Wastewater Treatment Plant Master Plan

For the

City of Edgewater, Florida

Prepared by

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SECTION 1: INTRODUCTION

1.1 BACKGROUND

The City of Edgewater's wastewater system serves a population of nearly 25,000 within the approximately 25 square mile service area. Raw wastewater is collected in approximately 100 miles of gravity sewers and pumped by 60 Lift Stations through 60 miles of force main to the City's Wastewater Treatment Plant (WWTP) or Volusia County's Beacon Light Road Wastewater Treatment Facility (WWTF). Wastewater effluent is treated to public access reuse standards prior to distribution through nearly 40 miles of reclaimed water main to approximately 4,000 customers for landscape irrigation.

1.2 MASTER PLAN OBJECTIVES

The Wastewater Treatment Plant Master Plan was undertaken with the following objectives:

- Provide an overview of the City's existing wastewater treatment plant assets.
- Review the City's wastewater service area and areas targeted for expansion.
- Establish a wastewater level of service based upon historical wastewater demand data.
- Project the number of future[p-nmjk connections and wastewater flows within the service area.
- Develop recommendations for improvements to the wastewater treatment and collection systems to maintain compliance with regulatory requirements and to accommodate new growth.
- Prepare conceptual opinions of probable construction cost for the recommended improvements.
- Prioritize recommended improvements into an implementation plan with triggers based upon growth in the number of new service connections.

The Wastewater Treatment Plant Master Plan was developed based upon information available through May 2025, including assumed growth rates and patterns. It is recommended that the master plan be updated at a minimum of every five years.

1.3 DATA COLLECTION

The recommendations in this Wastewater Treatment Plant Master Plan were developed based upon a review of data found within the City's Florida Department of Environmental Protection (FDEP) Permit, Wastewater Treatment Plant Discharge Monitoring Reports, historical utility billing data, and discussions with City staff. Future population growth within the City's service area was projected based upon the "Small-Area Population Estimates and Projections for the City of Edgewater Utility Service Area" report prepared by the University of Florida's Bureau of Economic and Business Research (BEBR) dated January 26th 2025.

1.4 CONTENT AND ORGANIZATION

This Wastewater Treatment Plant Master Plan presents the data and methods used to evaluate the City's wastewater treatment plant, and recommendations for improvements to continue to maintain the same high level of service currently provided to the City's customers while accommodating future growth. The remainder of the Wastewater Treatment Plant Master Plan is organized as described below:

- **Section 2 – Existing Wastewater System:** Review of the wastewater system including service area, wastewater treatment plant, and lift stations.

- **Section 3 – Wastewater Flow and Load Projections:** Analysis of historical wastewater flow data to develop a level of service standard and preparation of future demand projections.

- **Section 4 – WWTP Expansion – Phase 1:** Evaluation of the current wastewater treatment plant unit processes and recommendations for improvements to continue to meet permit limits as part of an initial expansion to 4.125 MGD.

- **Section 5 – Future WWTP Expansions:** Development of conceptual site layouts to allow for phased implementation of improvements to allow for the ultimate wastewater treatment plant capacity of 8.25 MGD to be provided on the current site.

- **Section 6 – Supplemental Reclaimed Water Source Evaluation:** Evaluation of the current supplemental reclaimed water source with respect to meeting demand, and evaluation of the addition of a separate treatment train for supplemental reclaimed water.

- **Section 7 – Construction Cost Estimation Methodology:** Methodology for estimating capital costs of project implementation and estimated unit costs.

- **Section 8 – Implementation Plan:** Recommended implementation plan based upon project prioritization and actual growth within the service area.

- **Section 9 – Summary and Recommendations:** Summary of the recommendations of the master plan.

SECTION 2: EXISTING WASTEWATER SYSTEM

2.1 WASTEWATER SERVICE AREA

The existing wastewater service area covers approximately 25 square miles within the Edgewater City limits, as well as unincorporated Volusia County. Encompassing the area between New Smyrna Beach and Oak Hill, the wastewater service area stretches from the Indian River to the Spruce Creek Swamp. While the areas bordering the Indian River and US 1 are heavily developed, the vast majority of the wastewater service area west of Air Park Road and Silver Palm Drive consists of currently undeveloped land that has the potential for future growth.

A network of 60 wastewater lift stations, approximately 100 miles of gravity sewers, and 60 miles of force mains transport wastewater throughout the service area to either the City of Edgewater WWTP, or Volusia County's Beacon Light Road WWTF for treatment. The portion of the service area north of Volco Road generally is treated at the City's WWTP, while wastewater generated south of Volco Road is sent to the Beacon Light Road WWTF. The limits of the City's current wastewater service area and the locations of the WWTP and WWTF are presented in **Figure 2-1**.

2.2 WASTEWATER TREATMENT PLANT

The City of Edgewater's WWTP, located on Mango Tree Drive, is the site of the original wastewater treatment plant serving the City. Operating under FDEP Permit Number FL0021431, the WWTP has a currently permitted annual average daily flow (AADF) of 2.75 MGD. Wastewater is treated to provide advanced nutrient removal and to public access reuse standards prior to being distributed for landscape irrigation. A surface water discharge to the Indian River North is utilized during wet weather periods. A site plan of the existing WWTP is presented in **Figure 2-2**, while a process flow diagram for the existing WWTP is presented in **Figure 2-3**. A summary of the existing unit processes at the City's wastewater treatment facility is presented below.

2.2.1 INFLUENT SCREENING AND GRIT REMOVAL

Raw wastewater enters the WWTP through a 24-inch force main before flowing through the pretreatment structure located at grade. Large solids are removed by one of two mechanical bar screens. The screened wastewater then flows through an induced vortex grit removal unit to remove heavy inorganic solids including sand. Odor control is provided by a biotrickling filter. Return activated sludge (RAS) can also be returned to the influent of the pretreatment structure to help reduce odors. Screenings and grit are dewatered and deposited in dumpsters near the structure for disposal. A summary of the influent screening and grit removal process is presented in **Table 2-1** below.

Table 2-1: Summary of Influent Screening and Grit Removal

Parameter	Design Criteria
Type of Screen	Mechanical Bar Screen
Number of Screens	2
Opening Size	6 mm
Capacity	8,400 GPM
Type of Grit Removal System	Induced Vortex
Diameter of Grit Removal System	12'-0"

2.2.2 INFLUENT PUMP STATION

Screened degritted wastewater flows into the influent pump station prior to being pumped into the biological process basin. The concrete wetwell houses three submersible pumps, with space for the future addition of a fourth pump. The odor control unit serving the pretreatment structure is also connected to the influent pump station. Influent flow into the WWTP is measured by a magnetic flowmeter downstream of the influent pump station. A summary of the influent pump station process is presented in **Table 2-2** below.

Table 2-2: Summary of Influent Pump Station

Parameter	Design Criteria
Pumping Capacity	4,400 GPM
Number of Pumps	3 (2 Duty / 1 Standby)
Design Flow per Pump	2,200 GPM

2.2.3 BIOLOGICAL TREATMENT

Biological treatment is provided by the five-stage Bardenpho process, an activated sludge process specifically designed to provide biological removal of phosphorus and nitrogen from wastewater. Wastewater pumped from the Influent Pump Station mixes with RAS in an influent splitter box that utilizes weir gates to split flow between two parallel process trains. Each of the two anaerobic zones is divided into two sections where solids are kept in suspension using vertical shaft mixers. The anaerobic zones are followed by two first anoxic zones where nitrate rich mixed liquor is recycled from the aeration basins. Vertical shaft mixers are used to keep the solids in suspension in the first anoxic zones. Flow then enters one of the two oxidation ditches where a surface turbine aerator provides both dissolved oxygen for aeration, and motive force to circulate wastewater throughout the basin. The aerators are controlled by variable frequency drives (VFDs) that adjust the speed of the aerators to maintain a set dissolved oxygen within the oxidation ditches. While the oxidation ditches were originally constructed to utilize internal recycle pumps, they were retrofit to provide internal recycle of mixed liquor back to the first anoxic zone controlled through the use of a manual gate. The oxidation ditches are followed by two second anoxic zones for the removal of additional nitrate, where solids are kept in suspension using vertical shaft mixers. Reaeration zones following each second anoxic zone contain coarse bubble diffusers for aeration. Two positive displacement blowers in sound enclosures are located at grade outside of the five-stage Bardenpho train. A summary of the biological treatment process is presented in **Table 2-3** below.

Table 2-3: Summary of Biological Treatment Process

Parameter	Design Criteria
Anaerobic Zone	
Number of Basins	4
Volume per Basin	46,300 gallons
Side Water Depth	12’-9”
Number of Mixers	4
Mixer Motor Horsepower	3 HP
First Anoxic Zone	
Number of Basins	2
Volume per Basin	180,200 gallons
Side Water Depth	12’-9”
Number of Mixers	2
Mixer Motor Horsepower	10 HP
Oxidation Ditches	
Number of Basins	2
Volume per Basin	388,700 gallons
Side Water Depth	12’-9”
Solids Retention Time	6.78 hrs
Design MLSS Concentration	4,000 mg/L
Number of Aerators	2
Aerator Motor Horsepower	100 HP
Second Anoxic Zone	
Number of Basins	2
Volume per Basin	149,500 gallons
Side Water Depth	12’-9”

Number of Mixers	2
Mixer Motor Horsepower	7.5 HP
Reaeration Zone	
Number of Basins	2
Volume per Basin	34,100 gallons
Side Water Depth	12.65 ft
Number of Blowers	2
Blower Capacity	400 SCFM
Mixer Motor Horsepower	30 HP

2.2.4 SECONDARY CLARIFICATION

Effluent from the biological treatment flows by gravity to one of three circular secondary clarifiers. The secondary clarifiers are standard center feed units, where effluent overflows v-notch weirs along the outer perimeter of the tank. Fiberglass launder covers are used to prevent algae growth on the v-notch weirs.

Activated sludge is withdrawn from the bottom of the clarifiers into a sludge pit using telescoping valves to control the sludge blanket level in the clarifiers. RAS pumps return activated sludge from the sludge pit to the pretreatment structure and the biological process basins. Waste activated sludge (WAS) is withdrawn from the sludge pit and pumped to the sludge holding tank. Clarifier Nos. 1 and 2 share WAS pumps that also pump scum from the scum pit to the sludge holding tanks. Clarifier No. 3 has dedicated WAS pumps, and a fiberglass wetwell with submersible pumps to transfer scum to the scum pit. A summary of the secondary clarification process is presented in **Table 2-4** below.

Table 2-4: Summary of Secondary Clarification Process

Parameter	Design Criteria
Type of Clarifiers	Circular Center Feed
Number of Clarifiers	3
Diameter	70 ft
Side Water Depth	12 ft
Hydraulic Loading Rate	237 GPD per ft^2
Drive Motor Horsepower	0.75 HP

2.2.5 TERTIARY FILTRATION

Secondary effluent flows by gravity to one of the four deep-bed continuous backwash sand filters. Supplemental reclaimed water can also be pumped into the influent channel of the filters. Filtered effluent flows to the chlorine contact basin by gravity. Backwash waste and overflow flow to the In-Plant Recycle Pump Station where they are pumped to the head of the biological process train. A summary of the tertiary filtration process is presented in **Table 2-5** below.

Table 2-5: Summary of Tertiary Filters

Parameter	Design Criteria
Type of Filter	Continuous Backwash Sand Filters
Number of Filters	4
Type of Media	Sand
Design Average Influent Flow	2.75 MGD
Total Filter Area	800 ft^2

2.2.6 DISINFECTION

Filtered wastewater flows by gravity to the chlorine contact basin for disinfection. Sodium hypochlorite is injected into an influent chamber where it is mixed into the wastewater by a vertical shaft mixer before being split between the two chlorine contact basins. Disinfected effluent flows into the effluent transfer station. A summary of the disinfection process is presented in **Table 2-6** below.

Table 2-6: Summary of Disinfection Process

Parameter	Design Criteria
Number of Basins	2
Volume per Basin	60,500 gallons
Total Volume	121,000 gallons
Contact Time at ADF	63 minutes
Design Chlorine Residual	1.0 mg/L
Number of Transfer Pumps	3
Pump Station Capacity	5,200 GPM
Type of Pump	Vertical Turbine
Design Flow per Pump	2,600 GPM

2.2.6.1 EFFLUENT TRANSFER PUMP STATION

Disinfected effluent flows into the effluent transfer pump station, a concrete wetwell on the effluent end of the chlorine contact basin that houses three vertical turbine pumps. Under normal operating conditions the effluent transfer pumps pump effluent into the reclaimed water ground storage tanks. During periods of wet weather when the storage tanks are full the effluent transfer pumps can be used to pump effluent to the post-aeration basin for discharge to the Indian River North.

Table 2-7: Summary of Effluent Transfer Pump Station Process

Parameter	Design Criteria
Number of Transfer Pumps	3
Pump Station Capacity	7.5 MGD
Type of Pump	Vertical Turbine
Design Flow per Pump	2,600 GPM

2.2.7 RECLAIMED WATER STORAGE AND PUMPING

Reclaimed water is stored in two on-site reclaimed water storage tanks. Reclaimed water high service pumps distribute reclaimed water into the City's distribution system for landscape irrigation. One of the two reclaimed water storage tanks can also be used for reject storage, and a third ground storage tank is dedicated to reject storage. A summary of the reclaimed water storage and pumping process is presented in **Table 2-8**.

Table 2-8: Summary of Reclaimed Water Storage and Pumping Capacity

Parameter	Design Criteria
Number of Reuse Storage Tanks	2
Total Volume of Reuse Storage	4.5 Million Gallons
Number of Reject Storage Tanks	1
Total Volume of Reject Storage	3.25 Million Gallons
Number of High Service Pumps	5
Type of Pump	Horizontal Split Case
Design Flow per Pump 6 & 7	2,250 GPM
Design Flow per Pump 3 & 4 & 5	1,350 GPM

2.2.8 SURFACE WATER DISCHARGE

The WWTP maintains a surface water discharge to the Indian River North with a permitted capacity of 0.83 MGD AADF that is used during periods of wet weather, or when the effluent fails to meet the reclaimed water standards. Effluent flows from the chlorine contact basin to the post-aeration basin where it is aerated using two floating aerators to increase the dissolved oxygen, and dechlorinated using sodium bisulfite prior to being pumped to the outfall in the Indian River North. A summary of the surface water discharge process is presented in **Table 2-9**.

Table 2-9: Summary of Surface Water Discharge Process

Parameter	Design Criteria
Flow Rate	0.83 MGD AADF
Number of Transfer Pumps	3
Type of Pump	Vertical turbine
Design Flow per Pump	2,600 GPM
Number of Aerators	2
Type of Aerator	Floating
Horsepower	20 HP

The existing outfall pipe line from the WWTP to the Indian River runs along Ocean Avenue, a distance of approximately 4,500 linear feet. The majority of the outfall was upgrade to 16-inch diameter, with the exception being the submerged portion of the pipeline in the Indian River.

2.2.9 SOLIDS HANDLING

Waste Activated Sludge (WAS) from the secondary clarifiers is pumped to a sludge holding tank prior to dewatering using a centrifuge. The dewatered biosolids meet the requirements for Class B contained within 40 CFR Part 503 based upon the Monitoring of Fecal Coliform criteria.

The sludge holding tank is aerated to reduce odors and provide mixing to prevent the settling of solids. WAS is pumped from the sludge holding tank to a permanently installed centrifuge where polymer is injected and sludge is dewatered prior to being hauled offsite for land application by a third-party vendor. A summary of the solids handling process is presented in **Table 2-10**.

Table 2-10: Summary of Solids Handling System

Parameter	Design Criteria
Type of Sludge Holding	Aerobic
Number of Sludge Holding Tanks	1
Total Volume	75,000 gallons
Aeration Requirement	2,250 scfm
Type of Dewatering	Centrifuge
Numbers of Centrifuges	One
Centrifuge Capacity	75 gpm

2.2.10 CHEMICAL STORAGE AND FEED

Sodium hypochlorite, alum, and sodium bisulfite are used in the treatment process at the WWTP. All three chemicals are stored in the centrally located Chemical Storage Building and pumped directly from bulk storage tanks to the injection point by chemical metering pumps housed in an enclosed room within the Chemical Storage Building.

2.2.10.1 SODIUM HYPOCHLORITE

Sodium hypochlorite is used for disinfection of the effluent prior to it being pumped into the reclaimed water distribution system or discharged into the Indian River. Two HDPE double walled sodium hypochlorite bulk storage tanks are located under the covered portion of the Chemical Storage Building. A summary of the sodium hypochlorite storage and feed system is presented in **Table 2-11**.

Table 2-11: Summary of Sodium Hypochlorite Storage and Feed System

Parameter	Design Criteria
Number of Metering Pumps	4
Metering Pump Capacity Per Pump	14 gph
Total Metering Pump Capacity	42 gph
Type of Storage Tanks	Double-Walled HDPE
Number of Storage Tanks	2
Capacity per Storage Tank	3,050 gallons
Total Storage Capacity	6,100 gallons

2.2.10.2 ALUM

Aluminum sulfate (Alum) is used as a coagulant to aid in the removal of total suspended solids and phosphorus in the tertiary filters. Alum is stored in a single walled FRP storage tank located in a concrete secondary containment structure outside of the Chemical Storage Building. A summary of the alum storage and feed system is presented in **Table 2-12**.

Table 2-12: Summary of Alum Storage and Feed System

Parameter	Design Criteria
Number of Metering Pumps	2
Metering Pump Capacity	14 gph
Type of Storage Tanks	Double Wall XLPE
Number of Storage Tanks	1
Capacity per Storage Tank	4,400 gallons
Total Storage Capacity	4,400 gallons

2.2.10.3 SODIUM BISULFITE

Sodium bisulfite reacts with free chlorine to reduce the chlorine residual in the effluent. While sodium bisulfite is not regularly dosed during the treatment process, it is critical to meeting the permit limits associated with the surface water discharge to the Indian River. Sodium bisulfite is stored in a single HDPE double walled bulk storage tank located under the covered portion of the Chemical Storage Building. A summary of the sodium bisulfite storage and feed system is presented in **Table 2-13**.

Table 2-13: Summary of Sodium Bisulfite Storage and Feed System

Parameter	Design Criteria
Number of Metering Pumps	2
Metering Pump Capacity	14 gph
Type of Storage Tanks	Double Walled HDPE
Number of Storage Tanks	1
Capacity per Storage Tank	3,050 gallons
Total Storage Capacity	3,050 gallons

2.2.11 OPERATIONS AND ELECTRICAL BUILDINGS

The existing Operations Building is a single-story concrete block structure constructed in the early 1990s that originally included two offices, a conference room, an electrical room, a control room, a lab, and restrooms with lockers and showers. An expansion constructed in the mid-2010s doubled the size of the lab space increasing the overall size of the building from approximately 1,900 square feet to 2,200 square feet.

Motor control center (MCC) Nos. 1 and 2 are located in the electrical room in the existing operations building. MCC Nos. 3 and 4 are located in the existing dewatering building. MCC Nos. 5 and 6 are located in a concrete block building located near the reclaimed water high service pumps. MCC Nos. 7 and 8 are housed in a 420 square foot prefabricated electrical building adjacent to the existing biological treatment process. Redundant back up power is provided by a 1000 kW diesel generator with a base mounted day tank and a 4,000 gallon above ground storage tank.

2.3 WASTEWATER COLLECTION SYSTEM

2.3.1 LIFT STATIONS

The City owns and maintains 60 lift stations throughout its service area. Nearly half of the lift stations pump directly to the City's WWTP, while eight pump directly to Volusia County's Beacon Light WWTF. The remaining lift stations discharge into the gravity sewer system, and are repumped by another lift station. A map showing the locations of all of the City's lift stations is presented in **Figure 2-4**.

2.3.2 INFILTRATION AND INFLOW ANALYSIS

Infiltration and inflow are an on-going concern in the City's wastewater collection system leading to significant peaks in influent wastewater flow to the WWTP during wet weather. Rehabilitation of the collection system has the potential to reduce influent peak flows, while increasing the reliability of the WWTP. While the collection system is not a focus of the Master Plan, lift station run time data from the 48 lift stations that are on the City's SCADA system was reviewed during wet and dry weather periods in an effort to identify the lift station basins most impacted by infiltration and inflow. Evaluating lift station basins by the increase in wastewater flow during wet weather periods is more beneficial than solely evaluating run time data. However, pump data for each lift station was not able to be obtained to complete this analysis.

Lift station run time data for 34 dry weather days and 22 wet weather days throughout 2024 were included in the evaluation. Lift stations with average run times during wet weather that exceed their average run time during dry weather by more than four hours per day are presented in **Table 2-13**.

Table 2-13: Lift Station Run Time Increases During Wet Weather

Lift Station	Wet Weather Run Time Increase	Percentage Run Time Increase
Lift Station 4	868 minutes per day	94%
Lift Station 15	627 minutes per day	136%
Lift Station 8	414 minutes per day	66%
Lift Station 27	329 minutes per day	56%
Lift Station 45	285 minutes per day	182%
Lift Station 6	276 minutes per day	65%
Lift Station 26	251 minutes per day	35%

The combined impact of the infiltration and inflow experienced within these seven lift station basins is an increase in average pump run time of over 50 hours per day when compared to dry weather operation. It is recommended that the City complete a full evaluation of the condition of the collection system, and develop a rehabilitation plan with the goal of reducing infiltration and inflow in the collection system.

2.4 SUPPLEMENTAL RECLAIMED WATER SUPPLY

Reclaimed water demand in the City's distribution system regularly exceeds the available reclaimed water supply, requiring a supplemental reclaimed water supply. Stormwater from the on-site stormwater retention pond serves as supplemental reclaimed water during periods of heavy demands. Discharge of reclaimed water into the pond is not permitted in the current FDEP as the stormwater pond could potentially discharge. Due to the volume of the pond combined with its proximity to the reclaimed water storage tanks, there is a desire to explore permitting a reclaimed water discharge to the pond in the future.

The City's St. John's River Water Management District (SJRWMD) Consumptive Use Permit (CUP) currently allows for the withdrawal of 365 million gallons per year of stormwater for supplemental reclaimed water supply. Filtration and disinfection of the stormwater are required per FDEP regulations. A pump station adjacent to the pond pumps stormwater to the head of the filters where it mixes with the influent wastewater prior to being filtered and flowing to the chlorine contact chamber.

SECTION 3: WASTEWATER FLOW AND LOAD PROJECTIONS

3.1 LEVEL OF SERVICE STANDARD

The City of Edgewater's Comprehensive Plan, Chapter 4, Policy 1.1.1, states that the average daily wastewater flow is 204 gallons per day per ERU. The most recent available Committed Capacity Report for Water, Wastewater, and Solid Waste, FY2022-2023 found the actual average daily flow per connection to be 156 gallons per day. Future wastewater flow rates were estimated based upon the adopted level of service of 204 gpd per ERU.

3.2 HISTORICAL WASTEWATER FLOWS

Historical wastewater flow data from 2020 to 2024 was reviewed to determine current wastewater flow in the City's service area and establish a baseline for future growth. Monthly and annual average daily flows were determined from the WWTP Discharge Monitoring Reports. Wastewater flow within the service area is relatively consistent throughout the year, peaking in the fall months due to high rainfall. October 2022 and 2024 saw peak flows due to Hurricane Ian and Hurricane Milton, respectively. A summary of the monthly average daily flows is presented in **Table 3-1.**

Table 3-1: Summary of 2020 to 2024 Wastewater Flows

Month	2020 (MGD)	2021 (MGD)	2022 (MGD)	2023 (MGD)	2024 (MGD)
January	1.766	1.412	1.611	1.356	1.559
February	1.515	1.444	1.456	1.288	1.345
March	1.407	1.373	1.445	1.267	1.438
April	1.375	1.484	1.529	1.249	1.351
May	1.358	1.459	1.295	1.263	1.248
June	1.665	1.307	1.241	1.523	1.317
July	2.017	1.639	1.356	1.639	1.331
August	1.870	1.598	1.292	1.604	1.380
September	2.160	1.724	1.540	1.460	1.918
October	2.297	1.665	2.586	1.917	2.469
November	1.958	1.636	1.973	1.704	1.720

December	1.569	1.553	1.501	1.671	1.461
Average	**1.746**	**1.525**	**1.569**	**1.495**	**1.552**
Maximum	**2.297**	**1.724**	**2.586**	**1.917**	**2.469**
Note: Flow rates presented in this table are projected annual average daily flows.					

3.3 POPULATION PROJECTIONS

The University of Florida's Bureau of Economic and Business Research (BEBR) conducted a small-area population estimate and projection for the City of Edgewater Utility Service Area that was utilized for estimating the future population of the service area. The study utilized 2024 population data, as well as future land use and data on approved development to project the population of the City in five year increments from 2025 to 2050. The full January 2025 BEBR study is included as **Appendix A**. A summary of the growth projections for the City's wastewater service area is presented in **Table 3-2**.

Table 3-2: Summary of Population Projections

Year	Population
2024	24,772
2025	26,008
2030	28,538
2035	37,469
2040	40,329
2045	42,739
2050	44,824
Build-Out	80,772

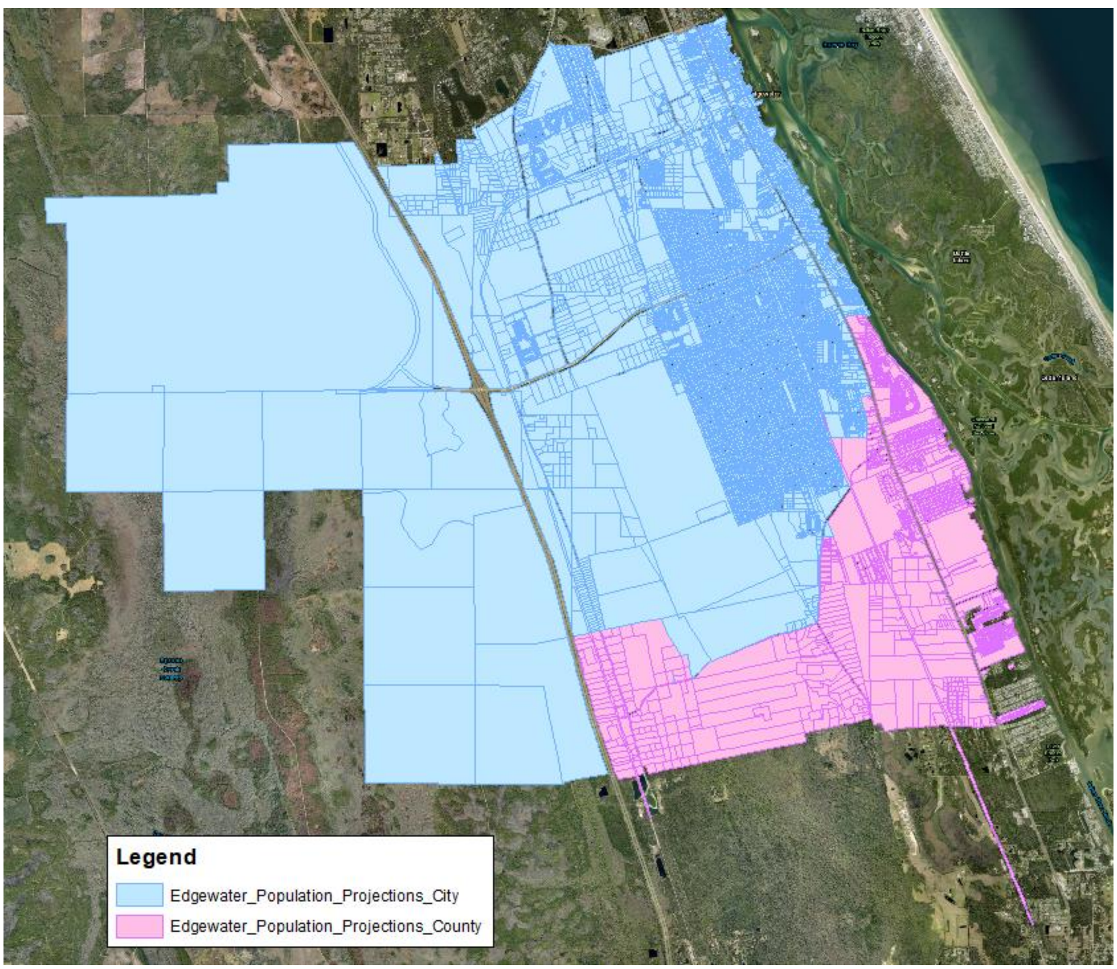
While the population projections do not extend beyond 2050, supplemental information provided with the study included GIS files that identified the size of every parcel of land within the City's wastewater service area, and a maximum population density for that parcel. This information was utilized to project the future build-out population of the wastewater service area. The build-out population was utilized to project the future maximum influent flow to the WWTP to allow the master plan to be developed consistent with the City's goal of providing wastewater treatment for all future flows on the current WWTP site.

3.4 WASTEWATER FLOW PROJECTIONS

Historical influent flows to the WWTP were reviewed to determine a baseline influent flow based on current conditions. The maximum month average daily flow for the period from 2022 to 2024, excluding peak flow events associated with Hurricanes Ian and Milton was assumed to be the current influent flow to the WWTP. Future influent wastewater flow rates were estimated based upon the projected increase in population assuming the US Census Bureau's estimate of 2.09 people per household, and the City's adopted level of service of 204 gpd per ERU.

As wastewater generated in the City's service area is treated at both the City of Edgewater WWTP and Volusia County's Beacon Light Road WWTF, wastewater flow projections were developed for the portion of flow that would be treated at each facility under the terms of the current agreement between the City and the County. A map showing where wastewater generated at each parcel within the service would be treated is presented in **Figure 3-1**.

Figure 3-1: Edgewater Wastewater Service Area Boundaries



Wastewater flow projections for the City's service area through 2050, including the portion that would be treated by the City or County under the current agreement are presented in **Table 3-2.**

Table 3-2: Wastewater Flow Projections

Year	City of Edgewater WWTP		Beacon Light Road WWTF		Total Wastewater Service Area	
	Population	Flow	Population	Flow	Population	Flow
2024	24,772	1.97	3,974	0.39	28,746	2.36
2025	26,008	2.09	4,183	0.41	30,191	2.50
2030	28,538	2.34	5,569	0.54	34,107	2.88
2035	30,395	2.52	7,074	0.69	37,469	3.21
2040	32,752	2.75	7,577	0.74	40,329	3.49
2045	34,841	2.95	7,898	0.77	42,739	3.72
2050	36,808	3.14	8,016	0.78	44,824	3.93

In addition to wastewater flows associated with growth, the City has identified 1,202 parcels with septic tanks that are to be included in a septic to sewer program. While the timing of the implementation of the septic to sewer system has not been determined, the elimination of septic tanks is projected to generate approximately 0.25 MGD in additional wastewater flow on an annual average daily basis. A summary of the septic to sewer flow projections is presented in **Table 3-3.**

Table 3-3: Septic To Sewer Wastewater Flow Projections

City of Edgewater WWTP		Beacon Light Road WWTF		Total Wastewater Service Area	
Septic Tanks	Flow	Septic Tanks	Flow	Septic Tanks	Flow
828	0.17	374	0.08	1,202	0.25

In addition to the uncertainty regarding the timing of the implementation of the septic to sewer program, there is potential that the City and Volusia County choose to discontinue their interlocal agreement for the treatment of wastewater at the Beacon Light Road WWTF. In the event that the interlocal agreement was terminated, all of the wastewater generated within the City's wastewater service area would be treated at the City's WWTP. A build-out scenario that includes projected wastewater flows associated with the maximum population of all parcels within the City's wastewater service area, as well as additional flow generated from the septic to sewer program was developed. The timing of the build-out scenario is unknown, but it allows for master planning of the WWTP site to provide capacity for the maximum future projected wastewater flow rate consistent with the City's goal. A summary of the wastewater flow projections for the City's wastewater service area under the build-out scenario is presented in **Table 3-4**.

Table 3-4: Summary of Build-Out Scenario Wastewater Flow Projections

Contributor	Population	Flow (MGD)
Parcels North of Volco Road	70,712	6.90
Parcels South of Volco Road	10,060	0.98
Septic to Sewer Program		0.25
Total	**80,772**	**8.13**

A build-out expansion of the WWTP to 8.25 MGD would provide sufficient capacity for all potential future development within the limits of the City's current wastewater service area at the adopted level of service. Incremental increases in capacity coinciding with growth reduce the likelihood of over-expanding and equipment and structures sitting unused deteriorating. A phased expansion of the City's WWTP from 2.75 MGD to 8.25 MGD is recommended. Each of the four phases of the expansion would increase the capacity of the WWTP by 1.375 MGD, approximately 6,740 ERUs of additional capacity at the City's adopted level of service. Due to the high levels of infiltration and inflow in the collection system, a peak hour peaking factor of 4.0 was assumed for the future phases of the WWTP. A summary of the recommended WWTP expansion phasing is presented in **Table 3-5**.

Table 3-5: Recommended WWTP Expansion Phasing

Phase	Permitted Capacity AADF (MGD)	Projected Peak Hour Flow (MGD)
Existing WWTP	2.750	11.00
Phase 1 Expansion	4.125	16.50
Phase 2 Expansion	5.500	22.00
Phase 3 Expansion	6.875	27.50
Phase 4 Expansion	8.125	32.50

3.5 WASTEWATER LOAD PROJECTIONS

Historical influent wastewater mass loads were reviewed to determine average concentrations in the influent, as well as peaking factors for use in sizing the proposed future improvements. Five day carbonaceous biochemical oxygen demand ($CBOD_5$), total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP) concentrations in the wastewater influent were measured weekly during 2023 and 2024. A biochemical oxygen demand (BOD_5) to $CBOD_5$ ratio of 1.1:1 was assumed to estimate BOD_5 concentrations in the influent wastewater. A summary of the historical wastewater loads and peaking factors is presented in **Table 3-6**.

Table 3-6: Historical Wastewater Mass Loads

Parameter	Average Concentration	Mass Load - AAD	Max Month Peaking Factor	Mass Load – MMAD
	mg/L	lbs/day		lbs/day
BOD_5	182	2,241	1.27	2,846
TSS	180	2,217	1.92	4,252
Total Nitrogen	42	498	1.09	541
Total Phosphorus	4.7	56	1.24	69

Historical influent concentrations are consistent with the original design assumptions. The 2023 and 2024 average concentrations mass load peaking factors were utilized to develop design criteria for the proposed expansion. A summary of projected maximum month influent wastewater mass loadings is presented in **Table 3-7**.

Table 3-7: Projected Maximum Month Influent Wastewater Mass Loads

Parameter	Units	Phase 1	Phase 2	Phase 3	Phase 4
BOD_5	Lb/d	7,952	10,602	13,253	15,904
TSS	Lb/d	11,890	15,853	19,816	23,779
Total Nitrogen	Lb/d	1,575	2,100	2,625	3,150
Total Phosphorus	Lb/d	213	284	355	427

SECTION 4: WWTP EXPANSION – PHASE 1

The Phase 1 expansion of the WWTP would increase the permitted capacity from 2.75 MGD to 4.125 MGD. A conceptual site plan showing the Phase 1 Expansion improvements is presented in **Figure 4-1**. A summary of the recommended improvements included in the expansion are presented below.

4.1 INFLUENT SCREENING AND GRIT REMOVAL

The existing pretreatment structure cannot be expanded to add additional capacity, and it is located near the eastern fence line of the site. Construction of a new headworks structure with additional capacity, and the ability to be easily expanded in future phases of construction is recommended. The proposed headworks would consist of three screening channels, with two channels containing mechanical screens with screenings washer and compactors and the third channel containing a manual bar rack for redundancy. Screened wastewater would then flow into a forced vortex grit removal system. A single grit removal unit with a bypass channel would be provided. Settled grit would be pumped from the bottom of the grit removal unit to a grit classifier for dewatering. Compacted screenings and dewatered grit would be collected in a common dumpster adjacent to the headworks structure for disposal. The headworks structure would be covered and odor controlled.

The location of the current influent flow meter downstream of the influent pump station does not allow for accurate measurement of peak flows into the WWTP due to equalization provided within the influent pump station wetwell. A flow meter would be provided at the headworks to measure influent flows, along with an influent composite sampler for regulatory compliance. A summary of the influent screening and grit removal systems is presented in **Table 4-1**.

Table 4-1: WWTP Influent Screening and Grit Removal Design Criteria

Parameter	Design Criteria
Type of Screen	Manual Bar Screen
Number of Screens	1
Opening Size	1 in
Peak Hour Flow	16.5 MGD
Type of Screen	Mechanical Bar Screen
Number of Screens	2

Opening Size	3 mm
Peak Hour Flow	16.5 MGD
Type of Grit Removal	Vortex
Number of Units	1
Size of Unit	12 ft
Grit Pump Flow Rate	250 GPM

4.2 INFLUENT PUMP STATION

Similar to the headworks, the influent pump station at the WWTP does not have sufficient capacity to support the expansion. Also, due to the location of the existing influent pump station expansion of the wetwell to accommodate the build-out capacity is not possible in its current location due to site constraints. Construction of a new influent pump station is required.

Elevating the proposed headworks was evaluated as an alternative to eliminate the need for an influent pump station, however 29 existing lift stations pump directly to the WWTP. In the event that the headworks was elevated to allow for gravity flow of wastewater through the WWTP, improvements to all 29 of the existing lift stations would be required to accommodate the additional static head. Construction of a new influent pump station would also allow for the wetwell to be oversized to provide for equalization of influent flows during peak flow events.

Screened and degritted wastewater flows to the influent pump station to be repumped to a splitter box to distribute flow to each biological treatment process basin. The proposed influent pump station would consist of submersible pumps housed in a concrete wetwell constructed adjacent to the new headworks. Sufficient pumping capacity would be provided for the peak hour flow, and the entire influent pump station would be covered and odor controlled. A summary of the design criteria for the influent pump station is presented in **Table 4-2**.

Table 4-2: WWTP Influent Pump Station Design Criteria

Parameter	Design Criteria
Pumping Capacity	14,000 GPM
Type of Pump	Submersible
Number of Pumps	5 (4 Duty / 1 Standby)
Design Flow per Pump	3,500 GPM

4.3 BIOLOGICAL TREATMENT

The existing 5-Stage Bardenpho biological treatment process basins effectively treat wastewater to meet the discharge limits for both public access reuse, and the surface water discharge. However, the mechanical equipment has been in service for over 20 years and has reached the end of its useful life, and the vertical shaft mixers are prone to ragging. The existing biological process trains would be rehabilitated as part of the proposed expansion. Each basin would be drained, cleaned, and any deterioration of the concrete structure repaired. All of the mechanical equipment including mixers, aerators, diffusers, blowers, and gates would also be replaced. Alternative mixer technologies including hyperbolic mixers that are less prone to ragging would be evaluated for use in the anaerobic, first anoxic, and second anoxic zones, and the reaeration blowers would be replaced with larger units to allow for one blower to be in-service with a second blower installed for redundancy.

A new five-stage Bardenpho process basin would be constructed adjacent to the existing, with an access path in between. The proposed basin would consist of anerobic zone, first anoxic zone, oxidation ditch, second anoxic zone, and reaeration zone. Unlike the existing process basin, the new proposed basin would be constructed with rounded ends to reduce grit building buildup in the corners. The anaerobic, first anoxic, and second anoxic zones will be mixed by vertical shaft mixers. Mechanical turbine aerators equipped with variable frequency drives (VFDs) will be provided in the oxidation ditches. The reaeration basins will be aerated using two positive displacement blowers and a grid of coarse bubble diffusers. Adjustable internal recycle gates will control the recycle of mixed liquor from the oxidation ditches to the first anoxic zones. Dissolved oxygen (DO) probes will control the speed of the aerators, and an oxidation-reduction potential (ORP) probe will control the position of the internal recycle gates. A summary of the biological treatment process design criteria is presented in **Table 4-3**.

Table 4-3: WWTP Biological Treatment Process Design Criteria

Parameter	Design Criteria
Anaerobic Zone	
Number of Basins	4
Volume per Basin	46,300 gallons
Side Water Depth	12.78 ft
Number of Mixers	4
First Anoxic Zone	
Number of Basins	2
Volume per Basin	180,200 gallons
Side Water Depth	12.74 ft
Number of Mixers	2

Aeration Basin	
Number of Basins	2
Volume per Basin	388,700 gallons
Side Water Depth	12.71 ft
Solids Retention Time	6.78 hrs
Design MLSS Concentration	4500 mg/L
Number of Aerators	2
Second Anoxic Zone	
Number of Basins	2
Volume per Basin	149,500 gallons
Side Water Depth	12.68 ft
Number of Mixers	2
Reaeration Zone	
Number of Basins	2
Volume per Basin	34,100 gallons
Side Water Depth	12.65 ft
Number of Blowers	2
Blower Capacity	500 SCFM

The existing oxidation ditches at the WWTP utilize the Ovivo Carrousel process with surface mounted mechanical aerators. Significant power savings can be obtained in the oxidation ditches by utilizing diffused air combined with submersible mixers or rotors. Diffused air provides more efficient oxygen transfer than can be obtained with mechanical surface aerators, and the addition of submersible mixers allows for aeration and mixing to be provided independently, increasing the ability of the operator to control the process.

Additionally, the existing biological process was originally constructed with internal recycle pumps to recirculate wastewater from the oxidation ditch back to the first anoxic zone. The oxidation ditches were later retrofit with internal recycle channels utilizing internal recycle gates to control the internal recycle flow. The internal recycle channels have proven to be difficult to clean and maintain, while the gates are prone to ragging and issues with control have led to the gates being operated manually. Internal recycle pumps operated on variable frequency drives offer the advantage of increased control, while being less prone to ragging and more accessible for maintenance. Further evaluation of the use of diffused air and internal recycle pumping should be completed during the preliminary design stage of the project.

4.4 SECONDARY CLARIFICATION

The three existing secondary clarifiers would remain in service after the expansion. The three existing clarifiers would be drained, cleaned, and any deteriorated concrete repaired. The clarifier mechanisms would be replaced. Clarifier No. 3 would also be modified to add a drain. The existing RAS, WAS, and scum pumps are planned to be replaced as part of an upcoming resiliency project and would not be replaced as part of the Phase 1 improvements.

Construction of two new 70-foot diameter clarifiers are proposed. The clarifiers will be constructed in concrete tanks with spiral scraper clarifier mechanisms with energy dissipating inlets, v-notch weirs, and Stamford baffles. Secondary effluent would flow over the v-notch weirs into a covered launder before flowing to the tertiary filters. RAS and WAS will be drawn directly from the bottom of each clarifier using centrifugal solids handling pumps mounted on a slab on grade. RAS pumps and WAS pumps would be provided. Scum from the clarifier surface would be collected in a below grade wetwell and pumped by double-disc pumps to the sludge holding tank for disposal.

Effluent from the biological process basins would flow into an MLSS splitter box with five weirs to evenly split flow between the proposed and existing clarifiers. RAS would be pumped into a drum screen mounted above the MLSS splitter box. Screened RAS would be discharged into the splitter box prior to flow splitting, while screenings would be dewatered and discharged into a dumpster. A summary of the proposed secondary clarifier design criteria is presented in **Table 4-4**.

Table 4-4: WWTP Secondary Clarification Design Criteria

Parameter	Design Criteria
Type of Clarifiers	Circular Center Feed
Number of Clarifiers	2
Diameter	70 ft
Side Water Depth	12 ft
Hydraulic Loading Rate	313 GPD per ft^2
Drive Motor Horsepower	0.75 HP

4.5 TERTIARY FILTRATION

The existing continuous upflow sand filter units have been in service since 1993 and require frequent maintenance including the replacement of sand. Replacement of the existing filters with new disc filters is proposed as part of the expansion. These proposed disc filter units would be contained in pre-fabricated steel tanks with skid mounted backwash pumps which will be installed on a slab on grade. To provide access for operations and maintenance, an elevated aluminum platform will be provided around the disc filter units.

Effluent from the clarifiers will flow into the disc filter units which will then flow to the chlorine contact basins. Backwash will flow into a manhole to be returned to the head of the plant for treatment. Each filter unit will include influent and effluent isolation valves, and a sodium hypochlorite feed line for intermittent dosing to prevent algae growth. A summary of the tertiary filter design criteria is presented in **Table 4-5**.

Table 4-5: WWTP Tertiary Filtration Design Criteria

Parameter	Design Criteria
Type of Filter	Disc Filters
Number of Filters	3
Type of Media	Cloth
Design Average Influent Flow	4.125 MGD
Total Filter Area	5,550 ft^2

4.6 DISINFECTION

4.6.1 CHLORINE CONTACT CHAMBER

The existing chlorine contact chamber would remain in service after the expansion. The structure would be drained, cleaned, and any deteriorated concrete repaired and coated to create a smooth surface. The existing gates within the chlorine contact basin would be replaced.

A second chlorine contact chamber is proposed that would be constructed adjacent to the existing. Effluent weirs will be used to split flow and maintain a minimum water level in the channels. Influent slide gates will be provided to allow one chamber to be taken out of service for maintenance.

A chlorine contact splitter box with a vertical shaft mixer would be constructed to split flow between the existing, proposed, and future phase chlorine contact basins. Sodium hypochlorite will be injected into the splitter box prior to the mixer. A summary of the chlorine contact basin design criteria is present in **Table 4-6**.

Table 4-6: WWTP Chlorine Contact Basin Design Criteria

Parameter	Design Criteria
Number of Basins	2
Volume per Basin	60,500 gallons
Total Volume	121,000 gallons
Contact Time at ADF	63 minutes
Design Chlorine Residual	1.0 mg/L
Number of Additional Basins	2
Volume per Basin	81,500 gallons
Total Volume	284,000 gallons
Contact Time at ADF	99 minutes
Contact Time at PHF	25 minutes
Design Chlorine Residual	1.6 mg/L

4.6.2 EFFLUENT TRANSFER PUMP STATION

The existing effluent transfer pump station will be interconnected with the proposed effluent transfer pump station at the effluent end of the proposed chlorine contact basin. The three existing effluent pumps will be removed. Five higher capacity pumps are proposed to provide a pumping capacity equal to the design peak hour flow. The pumps will transfer the disinfected effluent to the reclaimed water ground storage tanks. A summary of the effluent transfer pump design criteria is presented in **Table 4-7**.

Table 4-7: WWTP Effluent Transfer Pump Station Design Criteria

Parameter	Design Criteria
Number of Transfer Pumps	4
Pump Station Capacity	17.25 MGD
Type of Pump	Vertical Turbine
Design Flow per Pump	4,000 GPM

4.7 RECLAIMED WATER STORAGE AND PUMPING

4.7.1 RECLAIMED WATER AND REJECT STORAGE

FDEP regulations require a minimum of three days of reclaimed water storage for the portion of the flow for which no other disposal option exists. The surface water discharge provides 0.83 MGD of back-up disposal capacity, reducing the required reclaimed water storage to approximately 10 million gallons (MG) after construction of the expansion.

A summary of the reclaimed water storage tank capacity at the WWTP are presented in **Table 4-8**.

Table 4-8: WWTP Reclaimed Water Storage

Parameter	Capacity
Existing Reclaimed Water Storage Tank	2.25 MG
Existing Reclaimed Water /Reject Combination Tank	2.25 MG
Proposed Reclaimed Water Ground Storage Tank	7.5 MG
Total Reclaimed Water Storage Volume	12.0 MG

In addition to on-site storage, the City has reserved space at the Southeast Booster Pump Station site for the future construction of a 3.0 MG reclaimed water ground storage tank. The construction of the tank was not included in Phase 1 of the expansion as the City's reclaimed water distribution system does not currently extend to the site. Additionally, the City has held preliminary talks with an off-site developer regarding the construction of a 5.0 MG reclaimed water storage tank on the development site. The status of these off-site reclaimed water storage tanks should be evaluated during the design phase of the WWTP expansion as the addition of off-site reclaimed water storage to the system could reduce the need for on-site reclaimed water allowing it to be delayed to future phases of the expansion. The City is also in the process of designing the Edgewater Wetlands Park. The 50 acre constructed wetlands is anticipated to have a permitted capacity of 3.0 MGD, providing an additional wet weather disposal option, reducing the need for reclaimed water storage if it is constructed.

Discharge of reclaimed water to surface water bodies such as the on-site stormwater pond can be permitted provided that sufficient volume is present to store both stormwater and reclaimed water, and that the pond does not discharge to a downstream surface water body. While the existing stormwater pond has sufficient volume that it could accept reclaimed water, it was constructed with an overflow. An evaluation of the stormwater pond is recommended to determine the feasibility of removing the overflow discharge to allow for reclaimed water discharge to the pond to be added to the WWTP's FDEP permit.

4.7.2 RECLAIMED WATER HIGH SERVICE PUMPS

The existing reclaimed water high service pump station would be expanded to provide capacity for the expanded peak hour flow. The existing reclaimed water high service pumps would be replaced, and two additional pumps would be constructed. The existing plant water pumps would also be replaced with pumps with increased capacity. All of the pumps will be equipped with VFDs to allow for operation under a range of flow conditions. A summary of the reclaimed water high service pump design criteria is presented in **Table 4-9**.

Table 4-9: WWTP Reclaimed Water High Service Pump Design Criteria

Parameter	Design Criteria
Pump Station Capacity	17.8 MGD
Number of Transfer Pumps	2
Type of Pump	Horizontal Split Case
Design Flow per Pump	250 GPM
Number of Transfer Pumps	2
Type of Pump	Horizontal Split Case
Design Flow per Pump	1,500 GPM
Number of Transfer Pumps	2
Type of Pump	Horizontal Split Case
Design Flow per Pump	2,500 GPM
Number of Transfer Pumps	2
Type of Pump	Horizontal Split Case
Design Flow per Pump	3,500 GPM

4.8 SURFACE WATER DISCHARGE

Florida Senate Bill 64 Reclaimed Water, passed in 2021 with the goal of eliminating non-beneficial surface water discharges of wastewater effluent in the state. The Bill contains exceptions for surface water discharges including, in the event that they are wet weather discharges in accordance with an applicable department permit, or if the reuse system reuses a minimum of 90 percent of a facility's annual average flow for the five preceding years. It is anticipated that the City would be able to continue the use of the existing surface water discharge at its currently permitted capacity as they meet both of these criteria.

The City's existing surface water discharge to the Indian River North is currently permitted capacity of 0.83 MGD. Replacement of the existing floating aerators and vertical turbine effluent pumps are proposed as part of the expansion. The remaining 12-inch portion of the outfall pipeline should also be replaced with 16-inch piping. A summary of the surface water discharge design criteria is presented in **Table 4-10**.

Table 4-10: WWTP Surface Water Discharge Design Criteria

Parameter	Design Criteria
Flow Rate	0.83 MGD
Number of Transfer Pumps	3
Type of Pump	Vertical turbine
Design Flow per Pump	2,600 GPM
Number of Aerators	2
Type of Aerator	Floating
Horsepower	20 HP

4.9 REJECT WATER STORAGE

FDEP regulations require the ability for disposal or storage of one day of reject at the permitted capacity of the WWTP. One existing on-site ground storage tank is dedicated to the storage of reject, and a second existing ground storage tank can be used to store either reject or reclaimed water. Reject stored in the ground storage tanks is recirculated to the influent pump station during periods of low flow for retreatment. In order to provide one day of reject storage at the expanded capacity of the WWTP conversion of the existing 2.25 MG reclaimed water storage tank to a combination reclaimed water/reject water storage tank is recommended. A summary of the reject storage options at the WWTP are presented in **Table 4-11**.

Table 4-11: WWTP Reject Storage and Disposal Criteria

Parameter	Capacity
Reject Storage Tank	1.00 MG
Reclaimed Water/Reject Combination Storage Tank	2.25 MG
Convert Existing Reclaimed Water Storage Tank to Combo	2.25 MG
Total Storage/Disposal Capacity	**5.50 MG**
Required Storage/Disposal Capacity	**4.125 MG**

4.10 SOLIDS HANDLING

WAS and scum are currently pumped to a 75,000 gallon aerated sludge holding tank that requires operation of the centrifuges eight hours per day, seven days per week. As influent flow rates to the WWTP increase the amount of dewatering required will continue to increase unless additional sludge holding volume is provided. Demolition of the existing sludge holding tank is proposed as it has insufficient capacity to support the expanded WWTP, and its removal will allow for the construction of the additional biological treatment train adjacent to the existing.

The existing aerobic digesters would be refurbished as part of the expansion and utilized as sludge holding tanks. While the existing aerobic digester tanks provide approximately one-third of the volume required to meet the 40 days of solids retention time required for aerobic digestion contained under 40 CFR Part 503, it is assumed that the WWTP will continue to meet the Class B requirements through the monitoring of fecal coliforms in the sludge. Centrifuges will continue to be utilized for solids dewatering.

The existing aerobic digesters would be drained, cleaned, and any deteriorated concrete repaired. The piping would be modified to allow sludge to be pumped directly from the sludge holding tanks to the centrifuges, and the blowers, diffusers, and sludge pumps would be replaced. The blowers would be relocated near the digesters, and the air piping would be constructed above grade. A summary of the solids handling system design criteria is presented in **Table 4-12**.

Table 4-12: WWTP Solids Handling Process Design Criteria

Parameter	Design Criteria
Type of Sludge Holding	Aerobic
Number of Basins	2
Total Volume	612,654 gallons
Number of Blowers	3
Total Blower Capacity	3,160 scfm
Number of Centrifuges	2
Capacity of Centrifuges	200 gpm
Total Centrifuge Capacity	400 gpm
Centrifuge Run Time	8 hours per day, 3 days per week

4.11 CHEMICAL STORAGE AND FEED

Sodium hypochlorite, alum, and sodium bisulfite will continue to be utilized in the treatment process after the expansion. In order to minimize the amount of below grade chemical piping, and reduce the potential for spills, the storage facilities for each chemical will be relocated close to the dosing point as shown in the conceptual site plan.

4.11.1 SODIUM HYPOCHLORITE

Sodium hypochlorite will continue to be used for disinfection of effluent prior to distribution to the reclaimed water system or discharge to the Indian River. The existing sodium hypochlorite bulk storage tanks provide 30 days of storage at the average dosing rate, per FDEP requirements. Replacement of the existing sodium hypochlorite storage tanks with two new double walled HDPE tanks would provide sufficient storage at the expanded capacity of the WWTP. The existing sodium hypochlorite feed pumps would be replaced with new chemical metering pumps located in the existing pump room. A summary of the design criteria is presented in **Table 4-13.**

Table 4-13: WWTP Sodium Hypochlorite Design Criteria

Parameter	Design Criteria
Type of Tank	HDPE
Number of Tanks	2
Total Volume	10,000 gal
Average Chlorine Dose	10 mg/L
Metering Pump Flow Rate	14 gal/hr

4.11.2 ALUM

Alum will be dosed upstream of the new disc filters as required to remove TSS and total phosphorus from the effluent. A new double walled HDPE alum storage tank and chemical metering pump skid will be constructed on a concrete slab with a metal canopy near the proposed reaeration basins.

4.11.3 SODIUM BISULFITE

Sodium bisulfite will be dosed upstream of the post-aeration basin to remove chlorine residual from the effluent prior to the surface water discharge. A new double walled HDPE sodium bisulfite storage tank and chemical metering pump skid will be constructed on a concrete slab with a metal canopy near the existing operations building.

4.12 OPERATIONS AND ELECTRICAL BUILDINGS

The existing operations building has inadequate space to meet the needs of the WWTP, and while it is located above the 100-year flood plain the building was heavily flooded in 2022 during Hurricane Ian. A new operations building is proposed to meet the needs of the expanded facility. The new two-story operations building would be constructed above the 500-year flood plain to reduce the potential for flooding during future severe weather events. The approximately 7,400 square foot building would include a maintenance shop, maintenance office, and lab on the first floor, while two offices, a training and conference room, kitchen and breakroom, SCADA control room, storage room, and restrooms with showers and lockers would be located on the second floor. A conceptual floor plan of the proposed operations building is presented in **Figure 4-3**.

Electrical equipment will be also relocated into new electrical buildings located above the 500-year flood plain to reduce the potential for flooding during severe weather events. Three new electrical buildings are proposed as part of the first phase. Electrical Building No. 1 located between the existing biological process basins and secondary clarifiers would allow for the relocation of MCC Nos. 1 through 4, 7, and 8. Electrical Building No. 2 located near the proposed secondary clarifiers would house new MCCs required to support the mechanical equipment installed as part of the expansion on the northern portion of the site. Electrical Building No. 3 would be constructed near the reclaimed water high service pump station. Space would be provided within Electrical Building No. 3 for the relocation of MCC Nos. 5 and 6, as well as new MCCs to support mechanical equipment installed on the southern portion of the site.

Backup power will continue to be provided by diesel powered generators. The existing 1000 kW diesel generator would be relocated next to Electrical Building No. 1 as part of the Phase 1 improvements, while a second diesel powered generator would be installed next to Electrical Building No. 2.

4.13 VAC TRUCK DRYING BED

The City utilizes vac trucks for maintenance of the wastewater collection system. Vac trucks are utilized to remove build-up of solids from manholes and lift stations throughout the service area. Wastes collected by the vac trucks has an extremely high water content requiring it to be dewatered to increase the solids concentration prior to disposal. A new vac truck drying bed would be constructed at the WWTP to accommodate the dewatering of vac truck waste.

The vac truck drying bed would consist of a concrete structure with a sump with vertical and horizontal screens to retain solids while allowing water to drain from the vac truck waste. Wastewater from the vac truck waste would flow via gravity back to the influent pump station for treatment in the WWTP.

SECTION 5: FUTURE WWTP EXPANSIONS

5.1 PHASE 2 EXPANSION

The proposed Phase 2 Expansion of the WWTP would increase the capacity from 4.125 MGD to 5.5 MGD. A conceptual site plan of the WWTP after the Phase 2 Expansion is presented in **Figure 5-1**. The proposed Phase 2 Expansion would include:

- Addition of a mechanical bar screen to the headworks constructed in Phase 1.
- Addition of one submersible pump to the influent pump station.
- Construction of a new biological process basin constructed adjacent to the existing basin constructed in Phase 1.
- Construction of one disc filter unit adjacent to the units installed in Phase 1.
- Construction of one new chlorine contact chamber.
- Addition of one 5,000 gal sodium hypochlorite storage tank.
- Addition of one vertical turbine pump in the Phase 1 effluent transfer pump wet well.
- Addition of a 7.5 MG reclaimed storage tank.
- Construction of four new aerobic digesters.
- Demolition of the existing sludge holding tanks.
- Construction of a new dewatering building, and relocation of the Phase 1 centrifuges and blowers.

5.2 PHASE 3 EXPANSION

The proposed Phase 3 Expansion of the WWTP would increase the capacity from 5.5 MGD to 6.875 MGD. A conceptual site plan of the WWTP after the Phase 3 Expansion is presented in **Figure 5-2**. The proposed Phase 3 Expansion would include:

- Construction of a new headworks including two mechanical bar screens and a grit removal system.
- Addition of one submersible pump to the influent pump station.
- Construction of a new biological process basin constructed adjacent to the existing basin constructed in Phase 2.
- Construction of one disc filter unit adjacent to the existing.
- Addition of one 5,000 gal sodium hypochlorite storage tank.
- Addition of one vertical turbine pump in the Phase 2 effluent transfer pump wet well adjacent to the existing.

5.3 PHASE 4 EXPANSION

The proposed Phase 4 Expansion of the WWTP would increase the capacity from 6.875 MGD to 8.25 MGD. A conceptual site plan of the WWTP after the Phase 4 Expansion is presented in **Figure 5-3**. The proposed Phase 4 Expansion would include:

- Addition of one submersible pump to the influent pump station.
- Construction of a new biological process basin constructed adjacent to the existing basin constructed in Phase 2.
- Construction of one new secondary clarifier.
- Construction of one new chlorine contact chamber.
- Addition of one vertical turbine pump in the effluent transfer pump wet well.
- Addition of a 7.5 MG reclaimed storage tank.
- Construction of two additional aerobic digesters.

SECTION 6: SUPPLEMENTAL RECLAIMED WATER EVALUATION

6.1 SUPPLEMENTAL RECLAIMED WATER DEMAND

Reclaimed water is increasingly being used for landscape irrigation throughout the City's service area. While wastewater effluent is the primary source of reclaimed water, the available wastewater supply is insufficient to meet the City's reclaimed water demand. St. John's River Water Management District (SJRWMD) Consumptive Use Permit (CUP) Number 9157-7 limits the City's withdrawals of surface and stormwater to 365 million gallons per year. Stormwater from the pond south of the WWTP is currently utilized for supplemental reclaimed water.

Annual use of supplemental reclaimed water to meet reclaimed water demands increased over 800% between 2021 and 2024 despite influent flows into the WWTP increasing less than 2% over the same time period. However, supplemental reclaimed water withdrawals during the period from January to June 2025 have decreased by over 20% compared to the same time period in 2024. A summary of the annual supplemental reclaimed water withdrawals is presented in **Table 6-1**.

Table 6-1: Annual Supplemental Reclaimed Water Withdrawals

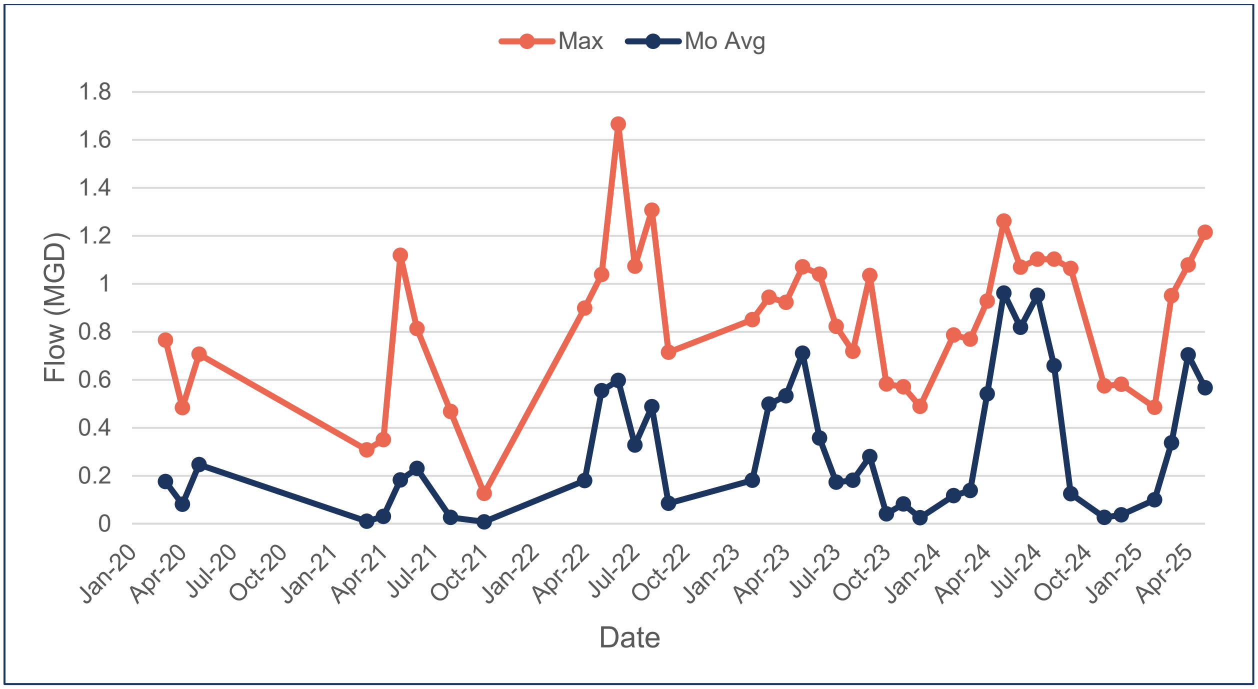
Year	Supplemental Reclaimed Water (MGY)	Influent Flow (MGD)
2020	15.5	1.746
2021	14.8	1.525
2022	68.2	1.569
2023	93.0	1.495
2024	134.9	1.552
2025	62.2*	1.527

* 2025 Withdrawal Includes Data from January through June

The City's CUP expires in December 2027. With the recent surge in dependence on the supplemental reclaimed water system to meet reclaimed water demands, an increase in the annual stormwater withdrawal should be considered as part of the permit renewal process.

Monthly average and daily maximum supplemental reclaimed water withdrawals over the previous five years were also reviewed to evaluate seasonal fluctuations in demand. The five-year historical monthly average and daily supplemental reclaimed water demand is shown in **Figure 6-2**.

Figure 6-2: Historical Supplemental Reclaimed Water Withdrawals



Demand for supplemental reclaimed water peaks during the period from May to June, with a maximum monthly average supplemental reclaimed water demand of 0.97 MGD in May 2024, and a maximum day supplemental reclaimed water demand of 1.67 MGD in June 2022. As the City extends reclaimed water service to new development within its service area the demand for supplemental reclaimed water can be expected to increase.

6.2 TREATMENT OF SUPPLEMENTAL RECLAIMED WATER

FDEP regulations require stormwater used as supplemental reclaimed water to be filtered and disinfected prior to entering the distribution system. Currently a single pump withdraws stormwater from the pond discharging it upstream of the filters where it mixes with WWTP flow prior to filtration and disinfection in the chlorine contact basins. The supplemental reclaimed water flow rates must be monitored in order to avoid overloading the filters and chlorine contact basins. A dedicated filtration system is recommended in order to increase the reliability of the supplemental reclaimed water supply.

An initial design flow of 2.0 MGD allows for the ability to treat the peak demands of the supplemental reclaimed water system based on current operating data. No redundancy would be provided, however the system would be designed to be easily expandable in the event that additional capacity is required as the WWTP is expanded. The existing supplemental reclaimed water pump would be replaced with a new pump discharging to a dedicated disk filter unit located adjacent to the disk filter units serving the WWTP. Filtered effluent would flow by gravity to the chlorine contact basins for disinfection.

SECTION 7: CONSTRUCTION COST ESTIMATION METHODOLOGY

7.1 INTRODUCTION

This section focuses on presenting cost data that can aid the City in preparing cost estimates in the future. Future costs are represented as 2025 dollars. A cost escalation factor to account for inflation and market conditions should be considered in future evaluations.

7.2 LEVEL OF CONTINGENCY

The planning level unit costs presented in this section are conceptual in nature, and do not account for actual field conditions. These costs may be impacted by factors such as:

- Maintenance of plant operations and limitations in taking equipment out of service;
- Tariffs or other economic factors;
- Difficult installation conditions such as tight site constraints, high groundwater tables, or the presence of rock; and,
- Ecological issues.

It is recommended that a 30 percent contingency be applied to all planning level construction cost estimates generated from this evaluation.

7.3 ENGINEERING SERVICES COSTS

Engineering services related to the implementation of capital projects were estimated to be eight percent of the total construction cost. General services during construction, including bidding assistance, review of shop drawings, response to requests for information (RFIs), production of record drawings, and general coordination with the contractor were assumed to be four percent of the total construction cost. The cost estimates for the recommended projects include costs associated with both construction and engineering.

7.4 CONCEPTUAL COST ESTIMATES

A conceptual cost estimate broken down by unit process was prepared for the Phase 1 improvements. In addition to construction costs, contingency, and engineering costs were included to represent the estimated overall cost of implementation of the project. A summary of the Phase 1 conceptual cost estimate is presented in **Table 7-1**.

Table 7-1: Phase 1 Conceptual Cost Estimate

Item	Total Cost
Construction Costs	
Headworks	$4,800,000
Influent Pump Station	$5,400,000
Five Stage Bardenpho Process	$9,100,000
Existing Biological Process Modifications	$2,500,000
Two New Secondary Clarifiers	$5,700,000
Disc Filtration	$2,500,000
Chlorine Contact Chamber	$5,900,000
Reclaimed Water Storage and Pumping	$4,100,000
Surface Water Discharge	$1,400,000
Solids Handling	$3,100,000
Electrical Buildings	$11,200,000
Operations Building	$5,600,000
Instrumentation and Controls	$3,100,000
Overall Construction Subtotal	**$64,000,000**
Contingency (30%)	$19,000,000
Construction Total	**$83,000,000**
Engineering (8%)	$6,600,000
Construction Administration (4%)	$3,300,000
Total Capital Costs	**$93,000,000**

Conceptual cost estimates were prepared for Phase 2, 3, and 4 of the expansion based upon a current construction cost estimate of $50 per gallon of additional capacity utilizing 2025 dollars. As Phases 2, 3, and 4 would increase capacity by equal amounts, the conceptual cost estimates for each phase are the same. A summary of the conceptual cost estimate for the future phases of expansion is presented in **Table 7-2**.

Table 7-2: Conceptual Cost Estimates for Future Phases of Expansion

Item	Total Cost
Construction Costs	
1.375 MGD Expansion at $50 per gallon	$69,000,000
Overall Construction Subtotal	**$69,000,000**
Contingency (30%)	$20,000,000
Construction Total	**$89,000,000**
Engineering (8%)	$7,200,000
Construction Administration (4%)	$3,600,000
Total Capital Costs	**$100,000,000**

These conceptual cost estimates are based on current market conditions and presented in 2025 dollars. Prior to implementation of the future phases of expansion these conceptual cost estimates should be refined to reflect actual market conditions.

SECTION 8: IMPLEMENTATION PLAN

8.1 JUSTIFICATION FOR WWTP EXPANSION

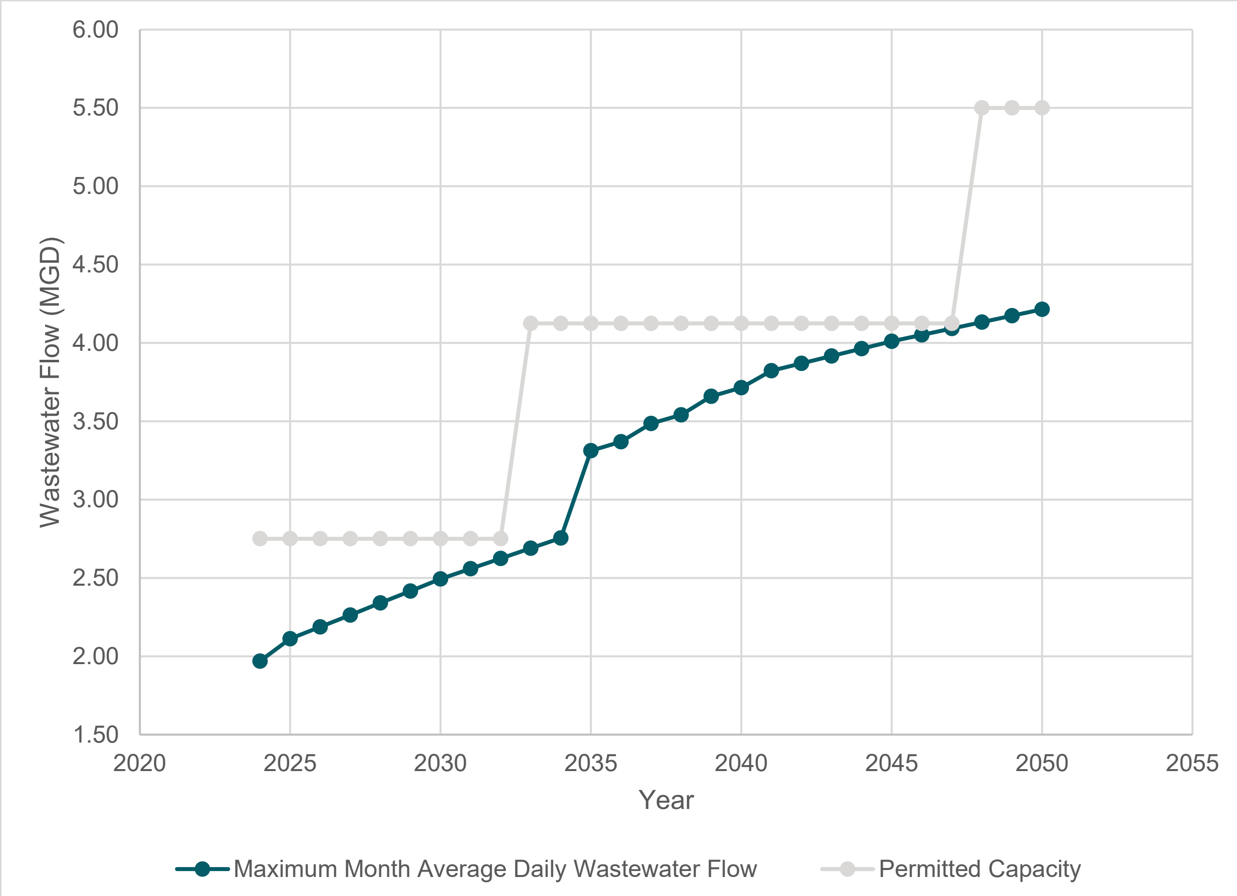
Annual wastewater flow projections were prepared for the period from 2025 to 2050 assuming linear population growth occurs between the five-year intervals in the BEBR study. Implementation of the septic to sewer system was projected to occur in four phases over an eight year period between 2035 and 2041. The projected septic to sewer implementation schedule is presented in **Table 8-1.**

Table 8-1: Projected Septic to Sewer Program Implementation Schedule

Year	Septic Tanks Removed	Wastewater Flow (gpd)
2035	300	61,200
2037	301	61,404
2039	300	61,200
2041	301	61,404
Total	1,202	245,208

The existing interconnect between the City and Volusia County's Beacon Light Road WWTP is scheduled to remain in service with no currently known date for the termination of the agreement between the City and the County. However, in order to develop wastewater flow projections it was assumed that the soonest the interconnect is removed from operation would be 2035, ten years from the development of the Master Plan. Wastewater flow projections for the 25-year period from 2025 to 2050 are presented in **Figure 8-1**.

Figure 8-1: 25-Year Wastewater Flow Projections



The currently permitted capacity of the WWTP of 2.75 MGD is projected to be exceeded in 2034, requiring an initial phase of the expansion to be placed in service in 2033. The first expansion would be constructed and in service prior to the initiation of the septic to sewer program or the elimination of the interconnect with Volusia County's Beacon Light Road WWTF. The expanded Phase 1 capacity of the WWTP is projected to be exceeded in 2049, requiring Phase 2 of the expansion to be placed in service in 2048. Expansion Phases 3 and 4 would not be required until after 2050.

Development patterns, growth rates, the status of the implementation of the septic to sewer program, and the interconnect with Volusia County's Beacon Light Road WWTF will all influence influent flow rates to the City's WWTP. Influent wastewater flow rates and growth projections should be regularly reviewed to refine the timing of the implementation of each phase of the expansion.

8.2 IMPLEMENTATION PLAN DEVELOPMENT

A phased expansion of the City's Wastewater Treatment Plant to its build-out capacity of 8.25 MGD is proposed. The proposed implementation plan includes $393 million in four expansion projects at the WWTP. The initial phase of the expansion includes the replacement of existing mechanical and electrical equipment. Future rehabilitation projects related to the repair or replacement of equipment are not included. Off-site improvements related to lift stations, gravity sewer and manholes, force main, reclaimed water distribution main, and off-site reclaimed water storage and pumping are not included.

The implementation plan was developed in August 2025 based upon projected growth rates from the population projections prepared by the University of Florida's BEBR. Changes in development patterns, growth rates, the implementation of septic to sewer conversion project, or the potential termination of the agreement with Volusia County to provide wastewater service for a portion of the City's wastewater service area may necessitate changes to the implementation schedule. Capacity Analysis Reports should be prepared as required by the Florida Department of Environmental Protection to refine the timing of the implementation of improvements. The proposed implementation plan is presented in **Table 8-1**.

Table 8-1: Proposed Implementation Plan

Year	Project	Budgeted Cost
2033	Phase 1 Expansion	$93 million
2048	Phase 2 Expansion	$100 million
To Be Determined	Phase 3 Expansion	$100 million
To Be Determined	Phase 4 Expansion	$100 million

The dates in the proposed implementation plan reflect the date that the WWTP expansion is placed into service. Engineering, permitting, bidding, construction, and commissioning of the improvements will require commencement of the project five years prior to the date it is necessary that it is placed into service.

SECTION 9: SUMMARY AND RECOMMENDATIONS

9.1 SUMMARY

The City of Edgewater's wastewater treatment plant receives flow from 60 lift stations in the 25 square mile service area. Originally constructed in 1992, the WWTP was expanded to its current capacity of 2.75 MGD in 2012. Annual average wastewater flows have ranged from 1.50 to 1.75 MGD over the last five years, and the WWTP has remained in compliance with FDEP permit requirements.

On-going rapid growth is projected to increase the City's population by over 50% by 2035, while the long-term status of the interconnect that sends of a portion of the City's wastewater flow to Volusia County for treatment is uncertain. Additionally, the Mosquito Lagoon Reasonable Assurance Plan encourages septic to sewer projects to reduce nutrient loading into the basin. The City has approximately 1,200 residential properties with septic tanks that are targeted for connection to central sewer. The combined impact of growth, potential elimination of the interconnect with Volusia County, and the implementation of a septic to sewer program is a projected increase in wastewater flows that will exceed the currently permitted capacity of the WWTP by 2030. A summary of the project future growth in the service area, as well as its impact on wastewater flows is presented in **Table 9-1**.

Table 9-1: Population and Wastewater Flow Projections

Year	Population	Wastewater Flow (MGD)
2024	24,772	1.70
2025	26,008	2.54
2030	28,538	2.79
2035	37,469	3.66
2040	40,329	3.94
2045	42,739	4.42
2050	44,824	4.62
Max	**80,772**	**8.13**

The projected wastewater flows presented are inclusive of the entire wastewater service area, including flow that would be treated at the City of Edgewater WWTP and Volusia

County’s Beacon Light Road WWTF under the terms of the current agreement between the City and the County.

9.2 RECOMMENDATIONS

Expansion of the WWTP is recommended to enable the City to continue to provide advanced wastewater treatment, and a reliable supply of reclaimed water for its growing population. A phased approach to the expansion will allow the City to increase the capacity of the WWTP incrementally as required to support future growth. Four expansion projects are recommended with a total projected construction cost of $393 million. Implementation of these projects will:

- Replace aging equipment and increase the reliability of WWTP operations.
- Increase the capacity of the WWTP to 8.25 MGD on the existing site, providing capacity for the projected future build-out population based on the current limits of the wastewater service area.
- Reduce the risk of flooding during severe weather events by elevating the electrical gear and critical operations above the 500-year flood plain.
- Provide dedicated treatment of the supplemental reclaimed water supply from the stormwater pond reducing the operational issues with the existing filters.

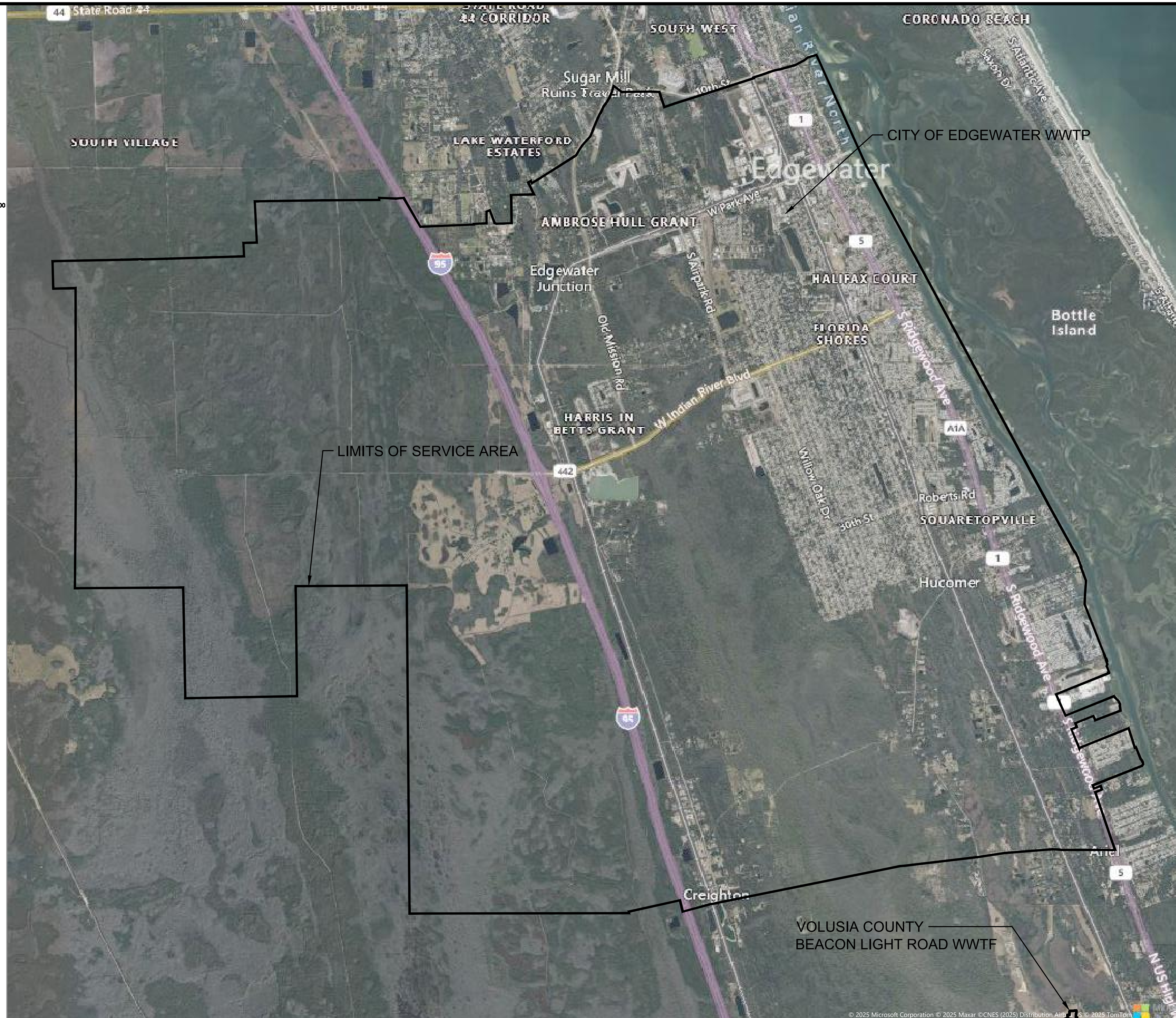
In addition to the expansion of the WWTP, it is recommended that the City complete a comprehensive evaluation of the wastewater collection to identify the sources of infiltration and inflow and prepare a rehabilitation plan to address the issues. A site plan showing all of the recommended improvements at the completion of the four phases of expansion is presented in **Figure 9-1**.

FIGURES

Scale: 1" = 5000'

5000 0 5000 10000

SCALE IN FEET



City of Edgewater, Florida

WWTP EXPANSION MASTER PLAN

EXISTING WASTEWATER SERVICE AREA

halff

902 NORTH SINCLAIR AVE.
TAVARES, FL 32778
TEL. (352) 343-8481

DATE:	SEPT. 2025
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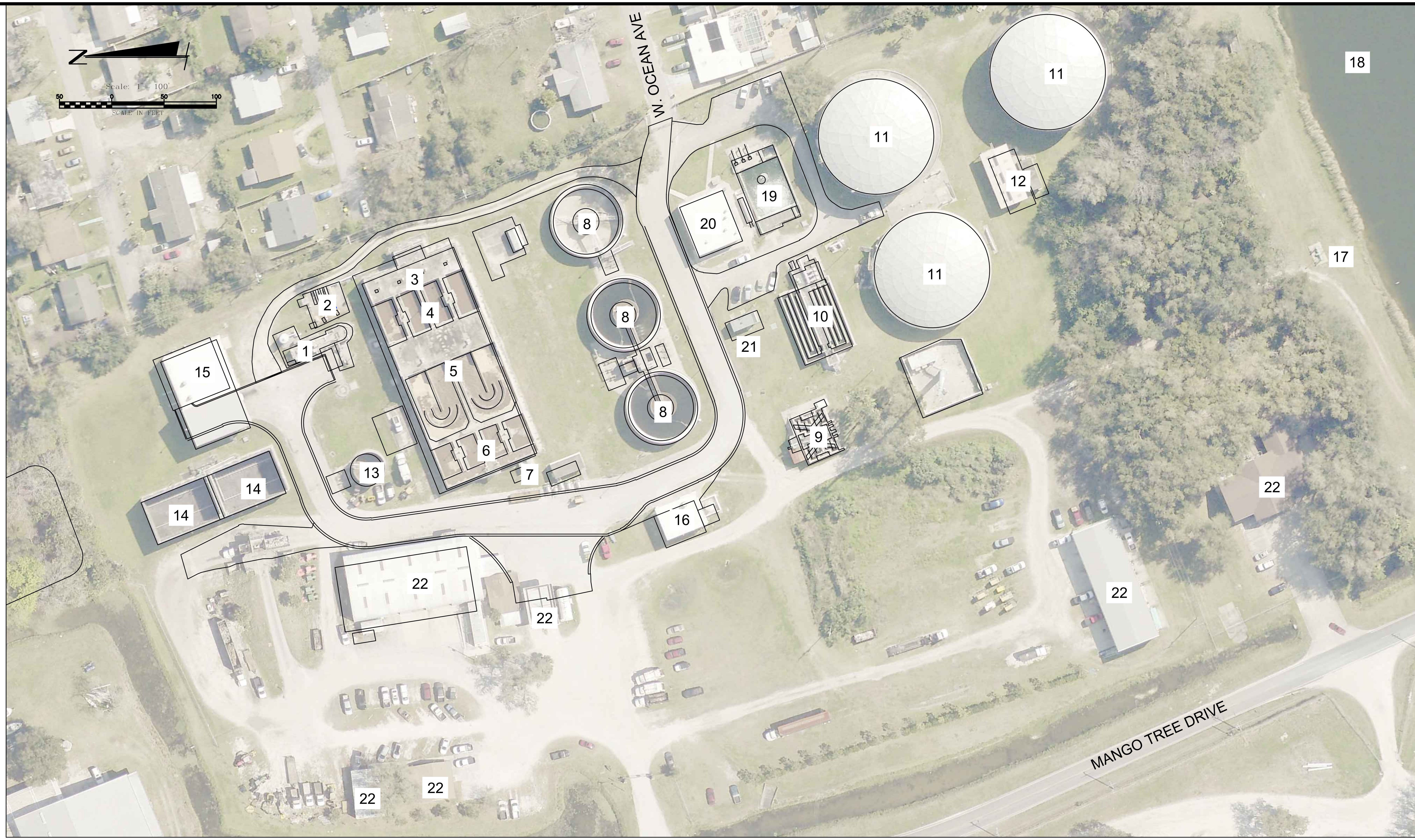
JOB NO.:	44629.014
FILE NAME:	--

FIGURE 2-1

MICHAEL C. SCULLION, PE
Registered Eng. 70753



LEGEND

1. PRE-TREATMENT STRUCTURE
2. INFLUENT PUMP STATION
3. ANAEROBIC BASINS
4. FIRST ANOXIC BASINS
5. OXIDATION DITCHES
6. SECOND ANOXIC / REAERATION BASINS
7. REAERATION BLOWERS
8. CLARIFIERS
9. FILTERS
10. CHLORINE CONTACT CHAMBER
11. RECLAIMED WATER GROUND STORAGE TANKS
12. RECLAIMED WATER HIGH SERVICE PUMPS
13. SLUDGE HOLDING TANK
14. AEROBIC DIGESTER
15. CENTRIFUGE BUILDING
16. CHEMICAL STORAGE BUILDING
17. SUPPLEMENTAL RECLAIMED WATER PUMP
18. STORMWATER POND
19. POST-AERATION BASIN
20. OPERATIONS BUILDING
21. GENERATOR
22. NON-WWTP STRUCTURE

City of Edgewater, Florida
WWTP EXPANSION MASTER PLAN

EXISTING WWTP SITE PLAN

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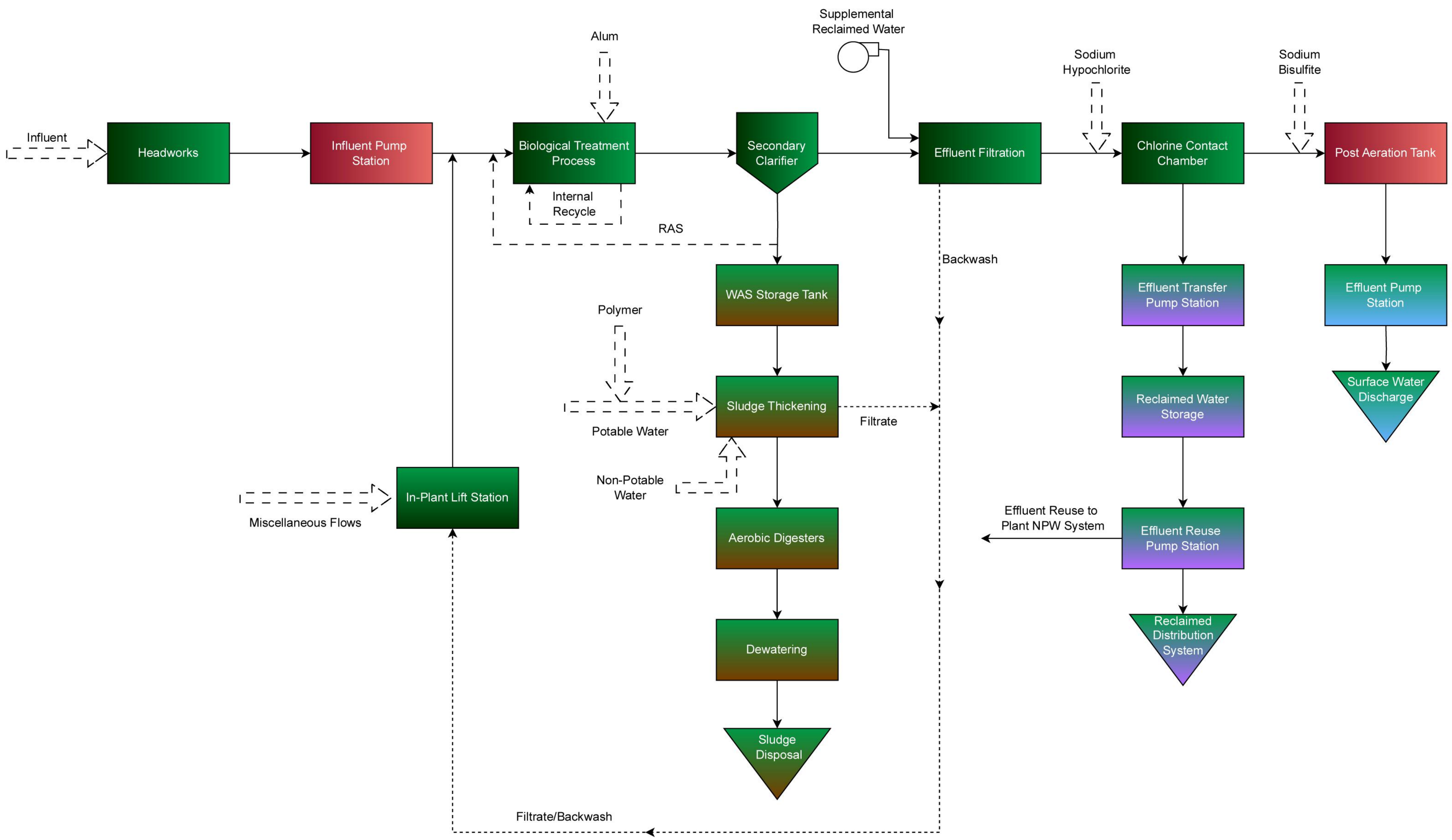
FIGURE 2-2

MICHAEL C. SCULLION, PE
Registered Eng. 70753



DATE	REVISION
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City of Edgewater, Florida

WWTP EXPANSION MASTER PLAN

FLOW DIAGRAM

City of EDGEWATER Florida

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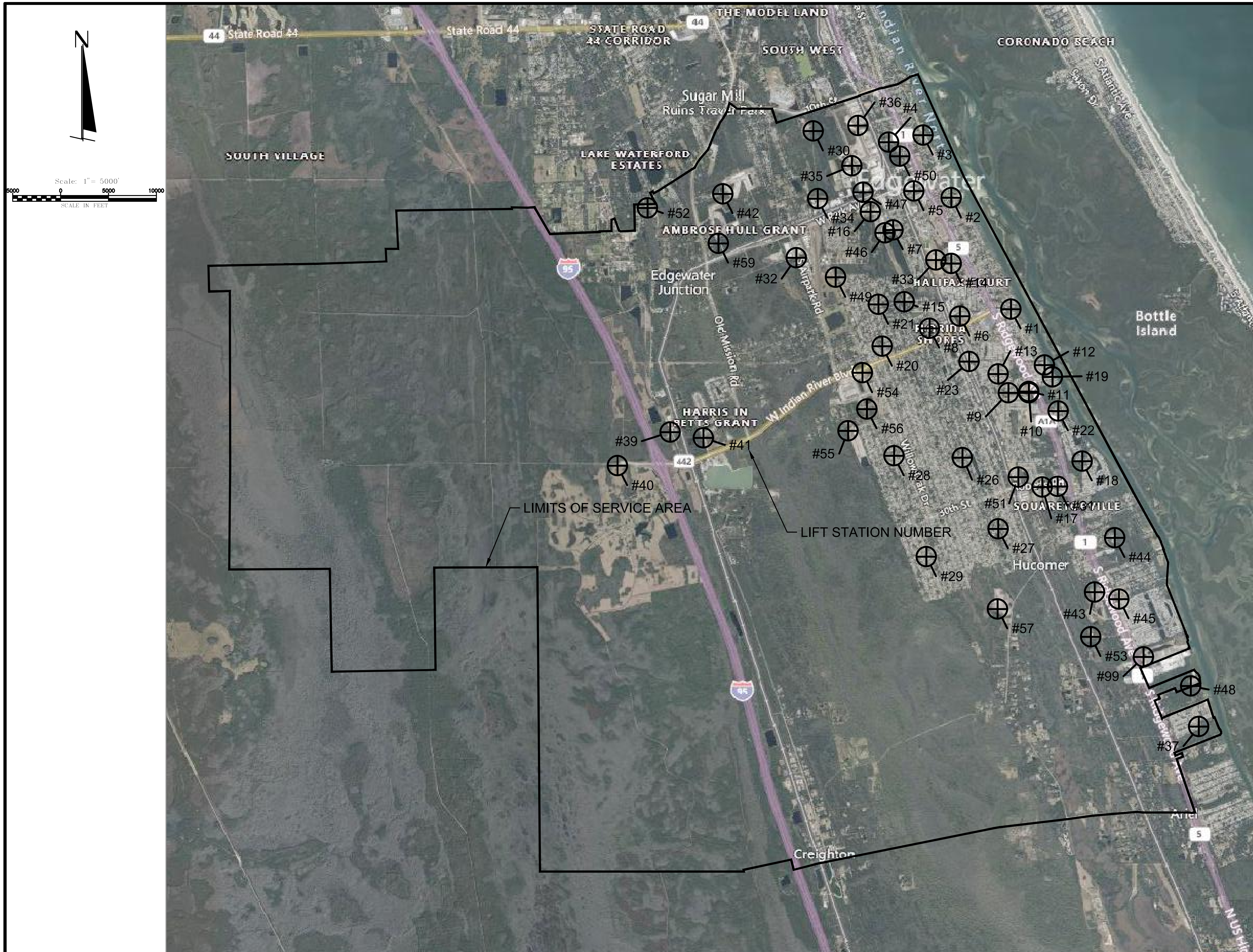
FIGURE 2-3

MICHAEL C. SCULLION, PE
Registered Eng. 70753



City of Edgewater, Florida

WWTP EXPANSION MASTER PLAN

LIFTSTATION LOCATION MAP

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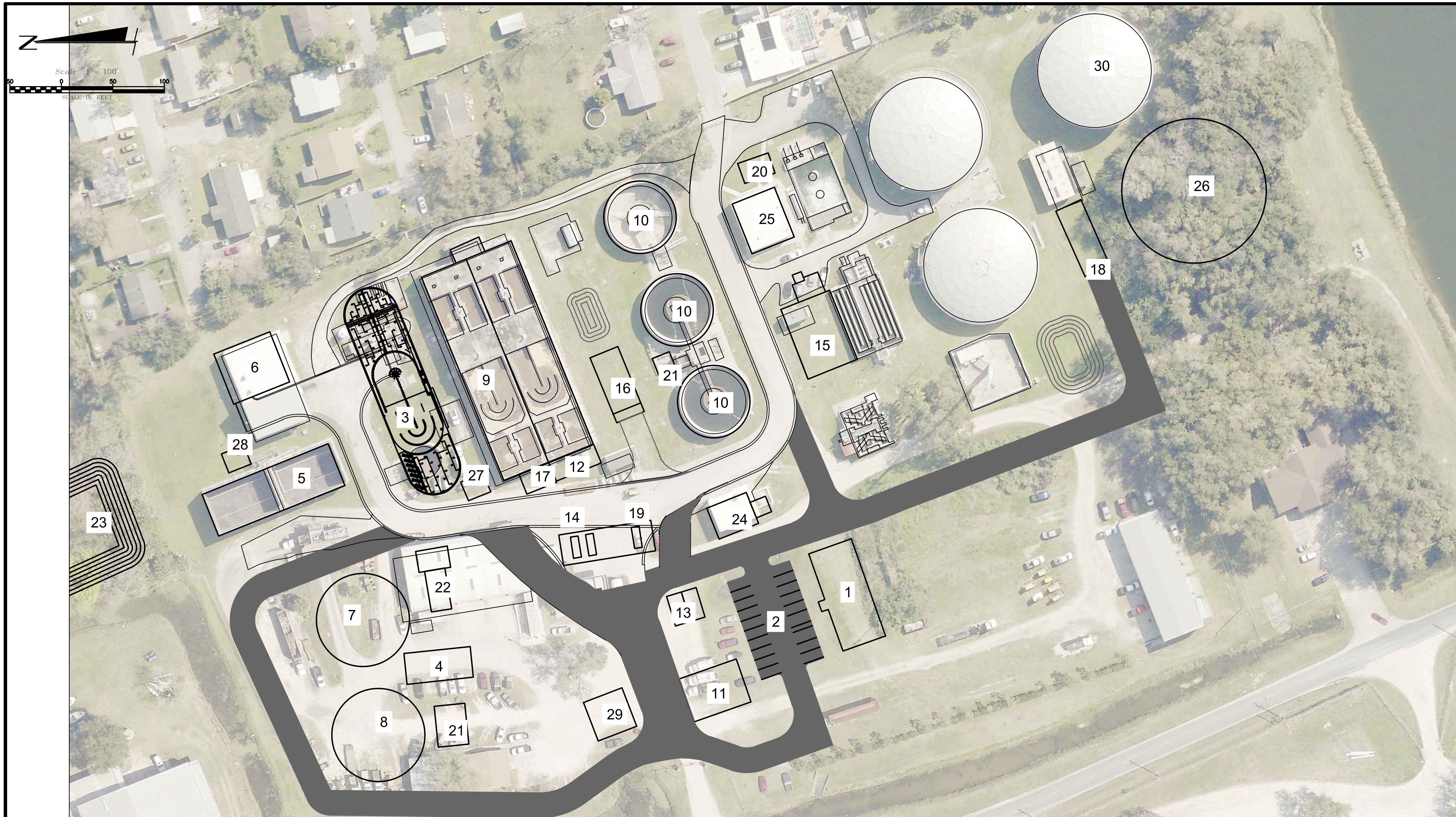
FIGURE 2-4

MICHAEL C. SCULLION, PE
Registered Eng. 70753



LEGEND

1. OPERATIONS BUILDING
2. PARKING
3. 5-STAGE BARDENPHO TRAIN 3
4. MLSS SPLITTER BOX
5. REHAB DIGESTERS
6. REPLACE CENTRIFUGES
7. CLARIFIER 4
8. CLARIFIER 5
9. REPLACE MIXERS AND AERATORS
10. REPLACE CLARIFIER MECHANISMS
11. HEADWORKS
12. REPLACE REAERATION BLOWERS
13. INFLUENT PUMP
14. DISK FILTERS
15. CHLORINE CONTACT BASIN 2
16. ELECTRICAL BUILDING
17. ALUM STORAGE AND FEED
18. HIGH SERVICE PUMP BUILDING
19. SUPPLEMENTAL RECLAIMED WATER FILTRATION
20. SODIUM BISULFATE TANK
21. RAS/WAS PUMP STATION
22. ELECTRICAL BUILDING AND GENERATOR
23. STORM WATER RETENTION
24. SODIUM HYPOCHLORITE STORAGE AND FEED
25. OPERATIONS BUILDING RENNOVATION
26. RECLAIMED WATER GROUND STORAGE TANK #4
27. NEW REAERATION BLOWERS
28. REPLACE DIGESTER BLOWERS
29. VAC DUMPING STATION
30. CONVERT RECLAIMED WATER STORAGE TANK TO RECLAIMED WATER/REJECT COMBINATION TANK

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City of Edgewater, Florida
WWTP EXPANSION MASTER PLAN
PHASE 1 CONCEPTUAL SITE PLAN

City of EDGEWATER Florida

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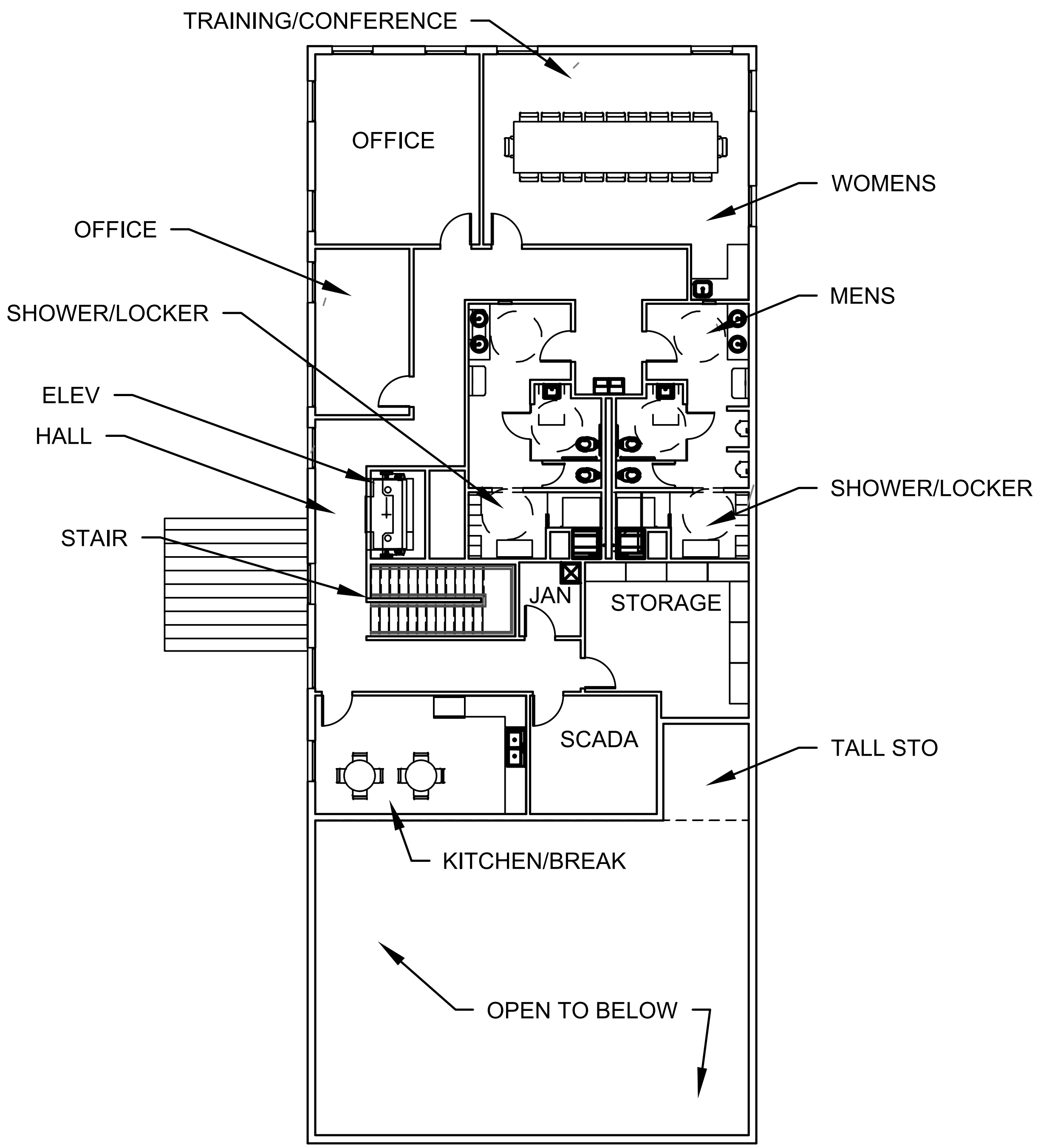
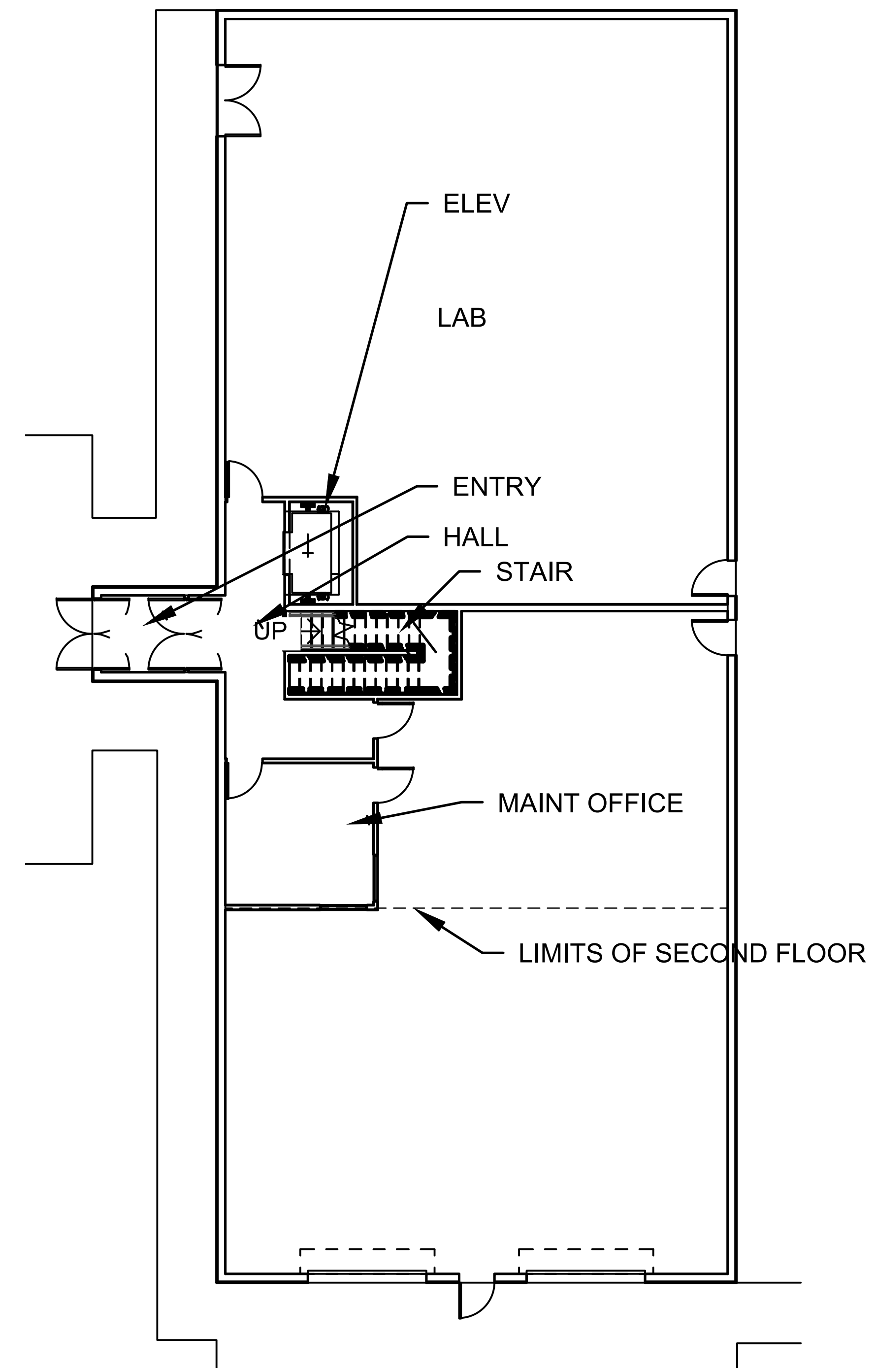
FIGURE 4-1

PRELIMINARY, NOT FOR CONSTRUCTION



② FLOOR PLAN-SECOND FLOOR
1/16" = 1'-0"



① FLOOR PLAN-FIRST FLOOR
1/16" = 1'-0"

City of Edgewater, Florida
WWTP EXPANSION MASTER PLAN
CONCEPTUAL OPS. BUILDING FLOOR PLAN

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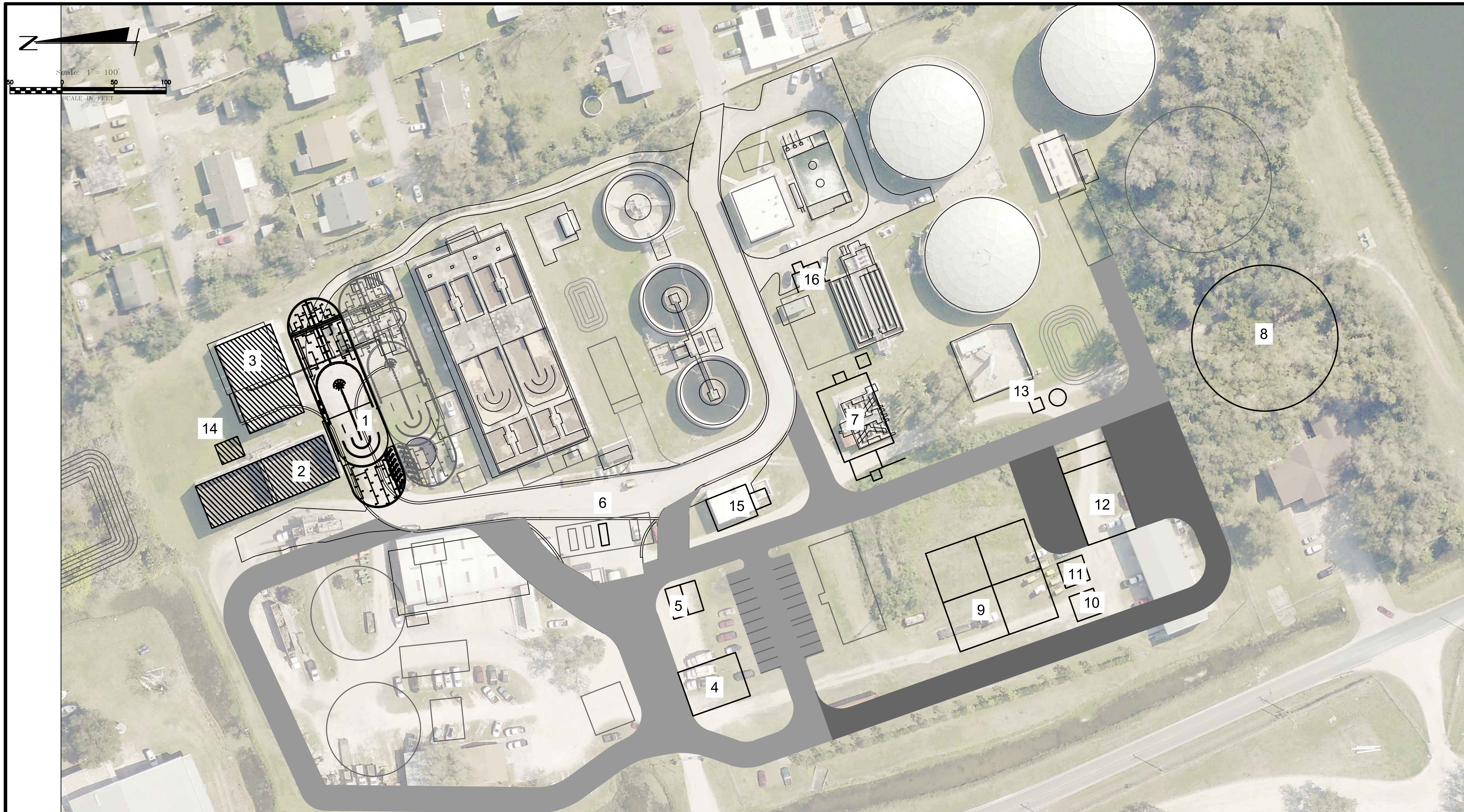
FIGURE 4-3

PRELIMINARY, NOT FOR CONSTRUCTION



LEGEND

1. 5-STAGE BARDENPHO TRAIN 4
2. DEMOLISH DIGESTERS
3. DEMOLISH CENTRIFUGES
4. HEADWORKS
5. INFLUENT PUMP
6. DISK FILTER NO. 3
7. CHLORINE CONTACT BASIN 3
8. RECLAIMED WATER GROUND STORAGE TANK #5
9. AEROBIC DIGESTERS
10. DIGESTER BLOWERS
11. SLUDGE FEED PUMPS
12. CENTRIFUGE BUILDING
13. IN-PLANT LIFT STATION
14. RELOCATE DIGESTER BLOWERS
15. SODIUM HYPOCHLORITE STORAGE TANK
16. EFFLUENT TRANSFER PUMP

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City of Edgewater, Florida
WWTP EXPANSION
MASTER PLAN

PHASE 2 CONCEPTUAL
SITE PLAN

City of EDGEWATER Florida

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FIGURE 5-1

PRELIMINARY,
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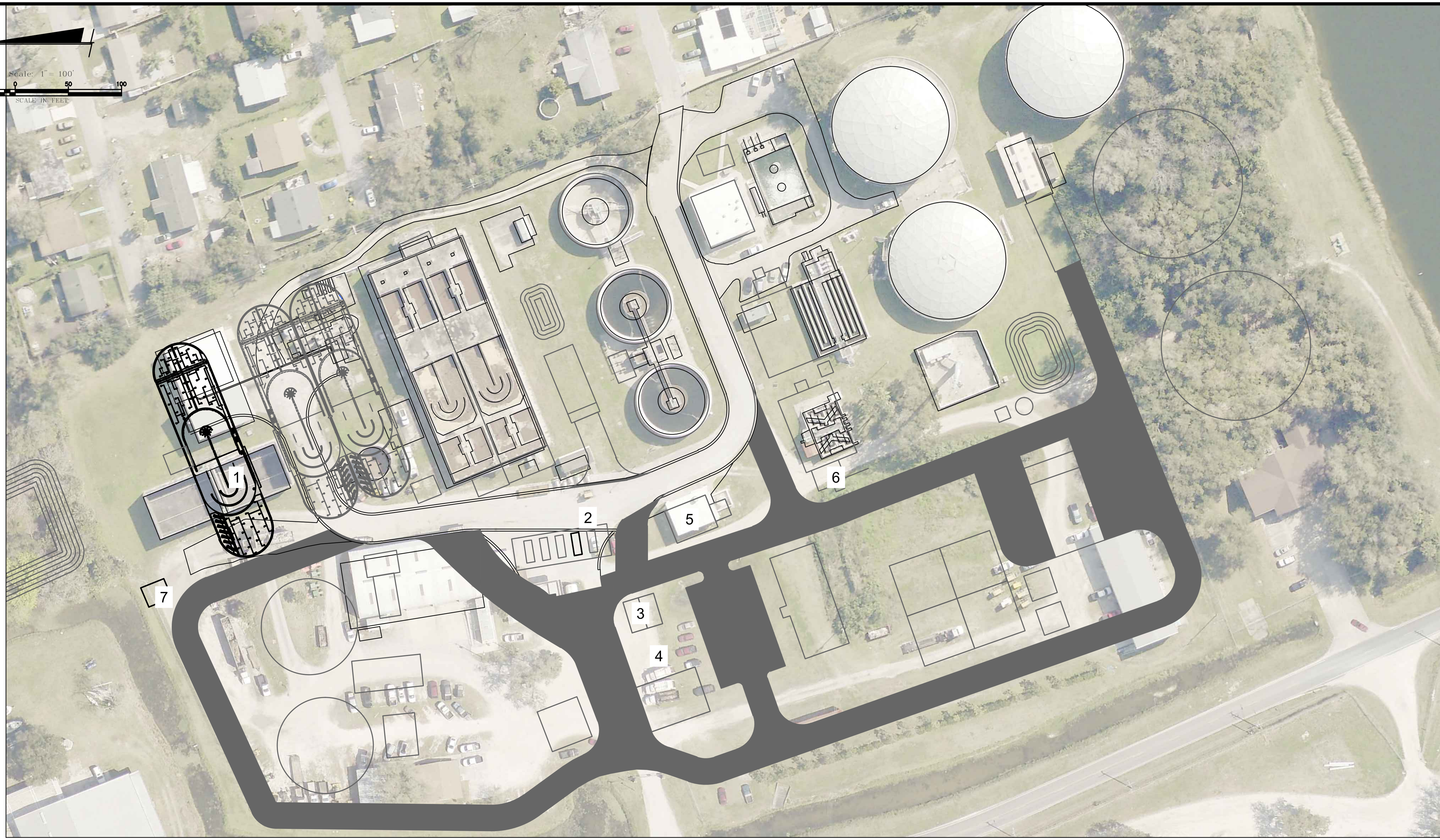
CONSTRUCTION



LEGEND

1. 5-STAGE BARDENPHO TRAIN 5
2. DISK FILTER NO. 4
3. INFLUENT PUMP
4. HEADWORKS EXPANSION
5. SODIUM HYPOCHLORITE STORAGE TANK
6. EFFLUENT TRANSFER PUMP
7. REAERATION BLOWER

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City of Edgewater, Florida

WWTP EXPANSION MASTER PLAN

PHASE 3 CONCEPTUAL SITE PLAN

City of EDGEWATER Florida

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FIGURE 5-2

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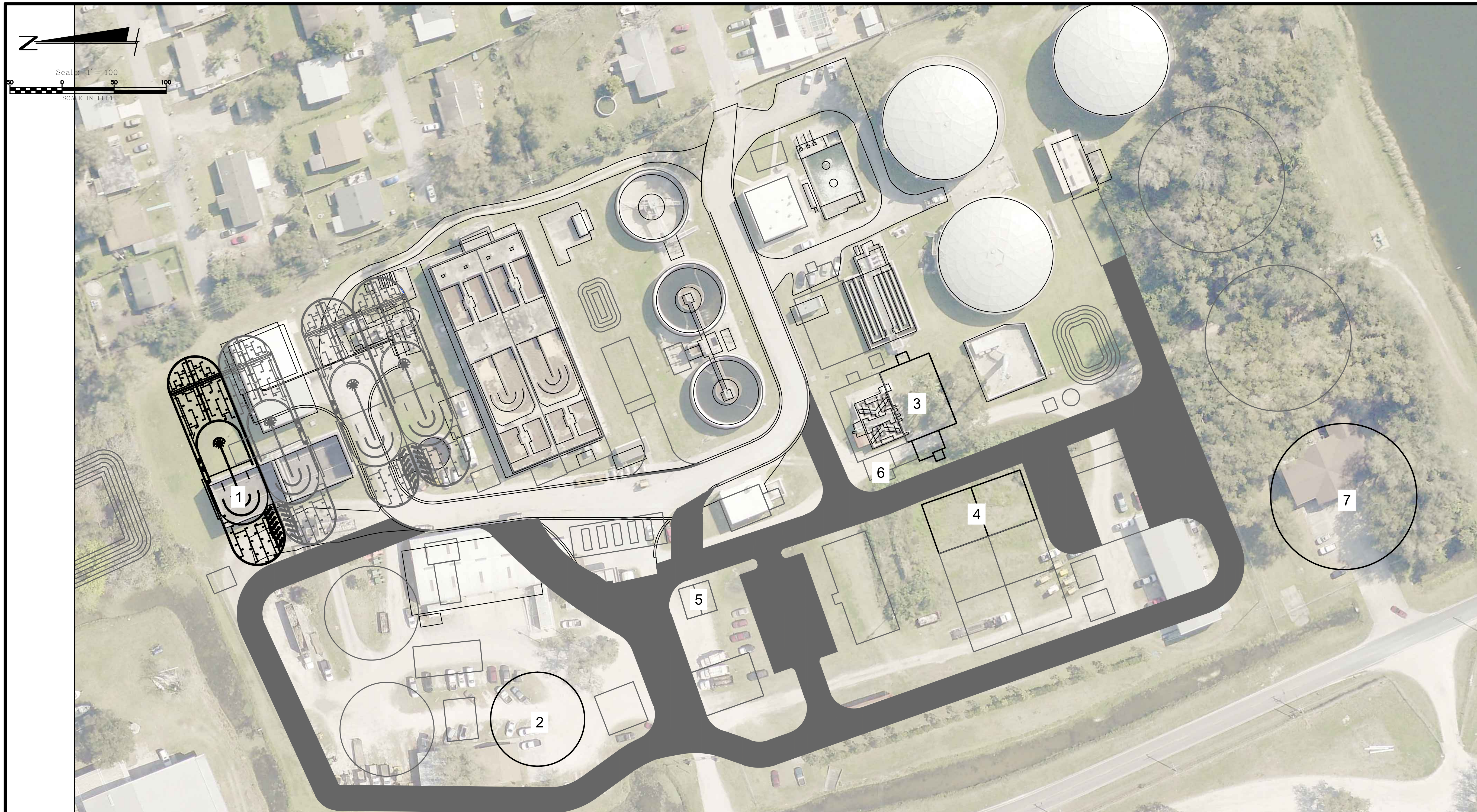

LEGEND

1. 5-STAGE BARDENPHO TRAIN 6
2. CLARIFIER 6
3. CHLORINE CONTACT BASIN 4
4. AEROBIC DIGESTERS
5. INFLUENT PUMP
6. EFFLUENT TRANSFER PUMP
7. RECLAIMED WATER GROUND STORAGE TANK #6

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City of Edgewater, Florida
WWTP EXPANSION MASTER PLAN

PHASES 4 CONCEPTUAL SITE PLAN

City of EDGEWATER Florida

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FIGURE 5-3

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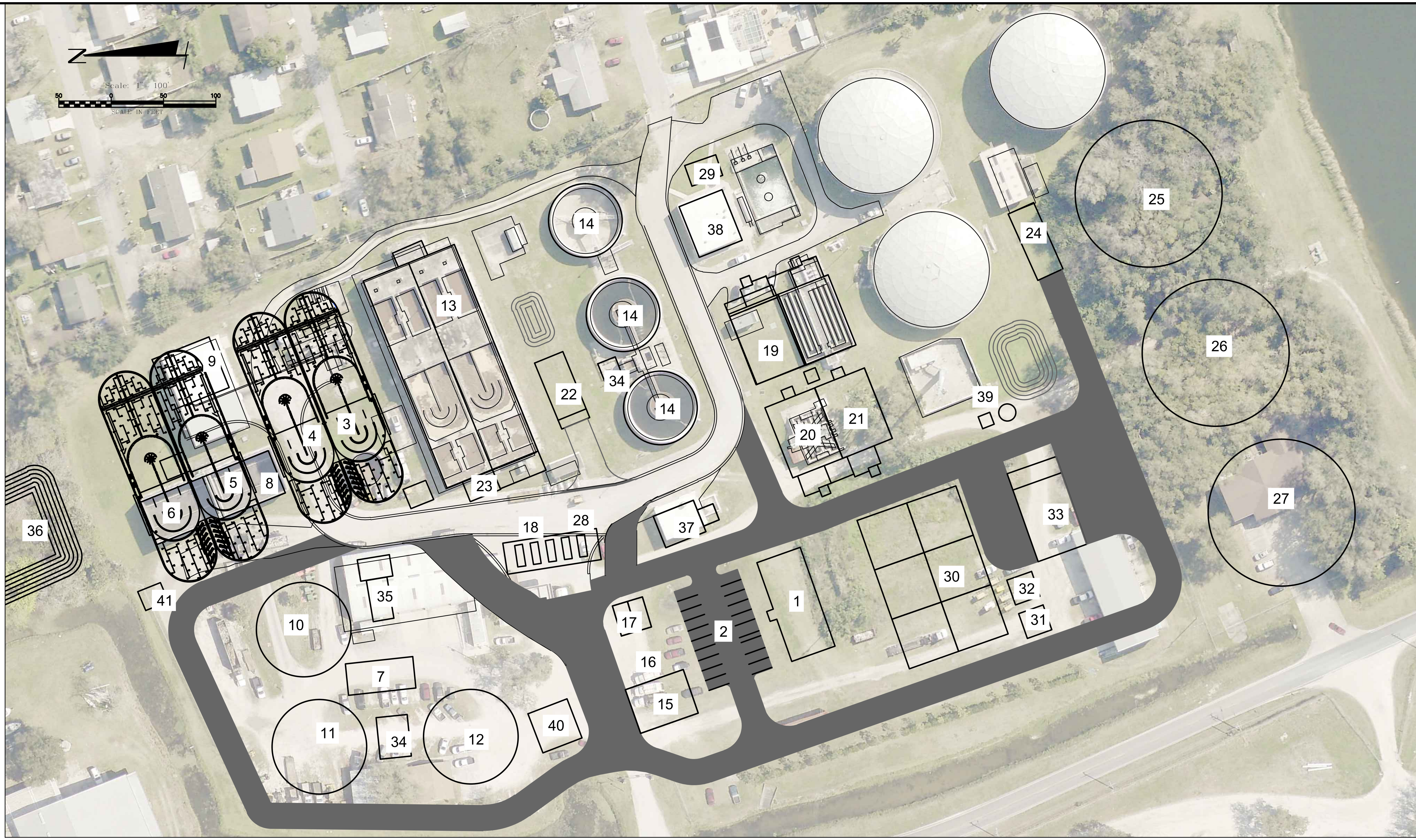

LEGEND

1. OPERATIONS BUILDING
2. PARKING
3. 5-STAGE BARDENPHO TRAIN 3
4. 5-STAGE BARDENPHO TRAIN 4
5. 5-STAGE BARDENPHO TRAIN 5
6. 5-STAGE BARDENPHO TRAIN 6
7. MLSS SPLITTER BOX
8. REHAB DIGESTERS
9. REPLACE CENTRIFUGES
10. CLARIFIER 4
11. CLARIFIER 5
12. CLARIFIER 6
13. REPLACE MIXERS AND AERATORS
14. REPLACE CLARIFIER MECHANISMS
15. HEADWORKS
16. HEADWORKS EXPANSION
17. INFLUENT PUMP
18. DISK FILTERS
19. CHLORINE CONTACT BASIN 2
20. CHLORINE CONTACT BASIN 3
21. CHLORINE CONTACT BASIN 4
22. ELECTRICAL BUILDING NO. 1
23. ALUM STORAGE AND FEED
24. HIGH SERVICE PUMP BUILDING AND ELECTRICAL BUILDING NO. 3
25. RECLAIMED WATER GROUND STORAGE TANK #4
26. RECLAIMED WATER GROUND STORAGE TANK #5
27. RECLAIMED WATER GROUND STORAGE TANK #6
28. SUPPLEMENTAL RECLAIMED WATER FILTRATION
29. SODIUM BISULFATE STORAGE AND FEED
30. AEROBIC DIGESTERS
31. DIGESTER BLOWERS
32. SLUDGE FEED PUMPS
33. CENTRIFUGE BUILDING
34. RAS/WAS PUMP STATION
35. ELECTRICAL BUILDING NO. 2 AND GENERATOR
36. STORM WATER RETENTION
37. SODIUM HYPOCHLORITE STORAGE TANK
38. RENOVATE EXISTING OPERATIONS BUILDING
39. IN-PLANT LIFT STATION
40. VAC DUMPLING STATION
41. REAERATION BLOWER

DATE	REVISION
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City of Edgewater, Florida
WWTP EXPANSION MASTER PLAN

CONCEPTUAL SITE PLAN PHASES 1 TO 4

City of EDGEWATER Florida

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FILE NAME:	--

FIGURE 9-1

PRELIMINARY, NOT FOR CONSTRUCTION

APPENDIX A

BEBR POPULATION AND PROJECTION REPORT

Small-Area Population Estimates and Projections for the City of Edgewater Utility Service Area

Prepared For

City of Edgewater
104 North Riverside
Edgewater, Florida 32132

Prepared By

Bureau of Economic and Business Research
College of Liberal Arts and Sciences
University of Florida
720 SW 2nd Avenue, Suite 150
P.O. Box 117148
Gainesville, Florida 32611-7148

January 26, 2025

TABLE OF CONTENTS

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INTRODUCTION

The University of Florida's Bureau of Economic and Business Research (BEBR) produces the official population estimates and projections for the State of Florida through a contract with the Florida Legislature. That contract funds the development of estimates at the state, county and city levels, and projections at the state and county levels. Because this data is often required at much smaller levels of geography for many planning activities and other purposes, BEBR also develops estimates and projections for smaller geographic units.

The City of Edgewater requires small-area population estimates and projections to guide its WWTP Expansion Master Plan and other planning efforts. This project generated those data using a GIS-based model which develops forecasts based on historical growth and BEBR's latest county forecast, and then constrains and directs population growth using a property parcel-level build-out analysis. The purpose of this document is to describe the methods used by BEBR to develop small-area population estimates and projections for the City of Edgewater's Utility Service Area.

GEOSPATIAL SMALL-AREA POPULATION MODEL OVERVIEW

BEBR used the Geospatial Small-Area Population Estimation and Forecasting Model ("Population Model") developed by GIS Associates to estimate and project residential population at the utility service area level, and then allocate those numbers to individual parcels within the service area. First, a Build-out Submodel was developed to estimate the maximum residential development potential at the parcel level. The current resident population was estimated, and then build-out values were forecasted. Areas which cannot physically or lawfully allow residential development (built-out areas, water bodies, public lands, incompatible land uses, etc.) were prevented from allowing future residential development by the Build-out Submodel. Conversely, the Growth Drivers Submodel identified areas where growth is more likely to occur based on proximity to certain spatial features (e.g., roads) that tend to drive growth to certain areas. Growth was projected based on a combination of historic growth trends (using an approach similar to what BEBR uses for its county level forecasts), and spatial constraints and influences, which both restrict and direct growth.

BUILD-OUT SUBMODEL

The Build-out Submodel was developed using the Volusia County Property Appraiser's GIS parcel database, including the associated tax roll information, the City and County future land use maps, recently developed residential housing unit densities by land use category, current and proposed developments, and environmental and legal growth constraints. This Submodel forecasts the maximum residential population by parcel at build-out.

Figure 1 below depicts the maximum number of housing units in the Utility Service Area, showing lower densities at build-out in pinks and higher ones in dark reds. Non-residential uses are in gray.

Figure 1. Parcels shaded by projected housing unit density (pink is low, light red is medium, and dark red is high)

Existing housing units were identified using data provided by the property appraiser. BEBR applied average unit occupancy and average household size from the 2020 decennial census tract data to convert housing units to household population. Population in parcels with group quarters were added to estimate the 2024 population for the Utility Service Area. The occupancy rate for residential parcels developed in 2024 was reduced so that population sum within the city limits equaled the official BEBR 2024 population estimate for Edgewater. (The BEBR estimate is as of 4/1/2024, and property parcel data was from much later in the year. The reduction was only for 2024, and those parcels were fully occupied by 2025.)

Future residential development was allowed in parcels with compatible land uses and sufficient developable area after water and wetlands were removed. The housing unit density per acre varied by land use type and were determined by recent development trends by land use. For parcels within any existing or planned developments, the development plans overrode the forecasted densities.

GROWTH DRIVERS SUBMODEL

The Growth Drivers Submodel predicts the relative probability of future residential development. The Submodel is a continuous raster surface of 10-meter cells containing values of 0-100, with '100' having the highest development potential and '0' having the lowest development potential. (See Figure 2). It influences the Population Model by factoring in the attraction of certain spatial features, or growth drivers on development. These drivers include:

1. Proximity to roads and interchanges prioritized by level of use (with each road type modeled separately)
2. Proximity to developments
3. Proximity to water utility service areas
4. Proximity to existing commercial development (based on parcels with commercial land use codes deemed attractors to residential growth)
5. Proximity to coastal and inland waters

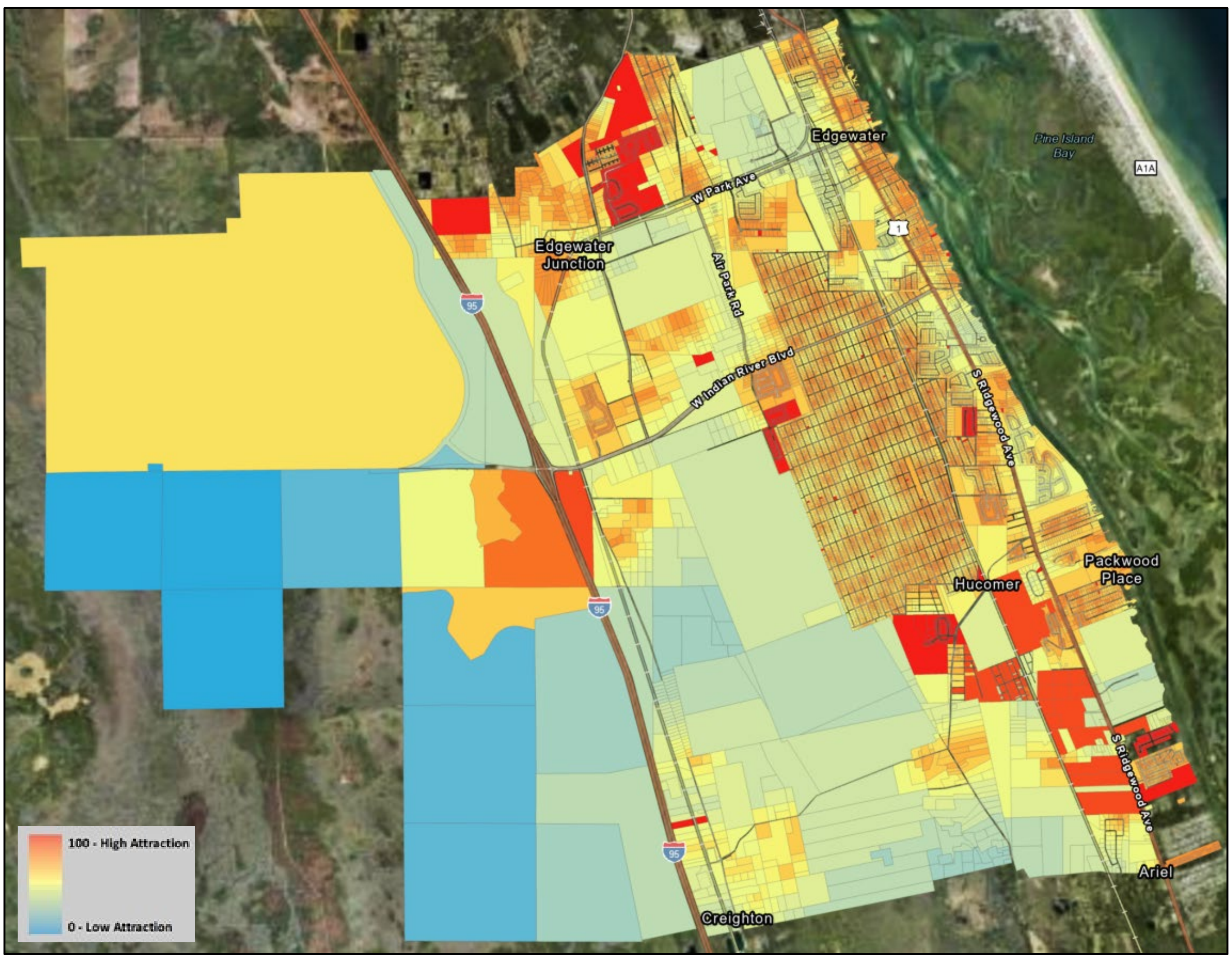

Figure 2. Parcels shaded by growth driver values (high development potential in red, moderate in yellow and low in blue)

The spatial relationship between these drivers and future residential development was determined by developing a logistic regression model using the individual driver grids as variables. Undeveloped parcels within an approved development were given additional value, and platted parcels in developments with recent growth were boosted further. The resulting output was a raster layer representing the likelihood of the occurrence of new residential development. This Submodel extends beyond the utility service area to account for the presence or absence of growth drivers outside it that could influence growth within it. This Submodel was used by the Population Model to rank undeveloped parcels based on their development potential, which is explained in the Growth Calculation Methodology section.

GEOSPATIAL SMALL-AREA POPULATION FORECASTING MODEL

The Geospatial Small-Area Population Forecasting Model ("Population Model") integrates the Build-out Submodel and the Growth Drivers Submodel with the Population Projection Engine™, which makes the projection calculations using a combination of those Submodel values, historic growth trends, and BEBR growth controls.

Historic Growth Trends

The historic growth trends were derived from historic population estimates from 2000-2024 for the City of Edgewater. (There are no comparable population estimates for the utility service area, but the City represents about 87% of the service area's population, so its historic percentage growth is a reasonable proxy for growth in the service area.) The estimates over this 25-year base period were used to produce 16 different projections using four demographic forecasting methods for evaluation for use in this forecast. Each of the four methods is a good predictor of growth in different situations and growth patterns, so evaluation and using a combination was the best way to avoid the largest possible errors resulting from the least appropriate techniques. This approach is similar to the one BEBR uses for its county population forecasts. Those methods included:

1. **Linear Projection Method:** The Linear Projection Method assumes that the future change in the number of persons will be the same as during the base period (Rayer and Comfort, 2024). Five linear calculations were made using base periods of 5, 10, 15, 20 and 25 years.
2. **Exponential Projection Method:** The Exponential Projection Method assumes that population will continue to change at the same percentage rate as during the base period (Rayer and Comfort, 2024). Five exponential calculations were made using base periods of 5, 10, 15, 20 and 25 years.

3. **Constant Share Projection Method:** The Constant Share Projection Method assumes that Edgewater's future percentage of the county's total population will be the same as over the base period (Rayer and Comfort, 2024). One Constant Share (CS) calculation was made based on 2020 shares. One constant share calculation was made based on the 2024 share of the county's population.
4. **Share-of-Growth Projection Method**: The Share-of-Growth Projection Method assumes that Edgewater's future percentage of the county's total growth will be the same as over the base period (Rayer and Comfort, 2024). Five share-of-growth calculations were made using base periods of 5, 10, 15, 20 and 25 years.

After evaluating all methods and historical periods against recent trends and current developments, the linear and exponential methods for more recent five- and ten-year historical periods were deemed the most appropriate to forecast Edgewater's population. Those four calculations were averaged, and the percentage increases in population of these city-level growth trends from the 2024 population (24,981) to the projected years (2025-2050) were then applied to the 2024 service area population total (28,746.)

Further, the temporal distribution of BEBR's projected growth through 2050 for Volusia County was incorporated into these projections, front-loading more of the growth earlier and slowing growth in the latter portion of the model horizon. For example, because 54.3% of the county's growth from 2024 to 2050 is projected by 2035, 54.3% of the service area projected growth through 2050 was allocated by 2035 as well. This is consistent with BEBR forecasts of slowing growth in the latter part of the 2050 horizon due to the aging of the population, the increasing natural decrease of the population (with deaths higher than births), and trends in both domestic and foreign net migration. The residential population projection summary for the City of Edgewater's utility service area is shown in Table 1.

Table 1. Population Projections

Year	Resident Population
2024	28,746
2025	30,191
2030	34,107
2035	37,469
2040	40,329
2045	42,739
2050	44,824

Growth Calculation Methodology

The Population Model then automated growth calculations using the historic growth trends and queries of the Build-out Submodel and the Growth Drivers Submodel. The methodology for calculating growth for each projection increment is summarized in the following steps:

1. Apply the projected growth for the increment (e.g., 2025-2030) to parcels within the utility service area with the highest driver values first. When all growth for the increment is distributed, go to the next 5-year increment.

2. After projecting growth for all 5-year increments through 2050, summarize the total growth for each increment and compare it against BEBR target growth for the service area. If the Population Model's projections exceeded the BEBR target growth, reduce the projected growth for parcels with the lowest growth driver values until the utility service area growth equaled the target. (The methodology used in this project can never result in population growth less than the BEBR target.)

PROJECTION DELIVERABLES

The final population projections were delivered in GIS format (Esri file geodatabase), with a single feature class containing parcel-level results. This format is useful for quality assuring the results and inputs, for maintaining the projection inputs over time, and for graphically depicting projected patterns of future population growth. Figure 3 symbolizes parcels showing 2024 population in yellow, 2024-2050 population growth in red, and parcels that do not allow residential development in white.

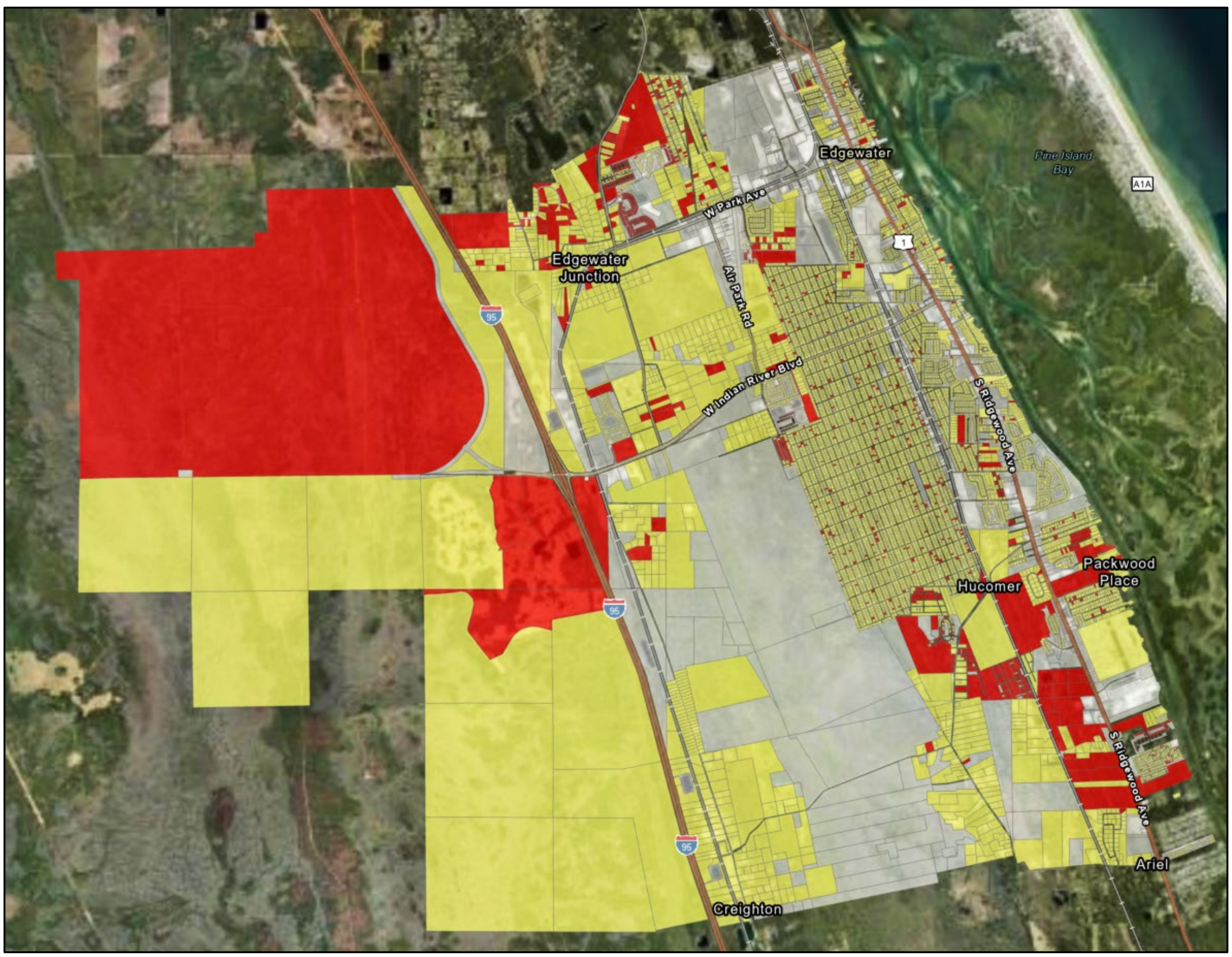

Figure 3. Parcel map showing projected 2024-2050 residential development (in red), 2024 residential development (in yellow), and non-residential areas (in white)

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