DRAFT PENDING COMPILATION OF FINAL REPORT

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

Task 5 – Cost Estimation and Cost-Effectiveness for Identified Alternatives (Draft)

Prepared for

Suwannee River Water Management District

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DRAFT PENDING COMPILATION OF FINAL REPORT

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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 5 including costing of the project alternatives and cost-effectiveness for wastewater treatment options.

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.

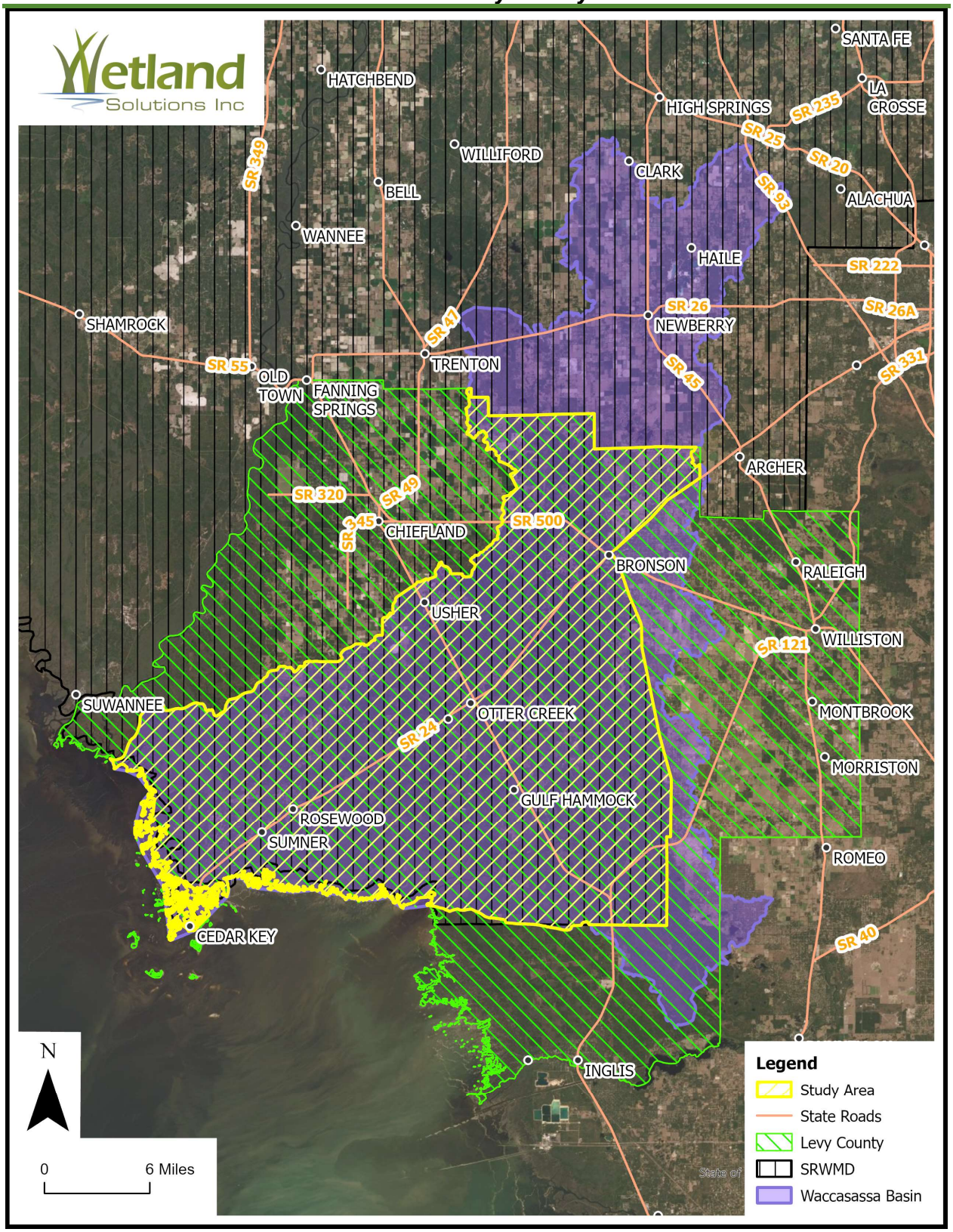

Figure 1. Regional Alternative Water Supply Feasibility Study Area Extents

Section 2 Cost Estimation Approach and Assumptions

This task is focused on developing a cost estimate for the feasibility study to provide water and wastewater service to the region that includes Cedar Key, Bronson, Otter Creek, and unincorporated areas of Levy County including Rosewood and Sumner. The cost estimate for this project was developed at the study/feasibility level to be approximately consistent with a Class 4 estimate as described by the Association for the Advancement of Cost Engineering International (U.S. Department of Energy 2018). The level of refinement for this cost estimate is expected to have an accuracy of +50% to -30%. This section discusses the costing methodology and assumptions that were made in preparation of this cost estimate. It is expected that future phases of this project would include detailed engineering and refinement of project details, quantities, and costs.

The remainder of this report presents cost estimates for the two identified project alternatives, other non-regional component cost estimates, and cost-effectiveness for wastewater treatment improvement and septic-to sewer conversion.

2.1 Costing Methodology

Costs were developed for this project based on a combination of historic cost data, cost estimates from manufacturers/installers, and professional judgment. As described above, this project is at the feasibility and alternatives evaluation stage. As such, the cost estimates developed for this study should be used only for planning purposes and should receive refinement as a specific project design advances.

2.2 Assumptions

A variety of assumptions were made in the development of this cost estimate. These assumptions were made based on the level of detail of this feasibility study and uncertainties associated with project aspects that will be refined as a specific alternative is advanced. These assumptions included:

- Land and right-of-way acquisition were not included as part of this cost estimate. These costs were not included due to uncertainty associated with the final location of water and wastewater infrastructure and potential parcel availability. Furthermore, land transfer from one or more of the involved municipalities may be a part of development of a regional cooperative.
- No specific utility conflicts were considered, and the extent of conflicts in the project right-of-way is unknown. Estimates of conventional pipe installation versus directionally-drilled pipe installation lengths were based on a 75%:25% split between conventional to directionally-drilled.
- Cost-effectiveness calculations assumed all identified OSTDSs were converted to sewer.

- It was assumed that any wastewater treatment facility would be required to achieve a TN of 3 mg/L prior to disposal to be protective of groundwater.
- Costs associated with providing water to potential reuse customers were not included due to a current lack of identified reuse customers and sites, and the probable need for redundant storage and/or disposal associated with any flows to reuse customers. Reuse feasibility can be explored further during specific project design phases.
- The same fixed percentages were used for estimating costs for engineering/geotechnical/ permitting, survey, construction oversight, mobilization/demobilization/bonding, and contingency for each project component.

Section 3 Alternative 1: Cedar Key, Otter Creek, and Unincorporated Areas Regionalized

The first project alternative for which costs were estimated included: development of a new water supply for Cedar Key, Otter Creek, and the unincorporated areas of Rosewood and Sumner; and development of a wastewater treatment and disposal system for the same communities. This project did not include new water supply or wastewater treatment for the Town of Bronson. This cost estimate only includes the reginal aspects of the project, not the costs associated with the individual communities. Costs associated with water supply distribution systems and septic-to-sewer conversion are presented later in this report.

This alternative included water development north of Otter Creek and south of Chiefland with wastewater treatment and disposal in the same general area (Figure 2). The anticipated served population for this alternative was 854 residents that are currently on a public water system (Cedar Key – 734, Otter Creek – 120) and potentially another 1,075 residents that are not currently on a public water supply. The additional potential residents were estimated assuming 2.5 people per home for the 430 identified OSTDSs within 1.5 miles of SR24. This estimate does not include the tourist population that inundates Cedar Key, particularly on holiday weekends, potentially doubling or tripling the resident population. This results in an anticipated population range of 1,929 residents and up to 3,397 people including tourists during holiday weekends as shown in Table 1. Assuming a planning level per capita water use of 130 gpcd (based on 2014-18 per capita water use in Bronson [Suwannee River Water Management District 2021, 2020–45]) anticipated water needs are between 0.25 and 0.44 MGD for the served population.

Table 1. Alternative 1: Project Area Population

Area	Population	Demand (MGD)
Cedar Key	734	0.095
Cedar Key Tourist	1,468	0.191
Otter Creek	120	0.016
1.5-Mile Buffer	1,075	0.140

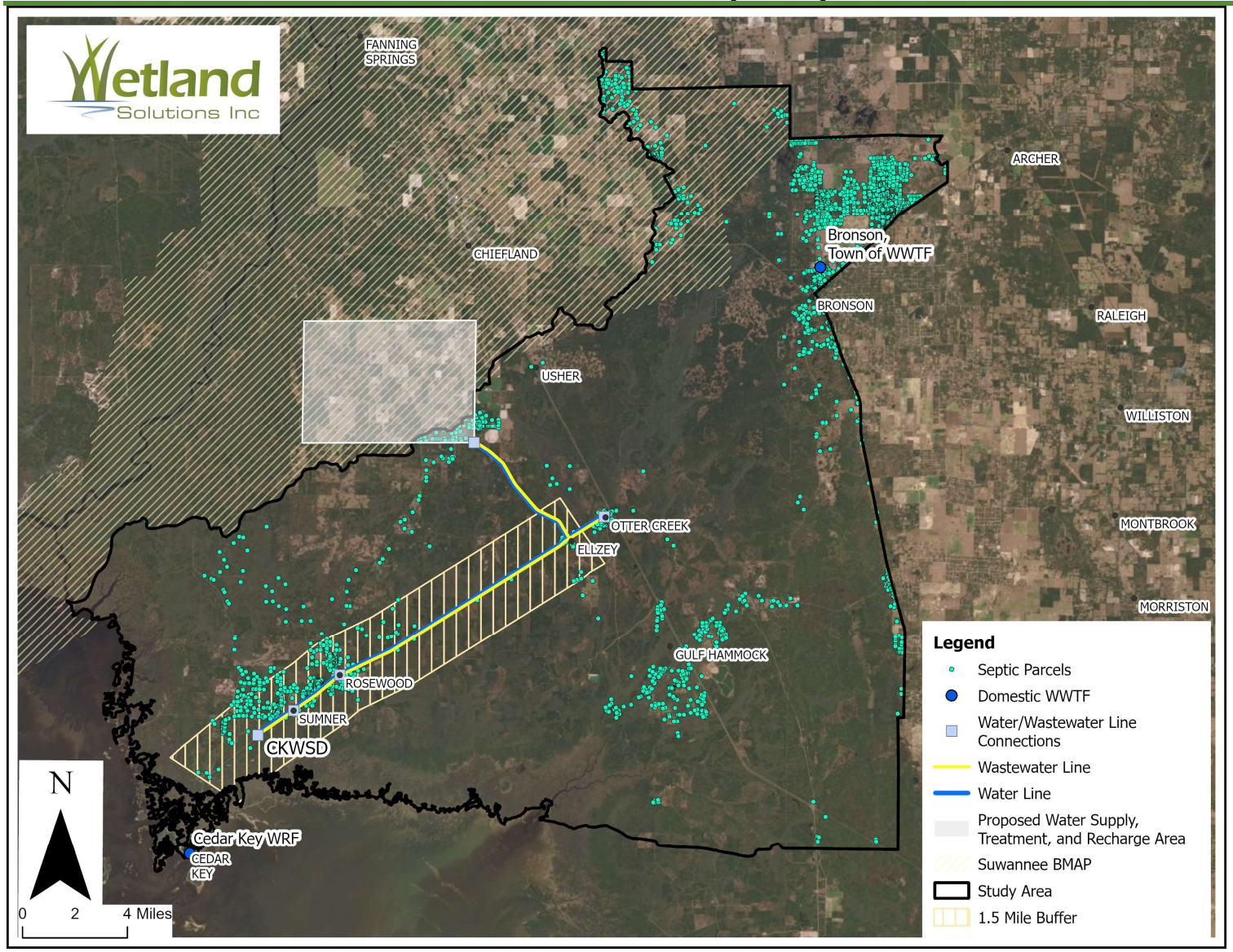

Figure 2. Alternative 1: Project Location

3.1 Alternative 1: Water System Costs

The water system for this alternative is comprised of the new infrastructure necessary to withdraw, treat, and distribute water to each of the served communities. It is expected that water would be delivered to each community into a storage tank with the community water system then distributing water to customers. Currently, both Otter Creek and Cedar Key have water distribution systems. It is expected that water would be re-chlorinated in the regional system before being discharged into the community water systems. Unincorporated areas along SR24 do not currently have water distribution systems. The costs for these systems are not included as part of the regional project and are discussed later. This alternative also includes no new infrastructure or upgrades for Bronson. The estimated cost for this alternative is $33.2 million dollars with cost details shown in Table 2.

Table 2. Alternative 1: Estimated Water System Cost

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
New Well & Pump	ea	$250,000	3	$750,000
Hydropneumatic Tanks	ea	$70,000	2	$140,000
Chlorination Facilities	ls	$100,000	1	$100,000
Electrical, Controls, and Generator	ls	$250,000	1	$250,000
Piping at WTP	ls	$100,000	1	$100,000
12" Pipeline - Conventional	ft	$115	21,000	$2,415,000
12" Pipeline - HDD	ft	$225	7,000	$1,575,000
12" Pipeline - Conventional	ft	$115	62,250	$7,159,000
12" Pipeline - HDD	ft	$225	20,750	$4,669,000
Valves and Boxes	ea	$3,000	110	$330,000
Air Release	ea	$8,000	60	$480,000
Master Meter and PSV	ea	$40,000	3	$120,000
Booster Pump Station and Rechlorination	ea	$500,000	1	$500,000
Storage Tank at Otter Creek	ls	$100,000	1	$100,000
Storage Tank at Cedar Key	ls	$250,000	1	$250,000
Booster Pumps and Rechlorination - RW	ls	$500,000	1	$500,000
As-Built & Record Drawings	ea	$50,000	1	$50,000
Erosion & Sediment Control	ac	$45,000	25	$1,147,000
Restoration	ac	$45,000	25	$1,147,000
			Subtotal	$21,782,000
Engineering/Geotechnical/Permitting	%	13%		$2,831,660
Survey	%	1%		$217,820
CEI	%	8%		$1,742,560
Mobilization/Demobilization/Bonding	%	10%		$2,178,200
Contingency	%	20%		$4,356,400
			Subtotal	$11,326,640
Design & Construction Total				**$33,200,000**

3.2 Alternative 1: Wastewater System Costs

The proposed wastewater system for this alternative includes a new wastewater treatment facility to collect and treat wastewater from Cedar Key, Otter Creek, and the unincorporated areas of Rosewood and Sumner. This facility would be constructed north of Otter Creek in the vicinity of the water system proposed in the previous water supply section to ensure that this highly-treated effluent would recharge the same area from which water was originally withdrawn. It is expected that the facility would be designed to achieve advanced wastewater treatment (AWT) standards to infiltrate less than 3 mg/L of TN as an annual average. Disposal is expected to be to a sprayfield, rapid infiltration basin (RIB), or treatment wetlands/RIBs with costs presented for each option. Currently, only Cedar Key has an existing wastewater collection system. New collection systems would be required to serve Otter Creek and the unincorporated areas along SR24 (including Rosewood and Sumner). The costs for these collection systems are discussed later in this report. This system would have raw wastewater conveyed from each of the communities back to a regional wastewater facility for treatment and disposal. The expected flow for the served areas is 0.22 MGD although flows will be highly variable based on Cedar Key tourism and are expected to be as high as 0.40 MGD during holiday weekends. The proposed wastewater facility for this alternative would have an initial design capacity of 0.60 MGD. The estimated costs for the conveyance and treatment facility are $50.2 million with the cost breakdown shown in Table 3.

The proposed wastewater treatment facility is expected to discharge highly-treated effluent back to the Floridan Aquifer. While there may be a potential reuse customer who could use the water for irrigation it is still expected that complete disposal redundancy will be required given the firm need for disposal during wet periods or planting when irrigation may not be necessary or desirable. There are three primary ways of recharging this effluent: RIBs, sprayfields, and treatment wetland-RIB hybrids. RIBs will require the smallest site area with an expected footprint of approximately 8 acres (based on a 3 inch per day loading rate) and are expected to have the lowest estimated cost of $1.95 million. Sprayfields will have the largest required footprint of approximately 78 acres (2 inches per week) and the highest estimated cost of $4.25 million. Both RIBs and sprayfields are primarily disposal mechanisms rather than effluent polishing systems. The incorporation of lined treatment wetlands will provide the ability to increase nitrogen removal cost-effectively to reduce nutrient loading to the aquifer. The anticipated footprint for wetlands will be the combination of the footprint of the RIBs with the addition of approximately 5 acres of lined wetland cells that will polish water before discharge. The anticipated footprint for this option is approximately 13 acres with an estimated cost of $3.36 million. Cost components are shown in Table 4 for RIBs, Table 5 for sprayfields, and Table 6 for the combination of treatment wetlands and RIBs.

Table 3. Alternative 1: Estimated Wastewater Treatment Facility Cost

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
WWTP	MGD	$12,586,800	0.60	$12,600,000
Electrical, Controls, and Generator	ls	$250,000	1	$250,000
Piping at WWTP	ls	$100,000	1	$100,000
12" Pipeline - Conventional	ft	$115	21,000	$2,415,000
12" Pipeline - HDD	ft	$225	7,000	$1,575,000
12" Pipeline - Conventional	ft	$115	62,250	$7,159,000
12" Pipeline - HDD	ft	$225	20,750	$4,669,000
Valves and Boxes	ea	$3,000	110	$330,000
Air Release	ea	$8,000	60	$480,000
Master Meter	ea	$40,000	3	$120,000
Booster Pump Station & Odor Control	ea	$500,000	2	$1,000,000
As-Built & Record Drawings	ea	$50,000	1	$50,000
Erosion & Sediment Control	ac	$45,000	25	$1,147,000
Restoration	ac	$45,000	25	$1,147,000
			Subtotal	$33,042,000
Engineering/Geotechnical/Permitting	%	13%		$4,295,460
Survey	%	1%		$330,420
CEI	%	8%		$2,643,360
Mobilization/Demobilization/Bonding	%	10%		$3,304,200
Contingency	%	20%		$6,608,400
			Subtotal	$17,181,840
Design & Construction Total				**$50,230,000**

Table 4. Alternative 1: Estimated Costs for Rapid Infiltration Basins

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Silt Fence	lf	$2.00	5,000	$10,000
Soil Tracking Device	ea	$5,000	1.00	$5,000
Clear & Grub	ac	$10,000	9.00	$90,000
Pipe	lf	$120	600	$72,000
Inflow Structures, Valves, & Meters	ea	$50,000	2	$100,000
Excavation	cy	$10.00	69,700	$697,000
Berm Construction	cy	$15.00	14,000	$210,000
Sod	sy	$5.00	14,000	$70,000
As-Built & Record Drawings	ea	$20,000	1	$20,000
Level Recorder/Staff Gauge	ea	$3,000	2	$6,000
			Subtotal	$1,280,000
Engineering/Geotechnical/Permitting	%	13%		$166,400
Survey	%	1%		$12,800
CEI	%	8%		$102,400
Mobilization/Demobilization/Bonding	%	10%		$128,000
Contingency	%	20%		$256,000
			Subtotal	$665,600
Design & Construction Total				**$1,950,000**

Table 5. Alternative 1: Estimated Costs for Sprayfields

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Silt Fence	ft	$2.00	15,000	$30,000
Soil Tracking Device	ea	$5,000	1.00	$5,000
Pump Station	ls	$100,000	1.00	$100,000
Clear & Grub	ac	$10,000	86	$860,000
Pipe	ft	$120	600	$72,000
Pump Station	ea	$50,000	2	$100,000
Field Piping (4")	ft	$40	11,613	$465,000
Field Piping (8")	ft	$70	3,871	$271,000
Sprinklers	ea	$100	150	$15,000
Seeding	sy	$2.00	416,240	$833,000
As-Built & Record Drawings	ea	$40,000	1	$40,000
			Subtotal	$2,791,000
Engineering/Geotechnical/Permitting	%	13%		$362,830
Survey	%	1%		$27,910
CEI	%	8%		$223,280
Mobilization/Demobilization/Bonding	%	10%		$279,100
Contingency	%	20%		$558,200
			Subtotal	$1,451,320
Design & Construction Total				**$4,250,000**

Table 6. Alternative 1: Estimated Costs for Treatment Wetlands with RIBs

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Silt Fence	ft	$2.00	5,000	$10,000
Soil Tracking Device	ea	$5,000	1.00	$5,000
Clear & Grub	ac	$10,000	14.00	$140,000
Pipe	ft	$120	600	$72,000
Inflow Structures, Valves, & Meters	ea	$50,000	2	$100,000
Excavation	cy	$10.00	108,500	$1,085,000
Berm Construction	cy	$15.00	21,700	$326,000
Liner	ac	$50,000	4	$200,000
Sod	sy	$5.00	21,700	$109,000
Outflow Structure	ea	$40,000	2	$80,000
Outflow Pipeline	ft	$120	200	$24,000
Mitered End Section	ea	$2,500	2	$5,000
Plants/Planting	ac	$5,500	4	$22,000
As-Built & Record Drawings	ea	$20,000	1	$20,000
Level Recorder/Staff Gauge	ea	$3,000	4	$12,000
			Subtotal	$2,210,000
Engineering/Geotechnical/Permitting	%	13%		$287,300
Survey	%	1%		$22,100
CEI	%	8%		$176,800
Mobilization/Demobilization/Bonding	%	10%		$221,000
Contingency	%	20%		$442,000
			Subtotal	$1,149,200
Design & Construction Total				**$3,360,000**

3.3 Alternative 1: Total Water and Wastewater System Costs

Based on the costs estimated for the water system, wastewater system, and recharge the total estimated project cost for Alternative 1 is between $85.4 million with RIBs for disposal and $87.7 million with sprayfields as disposal. As discussed earlier the accuracy of this estimate is expected to have bounds of -30% to +50%. Considering these bounds, the low estimate for the project is $59.8 million and the high estimate is $128.1 million with RIBs as the disposal method. With sprayfields, the most expensive disposal option, the estimated cost range is between $61.4 million and $131.6 million. Project costs for evaluated alternatives are provided in Table 7.

Table 7. Alternative 1: Total Estimated Project Costs

Project	Estimate (Million$)	Low Estimate (-30%) (Million$)	High Estimate (+50%) (Million$)
WTP, WWTF, RIBs	85.4	59.8	128.1
WTP, WWTF, Wetlands/RIBs	86.8	60.8	130.2
WTP, WWTF, Sprayfield	87.7	61.4	131.6

Section 4 Alternative 2: All Communities Regionalized

The second alternative considered was regionalization of Bronson, Otter Creek, Cedar Key, and unincorporated areas along SR24. This alternative would have construction of a new water supply for all the communities and a wastewater treatment facility that would receive wastewater from the identified communities and a large number of septic-to-sewer conversions north of Bronson.

This alternative included water supply development in the vicinity of Bronson with wastewater treatment and disposal occurring in the same general area to partially offset the withdrawals (Figure 3. Alternative 2: Project Location). The anticipated served population for this alternative was 1,935 residents that are currently on a public water system (Cedar Key – 734, Otter Creek – 120, and Bronson – 1,081) and potentially another 3,220 residents assuming 2.5 people per home for the 1,288 identified OSTDSs within 1.5 miles of SR24, within the University Oaks PSA, and the identified area north of Bronson. As before, this estimate does not include the tourist population that visits Cedar Key, particularly on holiday weekends, potentially doubling or tripling the Cedar Key residential population. This results in an anticipated population range of between 5,155 residents and 6,623 people including tourists during holiday weekends (Table 8). Assuming a planning level per capita water use of 130 gpcd (based on 2014-18 per capita water use in Bronson) anticipated water needs are between 0.67 and 0.86 MGD for the served population.

Table 8. Alternative 2: Project Area Population

Area	Population	Demand (MGD)
Cedar Key	734	0.095
Cedar Key Tourist	1,468	0.191
Otter Creek	120	0.016
Bronson	1,081	0.141
1.5-Mile Buffer	1,075	0.140
University Oaks	890	0.116
North Bronson	1,255	0.163

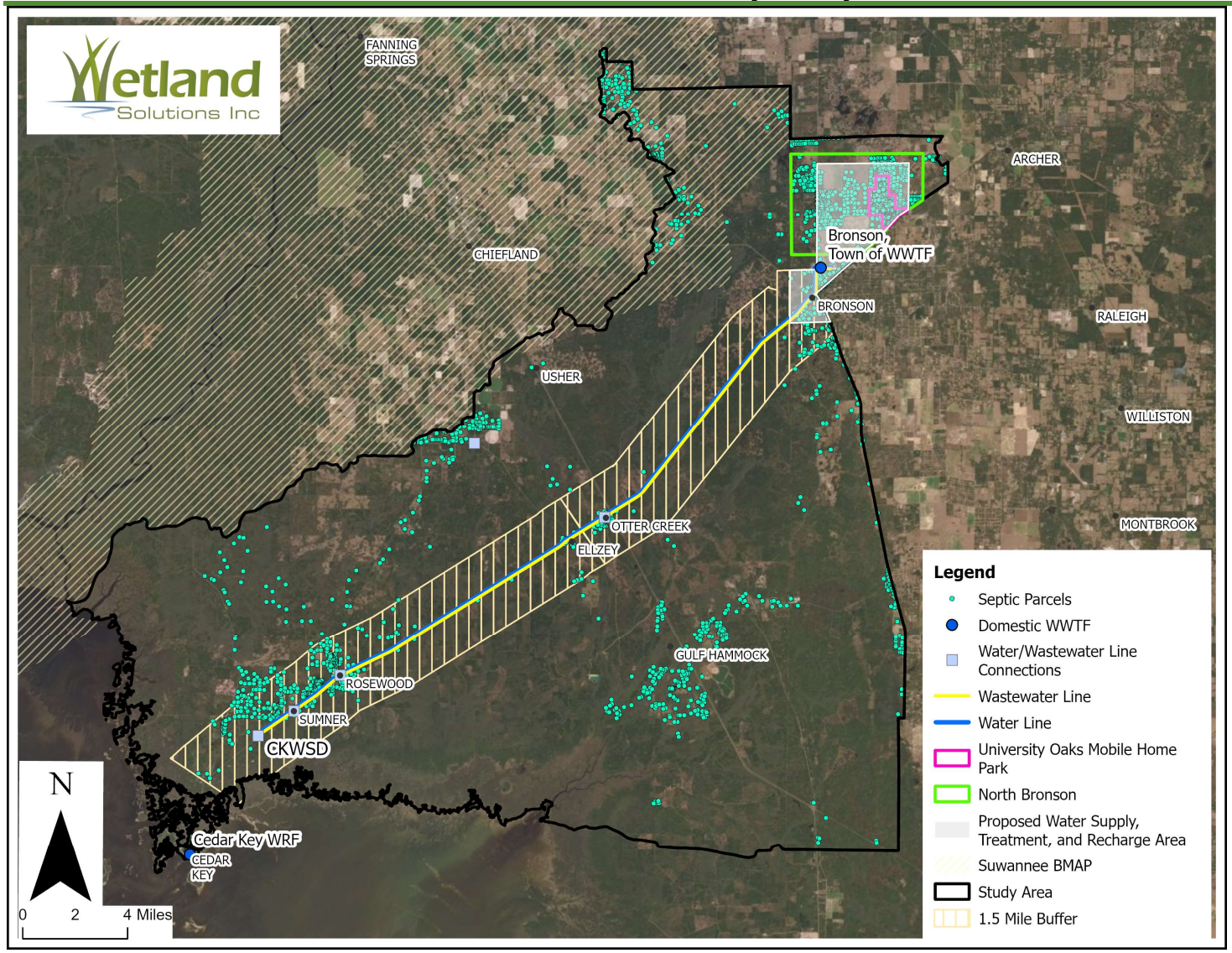

Figure 3. Alternative 2: Project Location

4.1 Alternative 2: Water System Costs

The water system proposed for this alternative would serve the identified communities and a large number of additional residents located north of Bronson. The water supply for this alternative would be located near Bronson with potable water produced in the regional facility and delivered to each community through a pipeline along SR24. Water would be delivered to each community into a storage tank with each of the community water systems then distributing water to their customers. Currently, Bronson, Otter Creek, and Cedar Key have water distribution systems. It is expected that water would be re-chlorinated before being discharged into the community water systems. Rosewood and the areas north of Bronson, outside of the University Oaks PSA, do not currently have water distribution systems. The cost for these systems is not part of the regional project and is discussed later. The anticipated cost for development of this regional water supply is $46.2 million with the cost breakdown shown in Table 9.

Table 9. Alternative 2: Estimated Water System Cost

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
New Well & Pump	ea	$250,000	3	$750,000
Hydropneumatic Tanks	ea	$70,000	2	$140,000
Chlorination Facilities	ls	$100,000	1	$100,000
Electrical, Controls, and Generator	ls	$250,000	1	$250,000
Piping at WTP	ls	$100,000	1	$100,000
12" Pipeline - Conventional	ft	$115	53,250	$6,124,000
12" Pipeline - HDD	ft	$225	17,750	$3,994,000
12" Pipeline - Conventional	ft	$115	62,250	$7,159,000
12" Pipeline - HDD	ft	$225	20,750	$4,669,000
Valves and Boxes	ea	$3,000	150	$450,000
Air Release	ea	$8,000	80	$640,000
Master Meter and PSV	ea	$40,000	4	$160,000
Booster Pump Station and Rechlorination	ea	$500,000	2	$1,000,000
Storage Tank at Bronson	ls	$250,000	1	$250,000
Storage Tank at Otter Creek	ls	$100,000	1	$100,000
Storage Tank at Cedar Key	ls	$250,000	1	$250,000
Booster Pumps and Rechlorination - OC	ls	$500,000	1	$500,000
Booster Pumps and Rechlorination - RW	ls	$500,000	1	$500,000
As-Built & Record Drawings	ea	$50,000	1	$50,000
Erosion & Sediment Control	ac	$45,000	35	$1,591,000
Restoration	ac	$45,000	35	$1,591,000
			Subtotal	$30,368,000
Engineering/Geotechnical/Permitting	%	13%		$3,947,840
Survey	%	1%		$303,680
CEI	%	8%		$2,429,440
Mobilization/Demobilization/Bonding	%	10%		$3,036,800
Contingency	%	20%		$6,073,600
			Subtotal	$15,791,360
Design & Construction Total				**$46,200,000**

4.2 Alternative 2: Wastewater System Costs

The wastewater system for this alternative includes a new wastewater treatment facility to collect and treat wastewater from Cedar Key, Otter Creek, Bronson, the unincorporated areas of Rosewood and Sumner, the University Oaks PSA, and other areas north of Bronson that are currently on OSTDSs. This facility would be constructed near Bronson in the vicinity of the water system discussed in the water supply section to ensure that this highly-treated effluent would recharge the area from which it was withdrawn. It is expected that the facility would be designed to achieve AWT standards to infiltrate less than 3 mg/L of TN as an annual average to be protective of groundwater and local springs. Disposal is expected to be via sprayfield, RIB, or a treatment wetland/RIB system with costs presented for each.

Currently, only Bronson and Cedar Key have existing wastewater collection systems. New wastewater collection systems would be required to serve Otter Creek, Rosewood, and Sumner. University Oaks and areas north of Bronson could have new collection systems constructed or be designed to discharge to the Bronson collection system. The costs for these new collection systems are discussed later in this report. This system would have raw wastewater conveyed from each of the communities back to a regional wastewater facility for treatment and disposal. The expected flow for the served areas is 0.51 MGD although flows will be highly variable based on Cedar Key tourism and are expected to be as high as 0.69 MGD during holiday weekends. The proposed wastewater facility for this alternative would have an initial design capacity of 1.00 MGD. The estimated costs for the conveyance and treatment facility are $73.7 million with the cost breakdown shown in Table 10.

Following treatment, highly-treated effluent will be recharged to the aquifer. As described for Alternative 1, there may be the opportunity for some water to be delivered to reuse, but it is expected that redundant disposal will still be required for all flows. Costs were developed for RIBs, sprayfields, and a hybrid wetland/RIB. RIBs will require approximately 13 acres and had an estimated cost of $2.85 million, with the cost breakdown shown in

Table 11. Sprayfields are estimated to require approximately 129 acres and had an estimated cost of $6.23 million, with the cost breakdown shown in Table 12Table 12. Treatment wetlands with RIBs were estimated to require 21 acres with an estimated cost of $4.46 million, with the cost breakdown shown in Table 13.

Table 10. Alternative 2: Estimated Wastewater Treatment Facility Cost

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
WWTP	MGD	$20,178,000	1.00	$20,200,000
Electrical, Controls, and Generator	ls	$250,000	1	$250,000
Piping at WWTP	ls	$100,000	1	$100,000
12" Pipeline - Conventional	ft	$115	53,250	$6,124,000
12" Pipeline - HDD	ft	$225	17,750	$3,994,000
12" Pipeline - Conventional	ft	$115	62,250	$7,159,000
12" Pipeline - HDD	ft	$225	20,750	$4,669,000
Valves and Boxes	ea	$3,000	150	$450,000
Air Release	ea	$8,000	80	$640,000
Master Meter	ea	$40,000	4	$160,000
Booster Pump Station & Odor Control	ea	$500,000	3	$1,500,000
As-Built & Record Drawings	ea	$50,000	1	$50,000
Erosion & Sediment Control	ac	$45,000	35	$1,591,000
Restoration	ac	$45,000	35	$1,591,000
			Subtotal	$48,478,000
Engineering/Geotechnical/Permitting	%	13%		$6,302,140
Survey	%	1%		$484,780
CEI	%	8%		$3,878,240
Mobilization/Demobilization/Bonding	%	10%		$4,847,800
Contingency	%	20%		$9,695,600
			Subtotal	$25,208,560
Design & Construction Total				**$73,700,000**

Table 11. Alternative 2: Estimated Costs for Rapid Infiltration Basins

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Silt Fence	lf	$2.00	5,000	$10,000
Soil Tracking Device	ea	$5,000	1.00	$5,000
Clear & Grub	ac	$10,000	14.00	$140,000
Pipe	lf	$120	600	$72,000
Inflow Structures, Valves, & Meters	ea	$50,000	2	$100,000
Excavation	cy	$10.00	108,500	$1,085,000
Berm Construction	cy	$15.00	21,700	$326,000
Sod	sy	$5.00	21,700	$109,000
As-Built & Record Drawings	ea	$20,000	1	$20,000
Level Recorder/Staff Gauge	ea	$3,000	2	$6,000
			Subtotal	$1,873,000
Engineering/Geotechnical/Permitting	%	13%		$243,490
Survey	%	1%		$18,730
CEI	%	8%		$149,840
Mobilization/Demobilization/Bonding	%	10%		$187,300
Contingency	%	20%		$374,600
			Subtotal	$973,960
Design & Construction Total				**$2,850,000**

Table 12. Alternative 2: Estimated Costs for Sprayfields

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Silt Fence	ft	$2.00	15,000	$30,000
Soil Tracking Device	ea	$5,000	1.00	$5,000
Pump Station	ls	$100,000	1.00	$100,000
Clear & Grub	ac	$10,000	142	$1,420,000
Pipe	ft	$120	600	$72,000
Pump Station	ea	$50,000	2	$100,000
Field Piping (4")	ft	$40	14,922	$597,000
Field Piping (8")	ft	$70	4,974	$349,000
Sprinklers	ea	$100	50	$5,000
Seeding	sy	$2.00	687,280	$1,375,000
As-Built & Record Drawings	ea	$40,000	1	$40,000
			Subtotal	$4,093,000
Engineering/Geotechnical/Permitting	%	13%		$532,090
Survey	%	1%		$40,930
CEI	%	8%		$327,440
Mobilization/Demobilization/Bonding	%	10%		$409,300
Contingency	%	20%		$818,600
			Subtotal	$2,128,360
Design & Construction Total				**$6,230,000**

Table 13. Alternative 2: Estimated Costs for Groundwater Recharge Wetlands

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Silt Fence	ft	$2.00	5,000	$10,000
Soil Tracking Device	ea	$5,000	1.00	$5,000
Clear & Grub	ac	$10,000	21.00	$210,000
Pipe	ft	$120	600	$72,000
Inflow Structures, Valves, & Meters	ea	$50,000	2	$100,000
Excavation	cy	$10.00	162,700	$1,627,000
Berm Construction	cy	$15.00	32,600	$489,000
Liner	ac	$50,000	2	$100,000
Sod	sy	$5.00	32,600	$163,000
Outflow Structure	ea	$40,000	2	$80,000
Outflow Pipeline	ft	$120	200	$24,000
Mitered End Section	ea	$2,500	2	$5,000
Plants/Planting	ac	$5,500	2	$11,000
As-Built & Record Drawings	ea	$20,000	1	$20,000
Level Recorder/Staff Gauge	ea	$3,000	4	$12,000
			Subtotal	$2,928,000
Engineering/Geotechnical/Permitting	%	13%		$380,640
Survey	%	1%		$29,280
CEI	%	8%		$234,240
Mobilization/Demobilization/Bonding	%	10%		$292,800
Contingency	%	20%		$585,600
			Subtotal	$1,522,560
Design & Construction Total				**$4,460,000**

4.3 Alternative 2: Total Water and Wastewater System Costs

Based on the costs estimated for the water system, wastewater system, and recharge the total estimated project cost for Alternative 1 is between $122.8 million with RIBs for disposal and $126.1 million with sprayfields as disposal. As discussed earlier the accuracy of this estimate is expected to have bounds of -30% to +50%. Considering these bounds the low estimate for the project is $86.0 million and the high estimate is $184.2 million with RIBs as the disposal method. With sprayfields, the most expensive disposal option, the estimated cost range is between $88.3 million and $189.2 million. Project costs for all evaluated recharge options are shown Table 14.

Table 14. Alternative 2: Total Estimated Project Costs

Project	Estimate (Million$)	Low Estimate (-30%) (Million$)	High Estimate (+50%) (Million$)
WTP, WWTF, RIBs	122.8	86.0	184.2
WTP, WWTF, Wetlands/RIBs	124.4	87.1	186.6
WTP, WWTF, Sprayfield	126.1	88.3	189.2

Section 5 Other Community Needs and Septic-to-Sewer

In addition to a regional water supply and regional wastewater treatment facility this study also considered the other water and wastewater needs for each of the communities that are required for a full-service system. A portion of the communities in the study area have water or wastewater infrastructure although some of these systems have current issues that need to be addressed. This section discusses the other system needs for the various areas and presents estimated costs for these additional project components. It is expected that these needs will be funded through specific projects that are not directly a part of the regional cooperative. Funding requests could originate from either the proposed cooperative or the individual communities. Timing for these projects is not expected to have an impact on the regional project, which can be developed with the consideration of potential future connections in identified areas. Table 15 shows the current water and wastewater infrastructure for each community.

Table 15. Current Water and Wastewater Infrastructure by Community

Community	Water Distribution	Wastewater Collection
Cedar Key	Yes	Yes
Bronson	Yes	Partial
Otter Creek	Yes	No
Rosewood	No	No
Sumner	No	No
University Oaks	Yes	No
North Bronson	No	No

Only four communities in the study area currently have water distribution systems and only two have wastewater collection systems. In the case of wastewater collections systems Cedar Key is unique in that 100% of built properties on the island are already on sewer. Bronson currently only provides sewer service to a portion of their water customers within their PSA, although projects have been submitted for funding to expand sewer service to more of the homes that are still on OSTDSs. Detailed costs are not able to be determined without specific evaluation of individual areas, which is beyond the scope of this study. Each community is expected to have different charges for connections of new water systems and the costs discussed here are not necessarily the same for all communities. Rosewood and Sumner were lumped for these analyses as part of a 1.5-mile buffer along SR24.

5.1 Water Distribution System Costs

The communities of Rosewood, Sumner, and the area north of Bronson do not currently have water systems. The costs for developing local distribution systems that would serve these customers assumed a uniform cost for each connection. This assumption is only expected to be accurate if the systems are built-out for all connections at the same time. It is expected that these distributions systems will also have some costs associated with distribution of water after it is received from the regional water supply pipeline. The cost for a new connection was assumed to be $10,000 per home in the absence of an existing distribution system.

Based on this estimated cost per home the three communities that lack water service are expected to have distribution system costs of approximately $4.3 million for the Rosewood and Sumner areas along SR24 and $5.1 million for the unserved area north of Bronson.

5.2 Wastewater Collection System Costs

Only Cedar Key currently supplies sewer service to all their residents. The remaining communities provide service to some customers (Bronson) or none of their residents (Otter Creek, University Oaks, Rosewood, Sumner, and the area north of Bronson). Costs to develop collection systems for customers not currently served by a wastewater facility were estimated based on the cost for septic-to-sewer conversion presented in WSI 2022 (Wetland Solutions, Inc. 2022). This approach bases the cost of conversion on the parcel size as a surrogate for identifying actual pipe lengths needed to move wastewater from the residence to the collection main. For each of the considered communities this was completed by determining the median parcel area and calculating the average septic-to-sewer conversion cost. This cost was then multiplied by the total number of OSTDSs to determine the total estimated project cost. Of note in this method is that larger parcels are significantly more expensive to serve than smaller parcels. For this reason, it is expected that with a more detailed design the decision may be made to only provide service in areas with smaller median parcel sizes. This is particularly true for the area north of Bronson where the median parcel size is 4.4 acres, and it may not be cost-effective to provide water or sewer service.

Estimated unit costs for each community and the total estimated costs for the collection systems are provided in Table 16. For all the communities, conversion of all OSTDSs is expected to cost approximately $98.2 million. As stated above, it is likely inefficient to target all homes for conversion, especially those on large lots that are more expensive to convert.

Table 16. Estimated Wastewater Collection System Costs

Community	Number of OSTDSs	Median Parcel (ac)	Unit Cost ($)	Total Cost ($)
Bronson	182	0.64	$33,000	$6,006,000
Otter Creek	79	1.00	$40,000	$3,160,000
SR24 1-Mile Buffer	353	1.25	$45,000	$15,885,000
SR24 1 to 1.5-Mile Buffer	77	1.38	$47,000	$3,619,000
University Oaks	356	1.33	$46,000	$16,376,000
North Bronson	502	4.40	$106,000	$53,212,000
Total	**1,549**			**$98,258,000**

In addition to costs associated with construction of new collection systems for wastewater there are expected to be costs to construct master lift stations that will introduce wastewater into the regional wastewater pipeline. These are expected to cost between $0.25 and $1.0 million depending on the flow generated by each community.

Section 6 Cost-Effectiveness for Wastewater Conversion

A common metric for evaluating projects is the cost-effectiveness of the project relative to either improving water quality or increasing water quantity. For this project the benefits of septic-to-sewer conversion were evaluated based on the flow of converted OSTDSs and the reduction in TN loading to the Floridan Aquifer. An additional cost-effectiveness calculation was made for addition of a treatment wetland to further reduce TN in water recharged to the Floridan Aquifer. To estimate the cost-effectiveness of conversion from OSTDSs to sewer the following assumptions were made:

- Wastewater flows of 100 gallons per person per day.
- Average of 2.5 people per home.
- Inflow TN concentration of 40 mg/L to OSTDS.
- Reduction in TN of 30% in an OSTDS (Lusk et al. 2020).
- OSTDS attenuation during infiltration to UFA of 57.5% (average value of range from 40 to 75% in FDEP Nitrogen Source Inventory Loading Tool [NSILT][1]).
- WWTF attenuation during infiltration to UFA of 42.5% (between 10 and 75% attenuation in NSILT).
- WWTF achieves AWT with TN of 3 mg/L.
- Treatment wetland achieves a TN of 2 mg/L based on modeling of performance for AWT inflow quality.
- Cost-effectiveness calculated for 30-year planning horizon.
- Cost of septic-to-sewer conversion based on lot size as discussed in previous section.
- Cost of treatment wetland assuming lined system proportional to flow contribution.
- Wetland modeling assumed TN of 3 mg/L with 1 mg/L of organic nitrogen, 0.5 mg/L of NH_4-N, and 1.5 mg/L of NO_X-N.

6.1 Wastewater Treatment Facility Cost-Effectiveness

The cost-effectiveness of septic-to-sewer was evaluated based on the cost to sewer and the reduction in load to the Floridan Aquifer. This approach assumed that the reduction in load was equal to the attenuated load from OSTDSs minus the attenuated load from a wastewater facility. Based on this approach the OSTDSs were evaluated for each community separately since the cost to convert to sewer is different amongst communities. The range of cost-effectiveness values varied from $142 per pound of TN to $456 per pound of TN as shown in Table 17.

[1] https://floridadep.gov/dear/water-quality-restoration/content/nitrogen-source-inventory-and-loading-tool-nsilt-1

Table 17. Cost-Effectiveness for Conversion from an On-Site Treatment and Disposal System to an Advanced Wastewater Treatment Facility

Community	Number of OSTDSs	Total Cost ($)	OSTDS UFA Load (lb/yr)	WWTF UFA Load (lb/yr)	Load Reduction (lb/yr)	Cost-Effectiveness ($/lb)
Bronson	182	$6,006,000	1,649	239	1,410	$142
Otter Creek	79	$3,160,000	716	104	612	$172
SR24 1-Mile Buffer	353	$15,885,000	3,199	464	2,735	$194
SR24 1 to 1.5-Mile Buffer	77	$3,619,000	698	101	597	$202
University Oaks	356	$16,376,000	3,226	468	2,758	$198
North Bronson	502	$53,212,000	4,549	659	3,890	$456

6.2 Cost-Effectiveness of Tertiary Treatment Wetland

The concept of incorporating a treatment wetland as part of disposal was discussed earlier in the report as a method to achieve additional TN removal. For evaluating the incorporation of a wetland, performance was modelled using the P-k-C* model (Kadlec and Wallace 2009). Based on the proposed loading rate 6.2 acres were modelled for treatment of the entire facility capacity of 1.0 MGD. Following modeling this showed a reduction in TN over an annual cycle to an average of 2 mg/L. Since the treatment wetland would be located at the regional facility each community sending water was considered as having the same unit cost for treatment. This resulted in an estimated cost-effectiveness of $88 per pound of TN removed (Table 18). Not evaluated as part of this study is construction of a conventional WWTF (TN of ≤10 mg/L) with the reduction of TN to less than 3 mg/L occurring in a treatment wetland. This would likely drastically increase cost-effectiveness of treatment and reduce treatment plant construction costs.

Table 18. Cost-Effectiveness for a Tertiary Treatment Wetland at the Advanced Wastewater Treatment Facility

Community	Wetland Cost ($)	WWTF UFA Load (lb/yr)	Wetland UFA Load (lb/yr)	Load Reduction (lb/yr)	Cost-Effectiveness ($/lb)
Bronson	$211,500	239	159	80	$88
Otter Creek	$91,810	104	69	35	$88
SR24 1-Mile Buffer	$410,210	464	309	155	$88
SR24 1 to 1.5-Mile Buffer	$89,480	101	67	34	$88
University Oaks	$413,690	468	312	156	$88
North Bronson	$583,350	659	440	220	$88

Section 7 References

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