alternative considered is routing all wastewater to a single regional wastewater facility. This alternative would include a new wastewater facility in the vicinity of Bronson where wastewater would be treated and either recharged or reused. This alternative would involve construction of an approximately 0.5 MGD facility to treat and dispose of approximately 0.32 MGD of flow, following collection of all of the OSTDSs that were previously discussed. Based on a review of the Town of Bronson's current wastewater facility and property there is the potential this facility could be constructed on the Town's existing property or another property in the area.

Given the location of this facility near Levy Blue Spring and in a high recharge area it is recommended, although requirements are not currently in place, that this facility be designed to comply with AWT for TN with a concentration of 3 mg/L. This will help to protect a sensitive and important recreational resource for the region as well as the water supplies of these communities. Furthermore, funding for an AWT facility is expected to be considered more favorably than a facility producing a secondary effluent. The potential general location of this facility and anticipated pipeline route is shown in Figure 7.

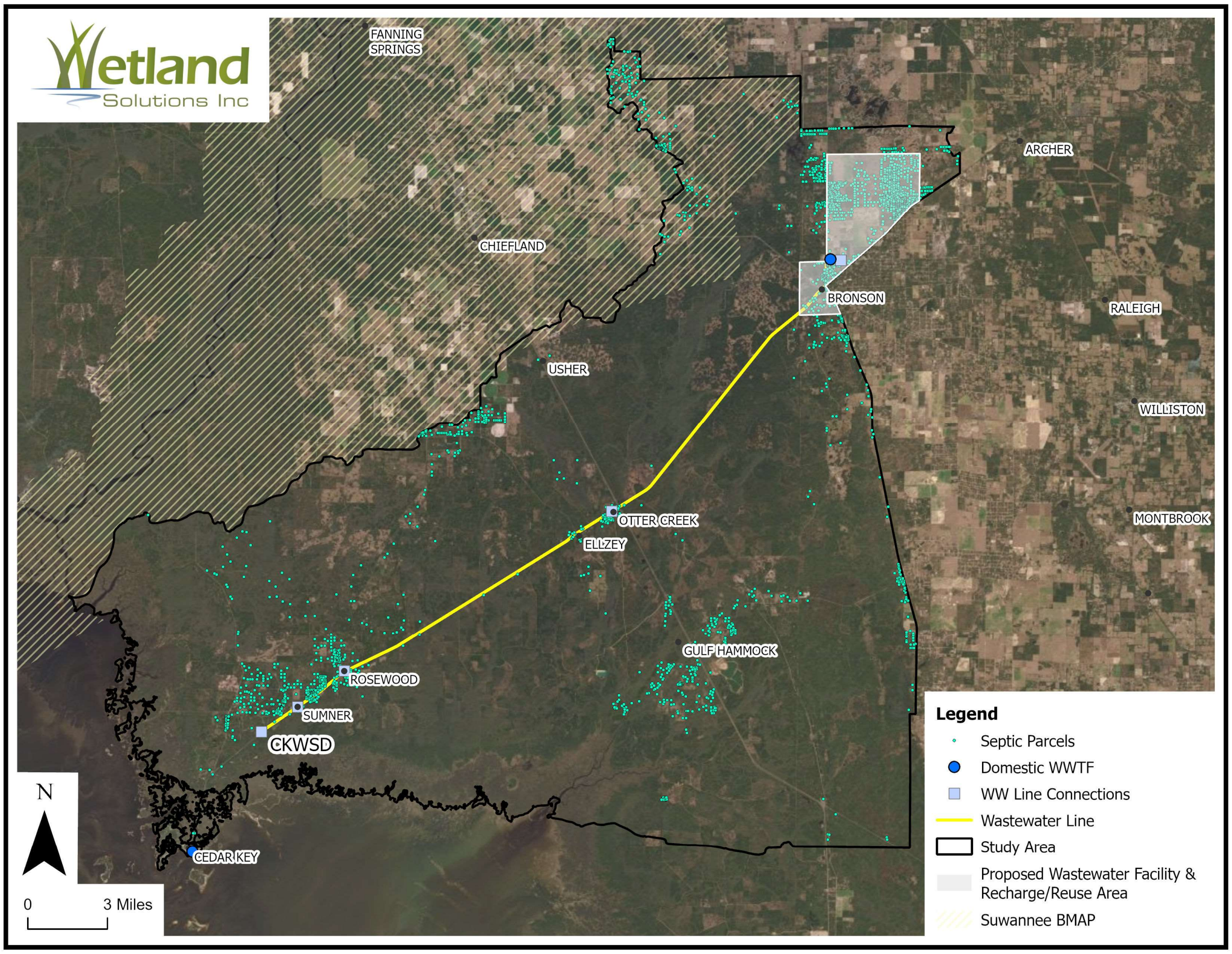

Figure 7. Single Regional Wastewater Facility and Force Main Routes

Section 3 Wastewater Effluent Management Alternatives

Following wastewater treatment, the effluent generated will need to be either reused or recharged. This section discusses effluent management alternatives. These are divided and discussed separately for reuse and recharge alternatives. For both reuse or recharge the goal of this project will be to provide the maximum benefit from the water by reducing waste or loss of the water.

3.1 Wastewater Reuse Alternatives

Reuse of water serves as an offset for current water uses. Typically reuse is provided for irrigation (residential, commercial, recreational, or agricultural) or for industrial uses (frequently as cooling water for power facilities). In general, industrial users are the most reliable customers for reuse as they typically need a fixed amount every day with little variation in demand.

3.1.1 Potential Reuse Locations

To evaluate potential reuse locations, water use permits (WUPs) from the SRWMD were reviewed. The information provided by the SRWMD includes three classifications of wells (active, inactive, and proposed) as shown in Figure 8. A total of 56 active WUPs are located within the study area. These permits are generally for either livestock watering or irrigation.

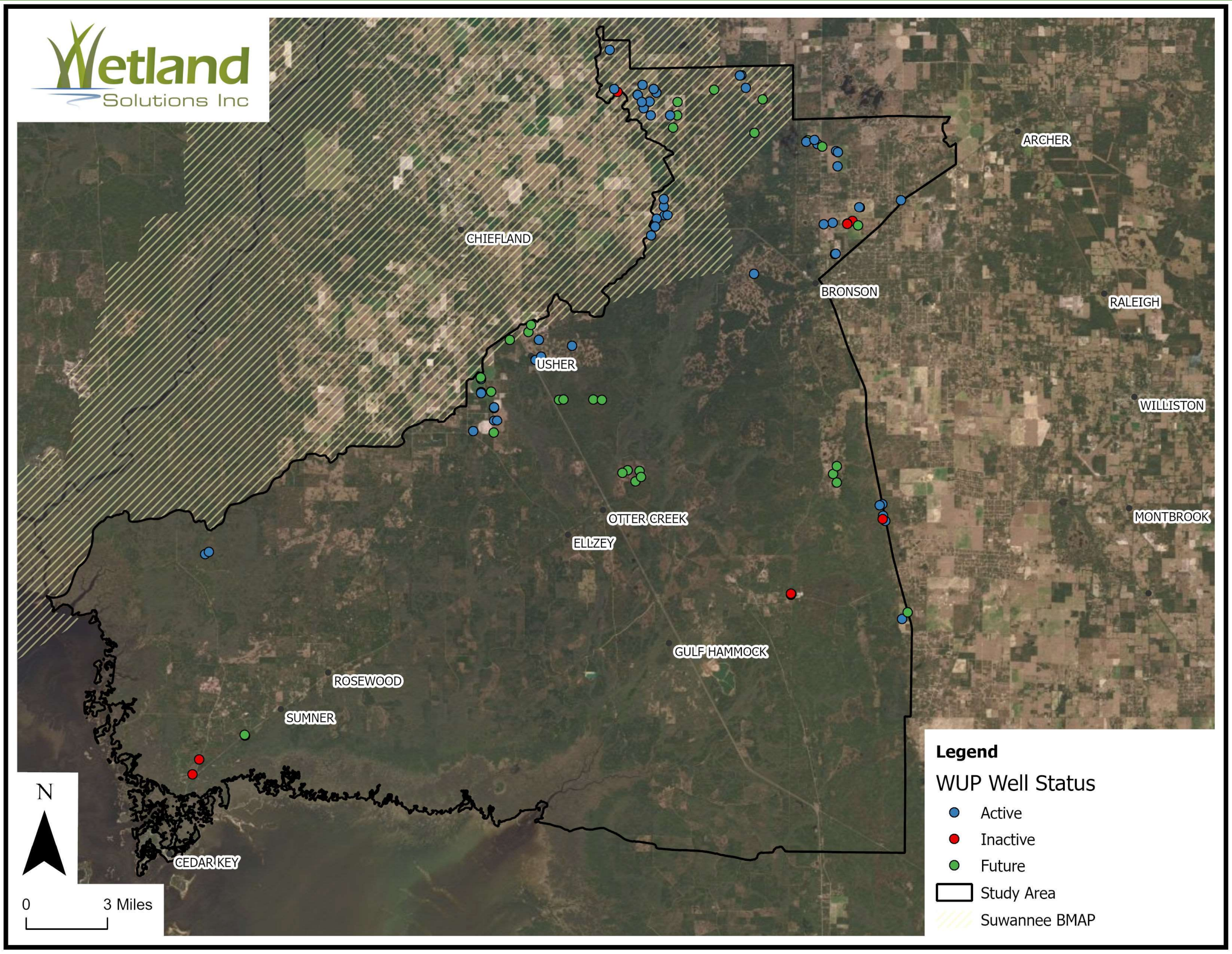

Figure 8. Water Use Permits in the Study Area

Of the wells included in the WUP database, a portion include information on the well pumping capacity. These values are not necessarily representative of the permitted flow but provide an idea of the size and capacity of the well. Active WUPs and available pumping capacity data in the vicinity of a regional facility located north of SR24 between Cedar Key and Otter Creek are shown in Figure 9, with the same information in the vicinity of a regional wastewater facility near Bronson shown in Figure 10.

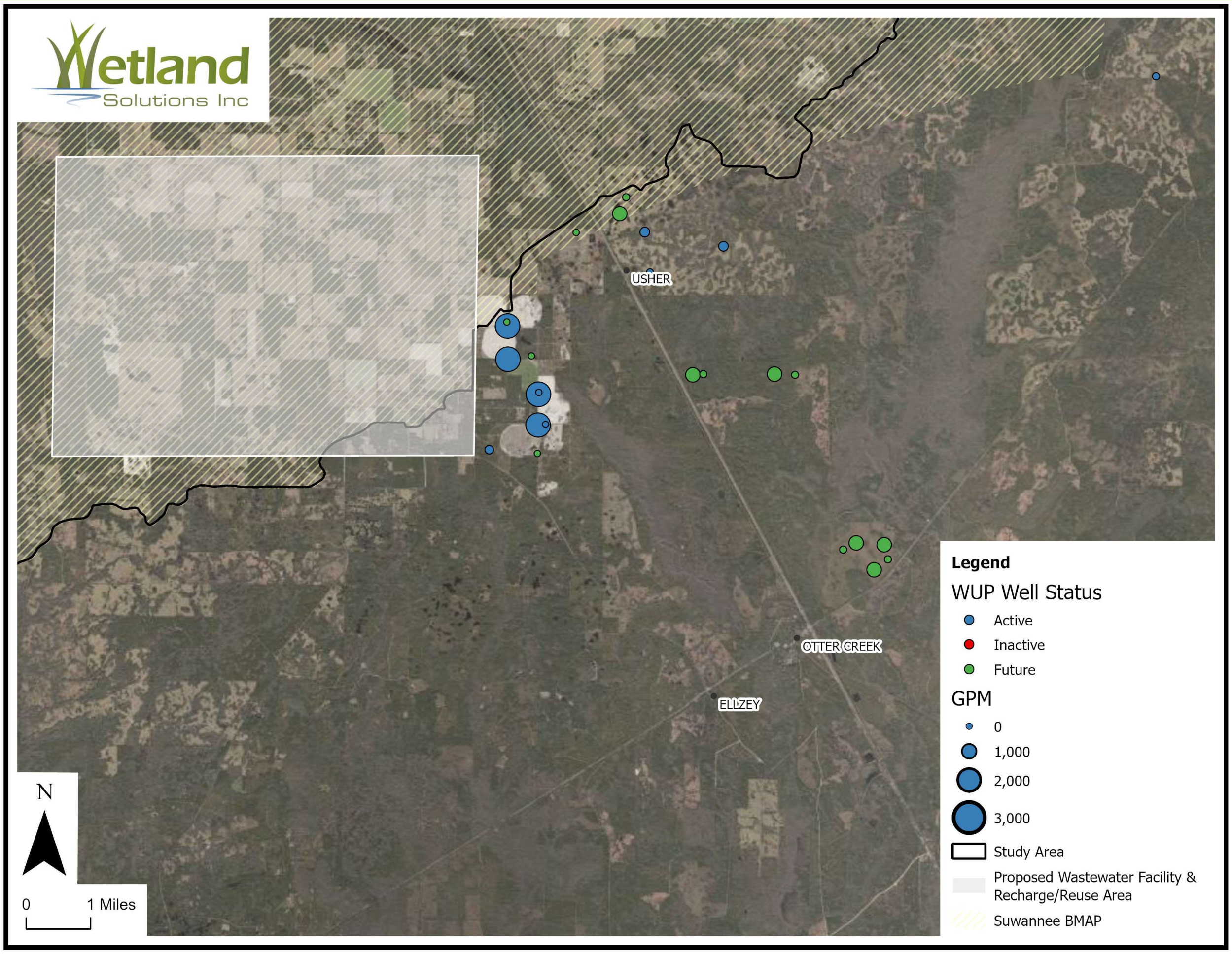

Figure 9. Water Use Permits Near North Regional Wastewater Facility

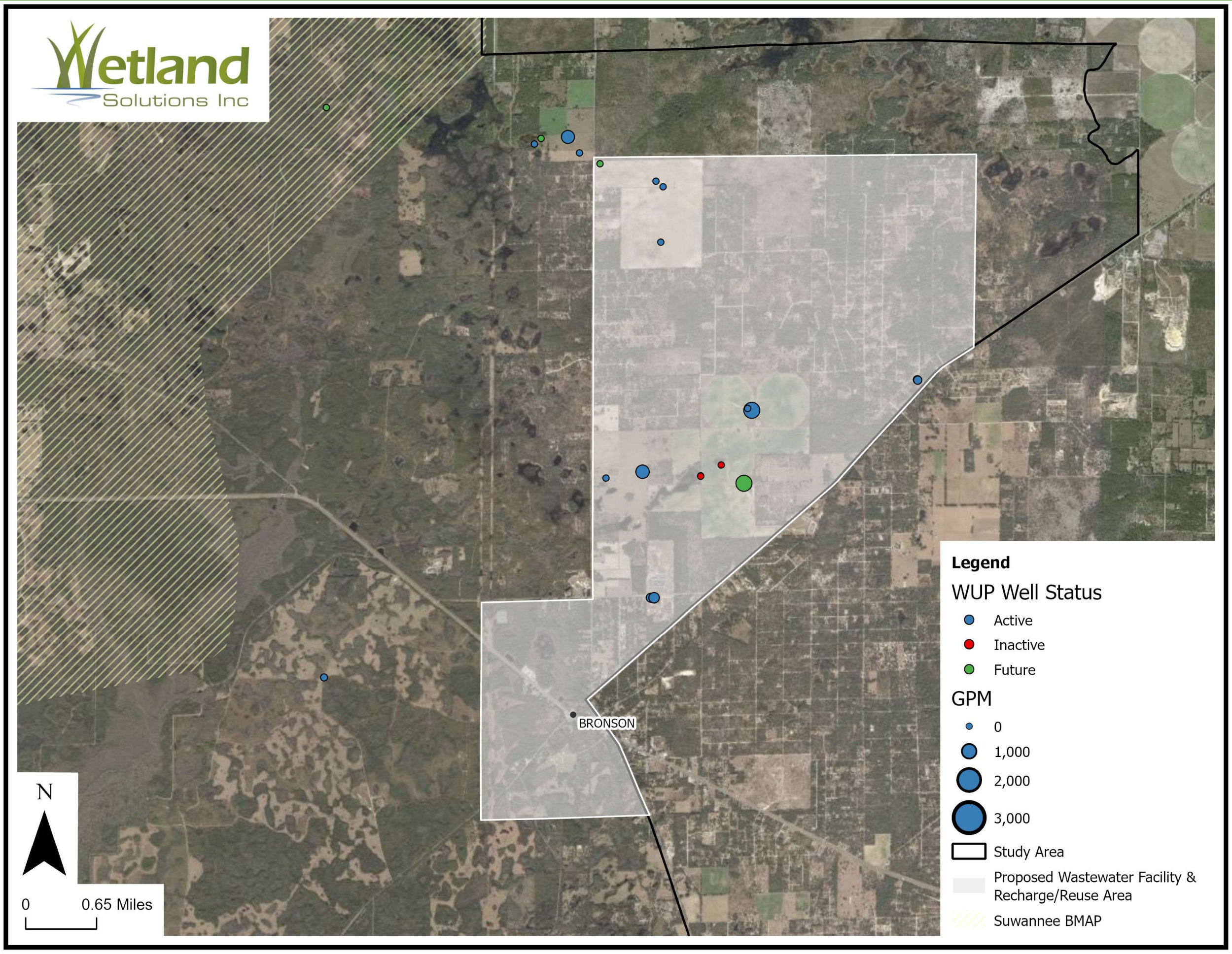

Figure 10. Water Use Permits Near Bronson Regional Wastewater Facility

In both locations there may be potential reclaimed users. Evaluation of potential projects would involve evaluating actual water use for reclaimed users, consideration of distance and cost to convey water, and coordination with a willing landowner. Even with incorporation of reuse it is expected that complete disposal redundancy will be required for treated flows as discussed in the following section. If reuse is to be pursued it is recommended that coordination with potential landowners begin in conjunction with engineering design of the wastewater treatment facility.

3.1.2 Reuse Permitting

Reuse water is required to meet variable treatment standards based on the water user and end use of the effluent. Water provided to customers for irrigation of residential areas or for edible crops are permitted as Part III (Slow-Rate Land Application Systems; Public Access Areas; Residential Irrigation; and Edible Crops) systems in Chapter 62-610.450, Florida Administrative Code (F.A.C.), and require treatment to public access reuse (PAR) standards (filtration and high-level disinfection). Water provided for irrigation of forage for cattle are permitted as Part II (Slow-Rate Land Application Systems; Restricted Public Access) systems in Chapter 62-610.400, F.A.C. These systems are not required to meet PAR, but if cattle are intended for milk production, a 15-day resting period is required between irrigation with the reuse water and rotation of grazing cattle to the application area. Finally, industrial reuse projects are permitted as Part VII (Industrial Use of Reclaimed Water) systems in Chapter 62-610.650, F.A.C. Industrial reuse treatment is dependent on the purposes of the water and the potential for contact. With the exception of open cooling towers, reuse water supplied to industrial users is required to meet secondary treatment and basic disinfection.

To ensure adequate disposal capacity reclaimed systems also have storage requirements. Storage requirements generally include the need for either redundant disposal for all water sent to reuse, or a minimum of 3 days of storage capacity for all water that does not have an alternative disposal location.

3.1.3 Reuse Limitations

There are a variety of challenges associated with supplying reuse for irrigation. Given that irrigation for both agricultural and residential uses are weather dependent, there is often inconsistent demand from customers, with maximum demand during dry periods and minimum or no demand during wet periods. In wastewater systems with infiltration and inflow, this problem is exacerbated since wastewater flows, and hence disposal flows, increase during wet weather conditions. The inconsistent nature of demand typically results in the need for redundant disposal and storage to hold water until times when it is needed and to meet peak reuse demands. Finally, water provided for irrigation of agricultural lands is subject to complete loss of capacity due to changed cropping practices, or land use conversions (e.g., development).

3.2 Wastewater Recharge Alternatives

A second alternative for wastewater disposal is recharge to the Floridan Aquifer. This disposal method provides both the natural environment and water users with water supply. Recharge to groundwater can occur as a Part II, Part III, Part IV (Rapid-Rate Land Application Systems), or Part V (Groundwater Recharge and Indirect Potable Reuse) system with permitting criteria described in Chapter 62-610, F.A.C. Generally, slow-rate land application and rapid-rate land application are distinguished depending on the rate at which water is applied with a standard application rate of 2″ per week for slow-rate (Part II or Part III) and a standard application rate of 3″ per day for rapid-rate (Part IV). Slow-rate land application is further divided by a requirement for water to achieve PAR for permitting as a Part III system for irrigation of public areas. Finally, Part V which allows for recharge wells has a variety of additional requirements because of the perceived lack of an infiltration buffer. These include filtration, high-level disinfection, primary and secondary drinking water standards, and maximum concentrations for total organic carbon (TOC) and total organic halides (TOX).

3.2.1 Land Application

Wastewater disposal methods that rely on land application are used extensively to recharge the Floridan Aquifer. Most frequently in Florida, this disposal relies on the use of either sprayfields or RIBs. The primary difference between these disposal methods is the rate at which water is applied, with sprayfields typically permitted for application of 2″ per week, and RIBs typically permitted for application of 3″ per day. The application rate is important because of the impacts it has on recharge effectiveness and loss of water to evapotranspiration (ET). Higher application/recharge rates correspond to a greater percentage of water being beneficially recharged, where the hydrogeology is suitable (Wetland Solutions, Inc. 2020). It is expected that for either two regional wastewater facilities or a single regional wastewater facility, land application would be developed at the wastewater facility property to minimize land acquisition and transmission costs.

Another alternative for disposal using land application is groundwater recharge wetlands. Groundwater recharge wetlands have been used for facilities in North Central Florida for wastewater disposal where additional nitrogen removal would be valuable for protecting the Floridan Aquifer and springs. Application rates for groundwater recharge wetlands typically fall between the permitted rates for sprayfields and RIBs with a primary difference being that continuous inundation is maintained to provide additional water quality treatment. As with other forms of land application, development of groundwater recharge wetlands on the wastewater facility property would be desirable to reduce transmission costs to a satellite location. Recharge wetlands also provide ancillary benefits including wildlife habitat and the potential for human use depending on how they are developed. Anticipated areas for land application/recharge are shown in the same locations as the wastewater facilities in Figure 6 and Figure 7.

3.2.2 Recharge Well

A second potential alternative for recharge is a recharge well. While feasible, this alternative involves treatment to much higher standards and the regulatory permitting is more challenging. Given the size of the wastewater facility, availability of land, additional treatment requirements, and permitting challenges this alternative did not receive further consideration.

3.3 Reuse and Recharge Effectiveness

Recharge effectiveness is an important consideration for this project given the value of local water resources (springs) and uses (public supply and agricultural irrigation). For this reason, this study considered the effectiveness of recharge, the portion of treated water that replaces withdrawals or that is returned to the Floridan Aquifer. This concept was considered for each of the evaluated disposal methods.

3.3.1 Reuse

As previously described, reuse is the replacement of a current water withdrawal in part or in whole with treated wastewater. This replacement offers the benefit of reducing or eliminating a withdrawal that would otherwise be occurring. When a customer is available and is taking all of the produced water this results in a one-for-one replacement of withdrawn water and a 100% benefit.

As an example, if a hay farm currently withdraws 0.25 MGD for irrigation and the farm is connected to a wastewater facility that produces 0.25 MGD of treated water then the entire use of the farm could be offset, assuming some storage is available to hold water until it is used. This would equate to a 0.25 MGD reduction in withdrawals and a 100% effectiveness. However, this example also illustrates the challenge of continuously supplying an irrigation customer with reuse. To extend this example, consider that the same farm spends the last two weeks of May harvesting and planting and then that June is particularly rainy. Effectively the irrigation needs and ability to store water during this six-week period may be zero and the wastewater facility has to manage and provide alternate disposal for 10.5 million gallons of water. For this reason, reuse typically requires complete disposal redundancy or significant storage to accommodate periods when the reuse customer may be unwilling or unable to take water.

3.3.2 Groundwater Recharge

Recharge effectiveness for other forms of disposal can be evaluated based on a variety of factors (Wetland Solutions, Inc. 2020). Water lost to ET is not recharged while all water that is not lost to ET, in an area with limited confinement and adequate infiltration rates (e.g., the study area), is recharged to the Floridan Aquifer. The loss of water to ET can be calculated based on the depth of water that is needed by the plant community and held in the soil profile, that is not supplied by rainfall, also termed the net irrigation requirement. This approach allows for calculation of an estimated annual recharge of water that is achieved at varying application rates.

For a sprayfield that is operating at its design capacity and loaded at 2” per week this results in approximately a 19% loss to ET. However, many sprayfields are operated at closer to 50% of their design flow (1” per week) resulting in a 38% loss to ET. Conversely, RIBs operated at 3” per day lose approximately 2% of applied water to ET and operated at 50% of capacity only lose approximately 4% of applied water to ET.

As previously described, groundwater recharge wetlands typically have infiltration rates between those of sprayfields and RIBs. An application rate of 1” per day is a desirable infiltration rate for treatment wetlands. At this application rate the loss of applied water would be approximately 6%. Unlike sprayfields or RIBs, recharge wetlands are continuously loaded and are not rotated or rested. For this reason, even at reduced loading rates recharge wetlands would be expected to have similar losses to ET as a result of reduced wetted footprint.

Section 4 Project Funding Sources

Many of the funding sources available for wastewater projects are similar to those available for potable water projects. The following section discusses the various funding mechanisms available to utilities for wastewater projects. In addition to the listed opportunities various funding mechanisms become available occasionally that can be used to support this project at the state or federal level. Timeframes for submitting projects vary by funding source and year.

4.1 State Revolving Fund

The SRF offers a variety of funding mechanisms for both water and wastewater projects. Drinking Water State Revolving Fund (Where) the DWSRF offers funding for water projects the Clean Water State Revolving Fund (CWSRF) offers a similar program for wastewater projects. The CWSRF offers low-interest 20-year loans for the design and construction of wastewater projects including: collection systems, treatment facilities, and reclaimed water lines. As with the DWSRF disadvantaged communities can receive partial loan principal forgiveness.

4.1.1 Small Community Wastewater Construction Grants Program

Also administered under the CWSRF is the Small Community Wastewater Construction Grants Program (SCWCGP). This grant program was developed to assist small communities with planning, design, and construction of wastewater management facilities. To be eligible for the program a community, county, or authority must have a total population of 10,000 or fewer with a per capita income less than the state of Florida average. These grants are applied for in an identical manner to a CWSRF loan. Highest funding priority is given to projects that address a public health risk and/or are listed in a BMAP. Grant percentage is dependent on the entity's affordability index and is 70-90% of the loan amount up to 25% of the funds available during the fiscal year. General information on the SCWCGP is contained in Chapter 62-505, F.A.C.

4.2 United States Department of Agriculture

The USDA-RD provides funding for waste disposal systems by the same mechanisms as for drinking water systems. As with the SCWCGP this funding program is only open to entities with a population of 10,000 or fewer. Up to 75% of the loan can be converted to a grant for qualifying projects.

4.3 Suwannee River Water Management District

The SRWMD facilitates or directly funds projects through several programs as described below.

4.3.1 State Springs Grant Program

As for drinking water projects the SRWMD facilitates funding of springs grant projects including wastewater projects that can be shown to have a benefit to springs. These projects are submitted to the SRWMD who evaluates the proposals and then forwards a list of recommended projects to the FDEP for funding consideration. Frequently, wastewater facility projects are excellent candidates for these funds because of the concentrated load that can be reduced, resulting in a low dollar per pound cost-effectiveness value.

4.3.2 State Alternative Water Supply Grant Program

This program, previously described in the water supply funding opportunities, is also available to support wastewater projects that provide reclaimed water, implement water conservation, or enhance water quantity.

4.3.3 Regional Initiative Valuing Environmental Resources (RIVER) Cooperative Funding Program

The RIVER Cooperative Funding Program, previously described, can be used to provide funding for projects that improve water quality, enhance aquifer recharge, or develop alternative water supplies. Wastewater projects can be funded and implemented to provide some or all of these benefits.

4.4 Local Funding

Projects can also be funded through local channels in the same way as for drinking water systems. These can include revenue bonds or non-ad valorem assessments as previously discussed.

Section 5 References

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