City of Apopka WRF

Future Capacity Evaluation

Draft Tech Memo

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#200-53076-23004

January 30, 2024

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AADF	Annual Average Daily Flow
AMP	Asset Management Plan
AWT	Advance Water Treatment
BEBR	Bureau of Economics and Research
BFP	Belt Filter Press
BMAP	Basin Management Action Plan
CAR	Capacity Analysis Report
City	City of Apopka
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DMR	Discharge Monitoring Report
EOPCC	Engineer's Opinion of Probable Construction Cost
EPA	Environmental Protection Agency
EQB	Flow Equalization Basin
FDEP	Florida Department of Environmental Protection
gpcd	Gallons per capita per day
GST	Ground Storage Tank
HLD	High-Level Disinfection
IR	Internal Recycle
LSG	Liquid Solutions Group
MDF	Maximum Daily Flow
MGD	Million Gallons per Day
NPDES	National Pollutant Discharge Elimination System
PAR	Public Access Reuse
PFAS	Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
POTW	Publicly Owned Treatment Works

Acronyms/Abbreviations	Definition
RAS	Return Activated Sludge
RIB	Rapid Infiltration Basin
SDWA	Safe Drinking Water Act
SJRWMD	St Johns River Water Management District
TSS	Total Suspended Solids
WAS	Waste Activated Sludge
WRF	Water Reclamation Facility

1 EXECUTIVE SUMMARY

1.1 GENERAL

The City of Apopka (City) water reclamation facility (WRF) has a permitted treatment capacity of 8.0 million gallons per day (MGD) provided by two separate process trains: the East Plant (5.0 MGD) and the West Plant (3.0 MGD). As a proactive planning strategy, the City intends to evaluate the existing WRF capacity to determine if the WRF can treat future wastewater flows and comply with current and future regulatory requirements. To this end, the City requested Tetra Tech to complete a series of conceptual evaluations to (1) identify and summarize regulatory requirements which relate to future WRF treatment, biosolids disposal, and reclaimed water disposal, (2) establish future wastewater flows, reclaimed water demand, and treatment capacity, (3) evaluate alternatives to expand and or upgrade existing processes for the East Plant and West Plant to comply with future regulatory requirements and wastewater flows and (4) evaluate the feasibility to recommission the West Plant to either continue operations as part of the WRF to treat influent wastewater or be re-purposed as a standalone facility to treat surface water for reclaimed water augmentation.

The following findings can be summarized from this report:

- Regulatory requirements:
  - The City's WRF is currently operating to meet existing regulations for wastewater, reclaimed water, and biosolids.
  - The latest Wekiva Basin Management Action Plan (BMAP) includes more stringent requirements for Total Nitrogen (TN) in the effluent, to a level of no more than 3.0 mg/L TN on an annual permitted basis. Based on the City's current FDEP operating permit, new effluent standards set forth in the Wekiva BMAP will take effect on July 1, 2028.
  - It is anticipated that future regulations will establish limits for additional constituents not yet regulated, including PFAS in reclaimed water and biosolids.
- The City's existing East Plant is able to comply with the latest BMAP requirements. The West Plant, however, would require upgrades to the facility to produce an effluent with a TN level below 3.0 mg/L.
- Influent nitrogen can have a significant impact to the design of the biological treatment system. Because influent nitrogen is not required to be monitored and reported on FDEP's monthly discharge monitoring reports, influent nitrogen is usually not readily available or limited. It is recommended that the WRF continues routine sampling for influent nitrogen so accurate data is available for use in design of the upgrades and/or expansion.
- Future wastewater and reclaimed water flows were evaluated using three (3) different projection analyses for each water source. Based on discussions with City Staff, the following methodologies were selected to establish future flows:
  - Wastewater – Tetra Tech's Linear Regression Analysis
  - Reclaimed Water – LSG's Reuse Water Balance Modeling Report
- While the permitted WRF capacity is 8.0 MGD, the actual WRF capacity is limited to the East Plant capacity (5.0 MGD) as a result of the West Plant being offline for approximately five years.
- A general capacity analysis and water quality analysis was completed to understand the need to upgrade and/or expand the WRF to comply with future requirements. The WRF will be required to produce an TN effluent below 3.0 mg/L based on the latest BMAP. Further, because the West Plant is not in operation, the WRF will require upgrades to have sufficient treatment capacity. Upgrades to the WRF capacity are

required to meet a planning, design, and construction schedule as set forth in Rule 62-600.45, FAC, as follows:

    - Begin planning and preliminary design if the permitted capacity will be equaled or exceeded within five (5) years,
    - Begin design of plans and specifications if the permitted capacity will be equaled or exceeded within four (4) years,
    - Submit FDEP permit application if the permitted capacity will be equaled or exceeded within three (3) years.

- The following two alternatives were evaluated for the upgrade/expansion of the WRF:
    - Recommission and upgrade the West Plant to place the existing treatment facilities in operation and upgrade the biological nutrient removal process of the treatment plant to enhance TN removal to achieve and effluent of 3.0 mg/L. This alternative allows the West Plant capacity (3.0 MGD) to be useful and therefore increase the WRF capacity to the permitted 8.0 MGD.
    - Construct new treatment facilities at the East Plant and demolish, abandon and/or repurpose all or portions of the West Plant. This alternative proposes a second liquid stream treatment train equal in size to the existing East Plant (5.0 MGD). By expanding the East Plant, the WRF can either maintain or increase the permitted capacity:
        - The existing headworks and EQB are sized for a flow of 8.0 MGD, consistent with the current WRF treatment capacity. If the headworks are not expanded, the WRF capacity would remain 8.0 MGD. Although expanding the EQB is recommended, but not required, to provide better flow attenuation, provide a more consistent nutrient loading to the biological treatment process
        - Alternatively, a new headworks and EQB can be installed to increase the WRF treatment capacity to 10.0 MGD.
- To meet the regulatory deadline of meeting an effluent TN of 3.0 mg/L by July 1, 2028, it is recommended that the City begin the project by issuing a request for qualification for professional engineering services for the expansion/upgrade June 2024 in order to begin design by September 1, 2024, in order to permit and complete design and construction by December 2027 and achieve operational treatment levels by June 30, 2028.
- Alternative uses of the West Plant were also evaluated, including
    - Re-purposing the West Plant as a surface water treatment facility to augment the reclaimed water supply using water from Border Lake, Lake Page, and Lake Pleasant.
    - Abandoning the West Plant and fully decommission it from future use.
- A summary of the Engineer's opinion of probable construction costs (EOPCC) for each alternative discussed in this Report is provided in **Table 1-1**. The values provided are preliminary estimates prepared using cost data from a variety of sources and engineering judgement. In general, the East Plant expansion estimate considered actual measurement and payment values from the East Plant construction in 2016 and adjusted for escalation. The West Plant upgrades estimate used the EOPCC provided in CHA's report and adjusted for escalation. The EOPCCs provided in **Table 1-1** also used other miscellaneous items cost data for similar projects from either schedule of values from other construction projects or EOPCCs developed by Tetra Tech for similar type projects.

Table 1-1. Engineer's Opinion of Probable Construction Cost Summary

Description	Upgrade West Plant (3 MGD/8 MGD Total)	Expand East Plant (3 MGD/8 MGD Total)	Expand East Plant w/o Biosolids (5 MGD/10 MGD Total)	Expand East Plant w/ Biosolids (5 MGD/10 MGD Total)	West Plant Stormwater Treatment
Upgrades to West Plant	$23,000,000	--	--	--	$17,000,000
Rehab and Replacement @ West Plant	$6,000,000	--	--	--	$4,000,000
Second Headworks @ East Plant	--	--	$9,000,000	$9,000,000	--
Second Equalization Basin @ East Plant	$11,000,000 [1]	$11,000,000 [1]	$12,000,000	$12,000,000	--
Liquid Stream @ East Plant	--	$66,000,000	$66,000,000	$66,000,000	--
Solids Handling (w/o Sludge Drying)	--	--	--	$13,000,000	--
Subtotal	**$40,000,000**	**$77,000,000**	**$87,000,000**	**$100,000,000**	**$21,000,000**
Contingency @ 35%	$14,000,000	$27,000,000	$30,000,000	$35,000,000	$7,000,000
Total	**$54,000,000**	**$104,000,000**	**$117,000,000**	**$135,000,000**	**$28,000,000**

Notes:

[1] Recommended but optional

1.2 RECOMMENDATIONS

The average estimated remaining useful life of the existing structures at the West Plant is 20 years. Based on the proposed schedule (2028) the remaining estimated useful life will be approximately 15 years. Based on the age of the existing structures, level of rehabilitation and replacement required at the West Plant, and estimated cost to upgrade the West Plant, it is recommended to construct new facilities at the East Plant. Depending on the availability of funding, the expansion of the East Plant can be completed in phases. The proposed phasing is as follows:

1. Phase 1 – Construct new liquid stream processes to maintain the current permitted capacity of 3.0 mgd. This includes a new 4-stage Bardenpho process, addition of a third clarifier, new filter and chlorine contact tank with effluent transfer pumps. This phase of the project will also include additional sodium hypochlorite storage tanks or replacement of the existing tanks with larger capacity tanks and additional chemical feed pumps.
2. Phase 2 – Construct second flow equalization tank (no additional capacity but will improve treatment by attenuating flow and nutrient load to the biological nutrient removal process and provide a more resilient process and increase reliability).
3. Phase 3 – Expand the permitted capacity of the WRF by constructing a new headworks.
4. Phase 4 – Expand the biosolids treatment facilities (no additional capacity gained but this will provide added redundancy and reliability and reduce the duration of operations at higher flows (i.e., days of the week and hours per day).

Table 1-2 summarizes the engineer's opinion of probable construction cost for each phase.

Table 1-2. Engineer's Opinion of Probable Construction Cost – Phased Summary

Phase	WRF Capacity (MGD)	EOPCC
Phase 1	8.0	$89,000,000
Phase 2	8.0	$16,000,000
Phase 3	10.0	$12,000,000
Phase 4	10.0	$18,000,000

There may be additional items in Phase 1 that can be deferred to Phase 2 to further reduce initial costs, but these would be relatively minor compared to the overall construction cost.

If funding is limited, the bare minimum required to meet the regulatory requirement of 3.0 mg/L includes the recommended upgrades to the West Plant and the required rehabilitation and replacement to the existing facilities. The engineer's opinion of probable construction cost is approximately $40,000,000.

2 INTRODUCTION

2.1 BACKGROUND AND PURPOSE

The City of Apopka (City) owns and operates its Water Reclamation Facility (WRF) which treats wastewater from domestic and non-domestic sources to public access reuse standards. The WRF is located at 333 Snowden Road, Apopka, FL 32703 and has an existing capacity of 8.0 million gallons per day (MGD) on an annual average daily basis (AADF) provided by two separate process trains; the East Plant (5.0 MGD) and the West Plant (3.0 MGD). Permitted effluent disposal for the City's WRF includes the City's permitted 19.4 MGD public access reuse (PAR) system and the City's 0.235 MGD restricted access sprayfield system.

As a proactive planning strategy, the City intends to evaluate the existing WRF capacity to determine if the WRF is capable to treat future wastewater flows and comply with additional regulatory requirements. To this end, the City requested Tetra Tech to complete a series of conceptual evaluations as follows:

1) Identify and summarize regulatory requirements which relate to future WRF treatment, biosolids disposal, and reclaimed water disposal,
2) Establish future wastewater flows, reclaimed water demand, and treatment capacity,
3) Review capacities of unit processes for the East Plant, West Plant, and reuse system to determine capacity limitations resulting from future regulatory requirements and wastewater flows, and
4) Evaluate the feasibility to recommission the West Plant to either continue operations as part of the WRF to treat influent wastewater or be re-purposed as a standalone facility to treat surface water for reclaimed water augmentation.

2.2 SCOPE OF WORK

The purpose of this technical memorandum is to present the conceptual analysis of the WRF's capacity to comply with future regulations and meet future water demands. The development of this technical memorandum is based on a review of existing site conditions, historical flow and influent characteristics analysis, and input from City staff.

In summary, this technical memorandum includes the following:

- Review of existing regulations on wastewater, reclaimed water, and biosolids
- Review of future regulations and proposed State House and Senate Bills applicable to wastewater treatment
- Review of existing WRF capacity
- Review of existing West Plant conditions
- Review of existing wastewater and reclaimed water flows
- Establish future wastewater and reclaimed water flows
- Determine the feasibility to recommission the West Plant to treat either wastewater or surface water
- Provide alternatives to increase treatment flow capacity and/or achieve future effluent water quality requirements, as determined necessary herein.

3 REGULATORY REQUIREMENTS AND PERMITTING

3.1 GENERAL

This evaluation will take into consideration existing, proposed, and emerging Federal, State, and other local regulations that will govern over the operation of the City's WRF. The Florida Department of Environmental Protection (FDEP) and the St Johns River Water Management District (SJRWMD) maintain regulatory jurisdiction over the project. The following subsections summarize the pertinent regulations or codes by each agency having jurisdiction. **Section 3.3.3** provides a summary table (**Table 3-3**) showing the effluent water quality limits, as enforced by the respective regulatory agencies.

Appendix A provides a copy of the wastewater, reclaimed water, and biosolids regulations summarized in this Report.

3.2 CURRENT PERMIT CONDITIONS

The City's WRF operates under FDEP's Wastewater permit no. FLA010818. A copy of the City's current FDEP wastewater operating permit is provided in **Appendix B**. The City is permitted to dispose of its effluent water either through the City's public access reuse system or through the City's restricted access sprayfield system. The PAR system constitutes additional design and operational regulations compared to the sprayfield due to its end use as residential irrigation. Facilities supplying reclaimed water to residential properties or crops for human consumption are required to provide filtration for TSS control (< 5 mg/L) and provide high-level disinfection as defined by Chapter 62-600.440(5), F.A.C. Where chlorine is the disinfectant, the design of the chlorine contactor must provide at least 1 mg/L of total chlorine residual in the effluent at all times and the product of the chlorine residual and the contact time must meet a minimum constant of 40 mg/L-min for the WRF. Once disinfected, there is no requirement for maintenance of a chlorine residual in the distribution system.

Current quality limits established in FDEP's permit no. FLA010818 for reclaimed water discharged into the PAR system and for biosolids produced by the WRF are provided in **Table 3-1** and **Table 3-2**, respectively.

Table 3-1. Current Permitted Reclaimed Water Limits (for PAR)

Description	Annual Average Value	Unit
Flow (to PAR)	19.4	MGD
Carbonaceous BOD_5	20	mg/L
Total Suspended Solids	5	mg/L
Total Nitrogen	10	mg/L
Total Phosphorus	Report	mg/L
Fecal Coliform (Single Sample)	25	# / 100 mL
Chlorine Residual (minimum)	1.0	mg/L

Table 3-2. Current Permitted Biosolids Limits – Sludge Dry Weight

Description	Class A Biosolids (Single Sample)	Class AA Biosolids (Monthly Average / Single Sample)	Unit
Nitrogen	Report	Report	%
Phosphorus	Report	Report	%
Potassium	Report	Report	%
Arsenic	75	41 / 75	mg/kg
Cadmium	85	39 / 85	mg/kg
Copper	4,300	1,500 / 4,300	mg/kg
Lead	840	300 / 840	mg/kg
Mercury	57	17 / 57	mg/kg
Molybdenum	75	75 (single sample)	mg/kg
Nickel	420	420 / 420	mg/kg
Selenium	100	100 / 100	mg/kg
Zinc	7,500	2,800 / 7,500	mg/kg
Total Solids	Report	Report	%
Fecal Coliform	1,000	1,000 (single sample)	MPN/4 g
Salmonella	3.0	3.0 (single sample)	MPN/4 g

3.3 REGULATORY REQUIREMENTS

3.3.1 Florida Department of Environmental Protection – Wastewater

According to Part I of Chapter 403 of the Florida Statutes, unless exempted by rule or statue, any facility or activity which discharges wastes into waters of the State, or which will reasonably be expected to be a source of water pollution must obtain a permit from the Department. Generally, persons who intend to collect, transmit, treat, dispose, or reuse wastewater are required to obtain a wastewater permit. A wastewater permit issued by FDEP is required for both operation and certain construction activities associated with domestic wastewater facilities or activities including reuse.

- Chapter 62-600.420 requires all domestic wastewater facilities provide a minimum of secondary treatment of wastewater prior to reuse or disposal.
- Chapter 62-600.420 (1)(a) states, for surface water disposal (excluding ocean outfalls), new or improved existing facilities shall provide secondary treatment so effluent after disinfection contains less than 20 mg/L BOD_5 and 20 mg/L TSS, or 85% removal of each from the wastewater influent.

3.3.2 Florida Department of Environmental Protection – Reclaimed Water

In recognition of reclaimed water as a valuable resource, the FDEP has prepared regulations pertaining to reuse of reclaimed water, the objective being rules that would facilitate and encourage the implementation of water reuse programs while ensuring protection of the environment and public health. The main chapters of the Florida Administrative Code (FAC) which regulate water reclamation and reuse facilities in the State of Florida are Chapters 62-610 “Reuse of Reclaimed Water and Land Application” and 62-600 “Wastewater Facilities.” The latest Basin Management Action Plan (BMAP) as published in 2018 was also reviewed in this evaluation.

- Chapter 62-600.550 (1) requires that existing domestic wastewater facilities shall comply with the new wastewater management requirements set forth in the Wekiva BMAP within five (5) years and new or expanded facilities shall comply immediately.
- Chapter 62-600.550 (3)(e) requires that Type I wastewater treatment facilities (Type I defined as a wastewater facility having a permitted capacity of 500,000 gallons per day or greater) that public access reuse systems or restricted access irrigation systems shall meet an annual average reclaimed water limitation of 10.0 mg/L Total Nitrogen.
- Chapter 62-600.550 (7)(a) states that new surface discharge shall be permitted only as back-up to a public access reuse system and only if it complies with the provisions of Sections 403.086(4) and (5), F.S. In addition, the discharge shall constitute no more than 30% of the total annual wastewater treatment plant flow.
- Chapter 62-600.550 (7)(b) states existing surface water discharges shall be restricted to serving as a back-up to a public access reuse system. To qualify as a back-up system, the discharge shall constitute no more than 30% of the total annual wastewater treatment plant flow.
- Chapter 62-610.460 (1) sets a maximum concentration of total suspended solids in reclaimed water of 5.0 mg/L before disinfection.
- Chapter 62-610.464 (3) states off-spec reclaimed shall be stored with a tank with a minimum volume equal to one day flow and be recirculated for further treatment.
- Chapter 1 of the Wekiva BMAP limits nitrogen concentration at new rapid infiltration basins (RIBs) and absorption fields at 3 mg/L TN.
- The Wekiva BMAP locates the City of Apopka to be in the *“most vulnerable*” and “*vulnerable*” areas:
    - Primary Protection Zone (referring to the “*most vulnerable*” areas):
        - Chapter 62-600.550 (3)(c) wastewater treatment facilities that use rapid-rate land application systems in the Primary Protection Zone shall meet an annual average reclaimed water limitation of 3.0 mg/L Total Nitrogen, as N, unless used as a back-up to a public access reuse system.
        - Chapter 4 of the Wekiva BMAP regulates wastewater effluent limits in the Primary Protection Zone as follows:
            - Existing RIBs – 3 mg/L TN
            - Reuse irrigation systems – 10 mg/L TN (including RIBs as backup to reuse)
            - Package plants – 10 mg/L TN or connect to another system
        - Chapter 1.5.2 of the Wekiva BMAP prohibits new domestic wastewater disposal facilities, including rapid infiltration basins, except for those facilities that meet an advanced wastewater treatment standard of no more than 3.0 mg/L Total Nitrogen.

- Secondary Protection Zone (referring to the "*vulnerable*" areas):
    - Chapter 62-600.550 (4)(a) wastewater treatment facilities that use rapid-rate land application systems in the Secondary Protection Zone shall meet an annual average reclaimed water limitation of 6.0 mg/L Total Nitrogen, as N, unless used as back-up to a public access reuse system.
    - Chapter 4 of the Wekiva BMAP regulates wastewater effluent limits in the Secondary Protection Zone as follows:
        - Existing and New RIBs – 6 mg/L TN
        - Reuse irrigation systems – 10 mg/L TN (including RIBs as backup to reuse)
        - Package plants – 10 mg/L TN or connect to another system
- Section 403.086 FAC sets forth limits for advance water treatment effluent as follows:
    - BOD_5 – 5 mg/L
    - Total Suspended Solids – 5 mg/L
    - Total Nitrogen – 3 mg/L TN
    - Total Phosphorus – 1 mg/L TP
- Polyfluoroalkyl Substances (PFAS):
    - The Effluent Guidelines Program Plan 15 (Plan 15) focuses on assessing opportunities to limit PFAS discharges from industrial categories. A Publicly Owned Treatment Works (POTW) Influent Study of PFAS will focus on collecting nationwide data on industrial discharges of PFAS to POTWs. The Environmental Protection Agency (EPA) plans to verify sources of PFAS wastewater and help POTWs assess the need for control measures at the source.
    - EPA proposed the first Clean Water Act aquatic life criteria for PFAS which reflect industry knowledge regarding the toxicological effects of PFAS and PFOS on freshwater aquatic organisms.
    - EPA is proposing to designate two (2) types of PFAS, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to increase transparency around releases of these harmful chemicals and hold polluters accountable for cleaning up their contamination.
    - EPA is reproposing the Fifth Unregulated Contaminant Monitoring Rule (UCMR 5) and is reissuing final regulatory determinations for PFOA and PFOS under the Safe Drinking Water Act (SDWA) for potable water treatment facilities.

3.3.3 Reuse Water Regulatory Summary

Table 3-3 provides a summary of the effluent quality limits on an annual average basis for reuse water as set forth by the various rules and regulations, enforced by FDEP and SJRWMD. Also included in **Table 3-3** are the existing regulatory limits for the City of Apopka under the current FDEP permit no. FLA010818. Currently, the City is required to produce secondary effluent that complies with the BMAP and Florida Statutes limits applicable at the time of the last WRF permit renewal. However, regulations will be more stringent in the future, especially for utilities that are located in the Wekiva BMAP. Based on the City's current FDEP operating permit, new effluent standards set forth in the Wekiva BMAP will take effect on July 1, 2028.

The City does not currently have surface water discharge or a rapid-rate land application system; therefore, the City is not currently required to meet the water quality limits presented in Section 403.086 FAC or 62-600.550 (3)(c) based on current regulations.

Table 3-3. Reuse Water Quality Limits

Regulating Authority	Rules and Regulations	Total Nitrogen	Total Phosphorus	Suspended Solids	BOD_5
FDEP	Current Permit Limit (Permit No. FLA010818)	10.0 mg/L	–	20.0 mg/L	20.0 mg/L
FAC	62-600.420 (1)(a)	–	–	20.0 mg/L	20.0 mg/L
FAC	62-600.550 (3)(c)	3.0 mg/L	–	–	–
FAC	62-600.550 (3)(e)	10.0 mg/L	–	–	–
FAC	62-600.550 (4)(a) [1]	6.0 mg/L	–	–	–
FAC	62-600.550 (3)(c) [1]	3.0 mg/L			
FAC	62-600.550 (4)(c)	10.0 mg/L	–	–	–
FAC	62-610.460	--	--	5.0 mg/L	--
Florida Statutes	403.086 [2]	3.0 mg/L	1.0 mg/L	5.0 mg/L	5.0 mg/L
FDEP	**Wekiwa Spring and Rock Springs BMAP 2018**	**3.0 mg/L**	**--**	**--**	**--**
Regulating Limit		**3.0 mg/L**	**–**	**5.0 mg/L**	**20.0 mg/L**

Notes:
[1] Not applicable the City does not have rapid-rate land application system.
[2] Not applicable; the City does not have surface water discharge.

3.3.4 Florida Department of Environmental Protection – Biosolids

The FDEP deems the unregulated use, disposal, or land application of biosolids a threat to public health and the environment. With intention to ensure the safety of the public and the environment, regulations for biosolids have been developed. These regulations apply to domestic wastewater treatment facilities and biosolids management facilities that generate, treat, or manage biosolids.

- Chapter 62-640.210 requires facilities that generate, treat, or manage Class A and AA biosolids to submit a Treatment Facility Biosolids Plan indicating the land application site.
- Chapter 62-640.300 (1) requires that facilities that receive or generate biosolids shall have a valid Department permit prior to treatment, land application, distribution and marketing, or disposal of biosolids. The permit shall specify the use or disposal of the facility's biosolids.

- 40 CFR Part 503.33 requires bulk sewage sludge applied to agricultural land, forest, a public contract site, or a reclamation site to meet one of the ten available options of the vector attraction reduction requirements, as follows:

  Option 1: Meet 38% reduction in volatile solids content.

  Option 2: Demonstrate vector attraction reduction with additional anaerobic digestion in a bench-scale unit.

  Option 3: Demonstrate vector attraction reduction with additional aerobic digestion in a bench-scale unit.

  Option 4: Meet a specific oxygen uptake rate for anaerobically digested biosolids.

  Option 5: Use aerobic processes at greater than 40°C for 14 days or longer.

  Option 6: Alkali addition under specified conditions.

  Option 7: Dry biosolids with unstabilized solids to at least 75 percent solids.

  Option 8: Inject biosolids beneath the soil surface.

  Option 9: Cover biosolids placed on a surface disposal site with soil or other material at the end of each operating day.

  Option 10: Alkaline treatment for domestic septage to pH 12 or above for 30 minutes without adding more alkaline material.

- Chapter 62-640.650 (3)(a) through (c) require facilities that generate, treat, or manage biosolids for land application to conduct frequent biosolids monitoring, soil monitoring, and groundwater monitoring to characterize current conditions. Biosolids are monitored for miscellaneous metals and groundwater quality is monitored for total nitrogen, total phosphorus, pH, and fecal coliform.
- Chapter 62-640.700 (5)(a) regulates metals concentration on a dry-weight basis for biosolids applied to a land application as follows:
  - Arsenic – 75 mg/kg
  - Cadmium – 85 mg/kg
  - Copper – 4,300 mg/kg
  - Lead – 840 mg/kg
  - Mercury – 57 mg/kg
  - Molybdenum – 75 mg/kg
  - Nickel – 420 mg/kg
  - Selenium – 100 mg/kg
  - Zinc – 7,500 mg/kg

The City's current FDEP operating permit includes regulatory limits that comply with current Federal, State, and Local regulations. While there have been no changes to biosolids regulations, various regulatory proposals have been evaluated by the EPA and the State of Florida to develop more stringent quality limits for biosolids. Recent and upcoming proposals include:

- Senate Bill (SB) 0880 intended to prohibit FDEP from authorizing land application site permits for Class B biosolids unless it could be demonstrated that the phosphorus and nitrogen in the biosolids do not add to the nutrient loading in the impaired sub-watershed in which the land application site is located. New or renewed Class B biosolids land application site permits issued after July 1, 2023 would have been required to comply with SB 0880 by July 1, 2025. SB 0880, however, was not passed and died in appropriations.

- House Bill (HB) 1405 consists of a Biosolids grant program to support projects that implement solutions for the disposal of biosolids or construct, upgrade, expand, or retrofit wastewater facilities to produce Class AA biosolids, nonfertilizer uses or disposal methods, or alternatives to synthetic fertilizers.
- PFAS:
    - EPA is conducting a biosolids risk assessment for PFOA and PFOS in biosolids which is planned to be completed by December 2024. If EPA determines that PFOA or PFOS in biosolids may adversely affect public health or the environment, risk managers will consider options for numerical limitations and best management practices for these compounds.

4 EXISTING CONDITIONS

4.1 GENERAL

This Section provides a summary of the existing capacities of unit processes for the East Plant, West Plant, and reclaimed water system to determine capacity limitations resulting from future regulatory requirements and wastewater flows.

The City' WRF is operated under the FDEP's Domestic Wastewater Facility (Permit No. FLA010818) and consists of two (2) separate treatment plants: the East Plant and the West Plant. The existing permitted flow is 8.0 MGD AADF which is divided between the East Plant (5.0 MGD) and the West Plant (3.0 MGD). **Table 4-1** provides a summary of the City's existing influent permitted capacity.

Table 4-1. City of Apopka WRF Existing Permitted Capacity

Permitted Capacity	Flow Rate, MGD
East Plant	5.0
West Plant	3.0
Total Permitted Treatment Capacity	8.0

4.2 INFLUENT WASTEWATER QUALITY

Historical influent flow characteristics as reported in the Discharge Monitoring Reports (DMRs) submitted to FDEP were used to evaluate current water quality and flow conditions. **Table 4-2** summarizes the historical data obtained from the DMRs for the time period between January 2019 and August 2023. The average flow to the facility during this period was approximately 3.10 MGD. Currently, the East Plant is operating at 60% of its capacity and the West Plant is offline.

Table 4-2. Historical Influent Wastewater Characteristics

Year	Annual Average Daily Flow, MGD	BOD_5, mg/L	TSS, mg/L	TN, mg/L
2019	2.90	251	338	49.1
2020	2.96	238	275	53.1
2021	3.08	249	243	47.7
2022	3.20	214	227	47.7
2023	3.25 [1]	235 [1]	243 [1]	47.3 [2]
Average	3.08	237	265	48.6
Maximum	3.61	337	415	96.0
Minimum	2.58	157	168	19.5
90th Percentile	3.32	286	352	54.9

Notes:

1 Includes flow data from January 2023 through August 2023, as available at the time of development of this Report.

2 Includes flow data from January 2023 through October 2023, as available at the time of development of this Report.

4.3 PRETREATMENT

Raw wastewater from the Apopka service area enters the WRF through an existing 30-inch force main. The East and West Plants share a common headworks structure, inclusive of an influent mechanical bar screen, a manual bypass screen, and a grit chamber for solids and grit removal. Water then flows into a 1.225 MG flow equalization basin (EQB) which equalizes flow through the plant by increasing or reducing the volume of water that travels through the plant at any given time. Both the headworks and the EQB are located at the East Plant. The EQB includes a transfer pump station inclusive of six dry-pit submersible pumps of which three pumps are used to transfer water to the East Plant and three pumps are used to transfer water to the West Plant. There is an existing odor control unit to treat odorous air trapped by the covered headworks structure and EQB basin.

Figure 4-1 provides a schematic pretreatment flow process diagram. **Table 4-3** provides a summary of the existing pretreatment capacity at the City's WRF.

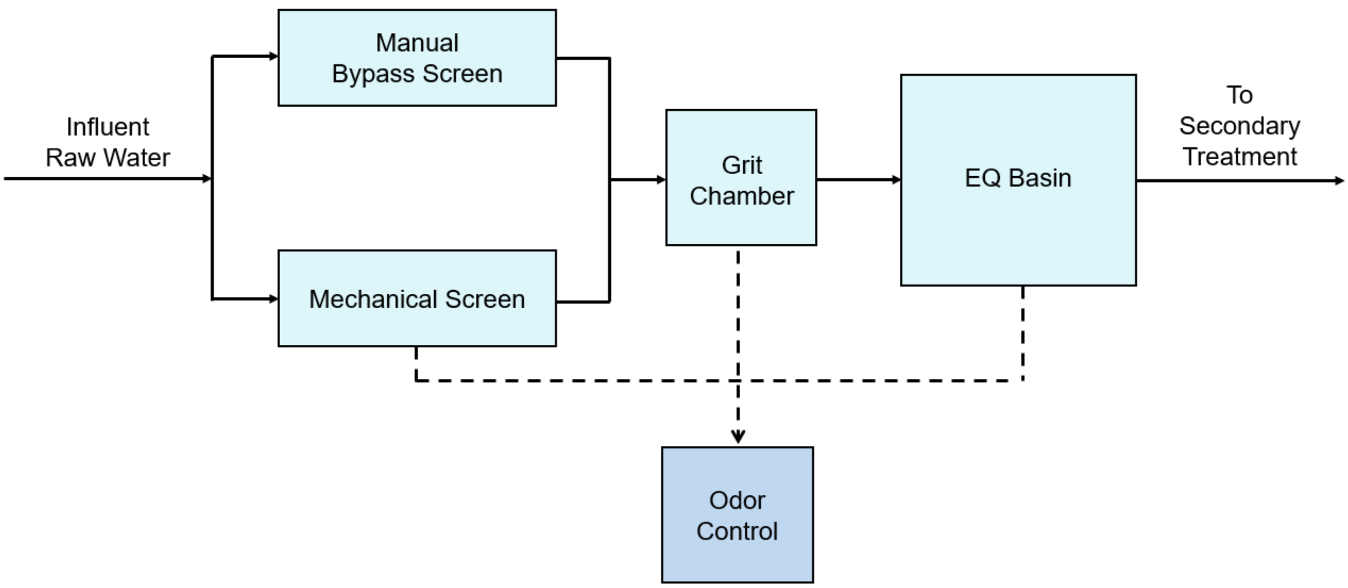


Figure 4-1. Pretreatment Process Flow Diagram Schematic

Table 4-3. Existing Pretreatment Capacity

Description	Quantity	Capacity (Each)
Screening		
Mechanical Bar Screen	1	16.0 MGD
Manual Bypass Screen	1	16.0 MGD
Grit Chamber		

Description	Quantity	Capacity (Each)
Grit Paddle Collection Unit	1	16.0 MGD
Flow Equalization Basin		
Basin Volume	1	1.225 MG
Odor Control Unit		
Air Flow Rate	-	6,000 cfm

4.4 SECONDARY AND TERTIARY TREATMENT

4.4.1 East Plant

The East Plant has a design capacity of 5.0 MGD AADF and 8.0 MGD maximum daily flow (MDF). Pretreated wastewater and return activated sludge (RAS) flow enter the East Plant for secondary treatment consisting of BOD and nutrient removal. The East Plant consists of two (2) equally sized four-stage Carrousel basins that follow a pre-anoxic, aeration, post-anoxic, and re-aeration configuration. Following re-aeration, wastewater is diverted to a splitter box which splits flows evenly between two 90-ft diameter clarifiers that settle sludge at the bottom and supply clarified water via the effluent launder to the tertiary filters. Filtered effluent is then disinfected for a minimum contact time of 15 minutes at peak design flow to meet high-level disinfection requirements. Finally, treated effluent is transferred to the onsite storage facilities for storage and subsequent distribution.

Figure 4-2 provides a schematic process flow diagram for the East Plant.

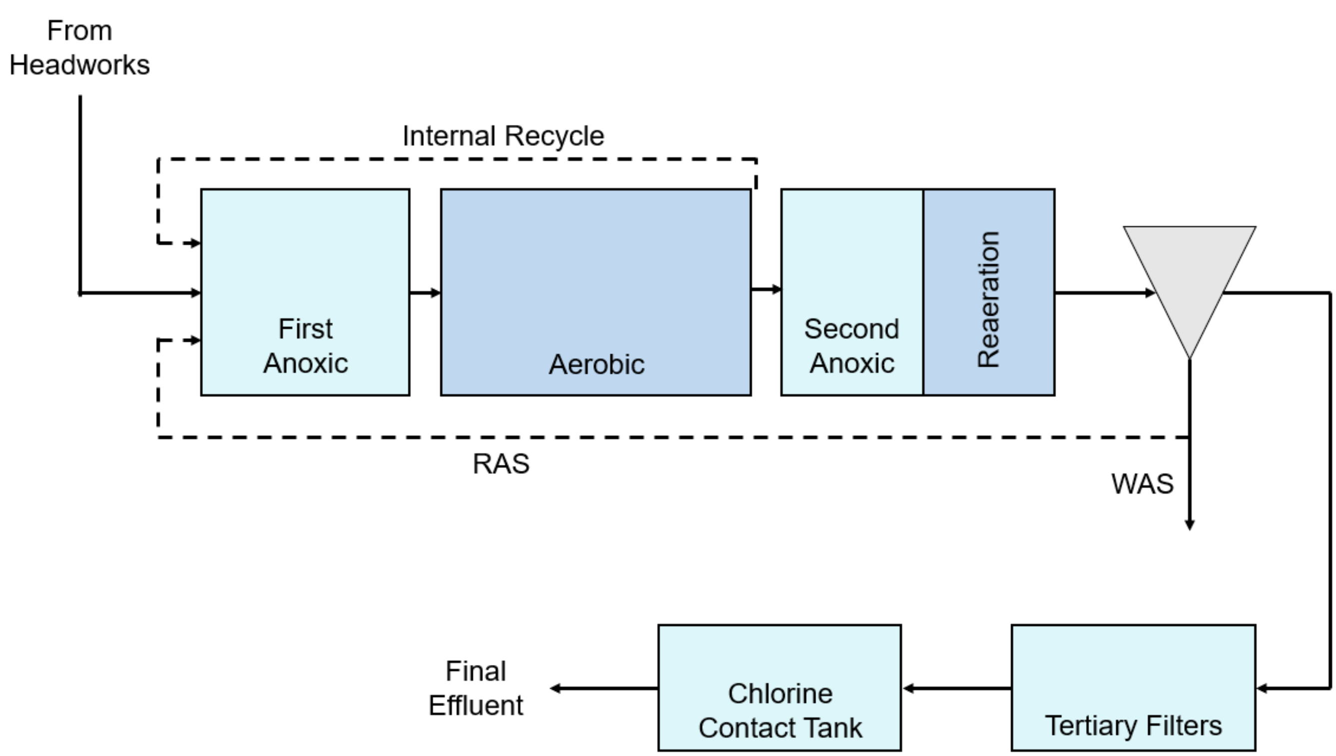


Figure 4-2. East Plant Process Flow Diagram Schematic

4.4.2 West Plant

The West Plant has a design capacity of 3.0 MGD AADF and 4.5 MGD MDF. At the West Plant, pretreated wastewater from the headworks combined with RAS flow enters a single anoxic tank before being sent to the head of the loop aeration structure. There is an existing splitter box that divides the flow between two aeration loops which are equipped with surface aerators to provide oxygen and mixing for BOD and nitrogen removal. Effluent from the west aeration loops is sent to the existing splitter box that divides the flow between the two secondary clarifiers at the West Plant. Similar to the East Plant, clarified effluent is treated for high-level disinfection via tertiary filtration and chlorine disinfection. Final effluent from the West Plant is combined with final effluent from the East Plant at the storage facilities prior to distribution.

Figure 4-2 provides a schematic process flow diagram for the West Plant.

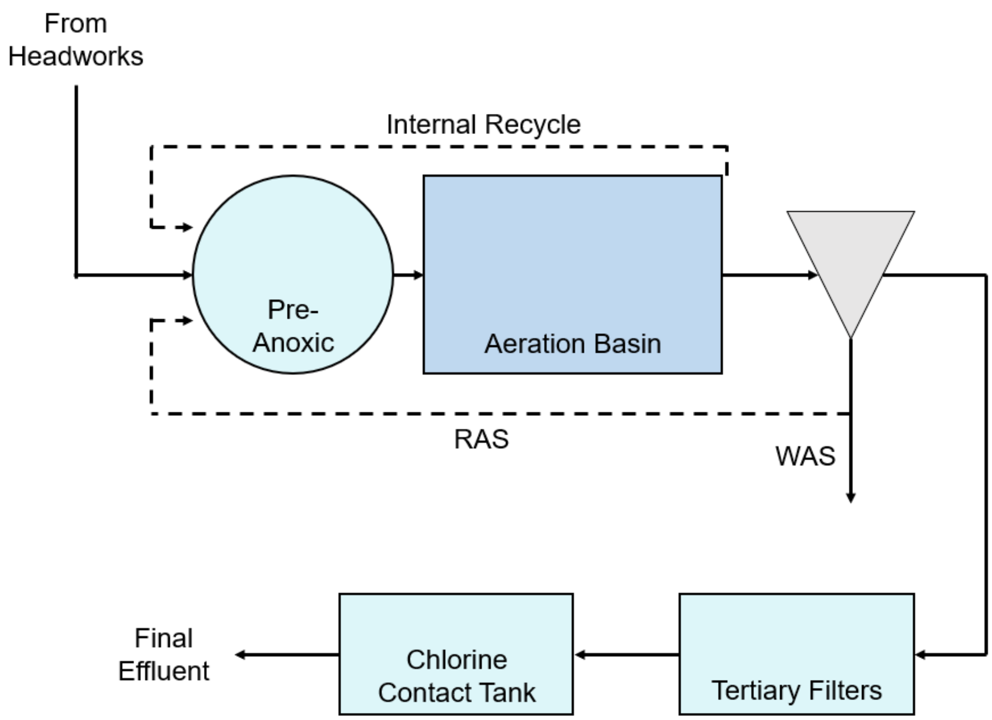


Figure 4-3. West Plant Process Flow Diagram Schematic

4.4.3 Plant Capacity

Table 4-4 provides a summary of the existing capacity of the East and West Plants, inclusive of major treatment basins installed.

Table 4-4. Existing East and West Plants Capacity

Description	East Plant		West Plant	
Treatment Basin	**Quantity**	**Capacity (Each)**	**Quantity**	**Capacity (Each)**
Pre-Anoxic Basin	2	0.324 MG	1	0.82 MG
Aeration Basin	2	1.125 MG	2	0.50 MG
Post-Anoxic Basin	2	0.246 MG	0	-
Re-Aeration Basin	2	0.0625 MG	0	-
Secondary Clarifiers	2	90-ft dia.	2	65-ft dia.
Tertiary Filters	1	5.0 MGD AADF, 7.5 MGD MDF	2	3.0 MGD AADF, 4.5 MGD MDF
Chlorine Contact Chamber	1	5.0 MGD	2	3.0 MGD

4.5 SOLIDS HANDLING SYSTEM

At each plant, sludge is removed from the secondary clarifiers and can either be returned to the head of the plant as RAS or wasted from the system as waste activated sludge (WAS). The City's WRF has a combined solids handling system for the East and West Plants which treats WAS from the two plants. The WAS pumps deliver waste activated sludge from the clarifiers to the rotary drum thickeners located on top of the aerobic digester tanks. The sludge is mixed with polymer and then enters the rotary drum thickener. In the rotary drum thickener, the liquid separates from the flocculated solids. The solids pass through the thickener before being discharged from the end of the unit into one of two aerobic digester tanks. The Digester consists of two (2) tanks each with two (2) zones to treat the solids generated from the treatment process.

The biosolids are dewatered using a belt filter press and transported via truck to a permitted residuals management facility operated by Shelley's Environmental Services. The biosolids undergo alkaline stabilization in accordance with 40 CFR 503 before disposal. The City also has an onsite thermal drying facility to process the solids to the requirements of Class A stabilization. This system has not been operated since it was constructed in 2019 and would need to be evaluated and potentially rehabbed before use.

Figure 4-4 provides a schematic flow process diagram for the biosolids handling system.

Table 4-5 summarizes the existing capacity of the treatment processes that compose the sludge handling system.

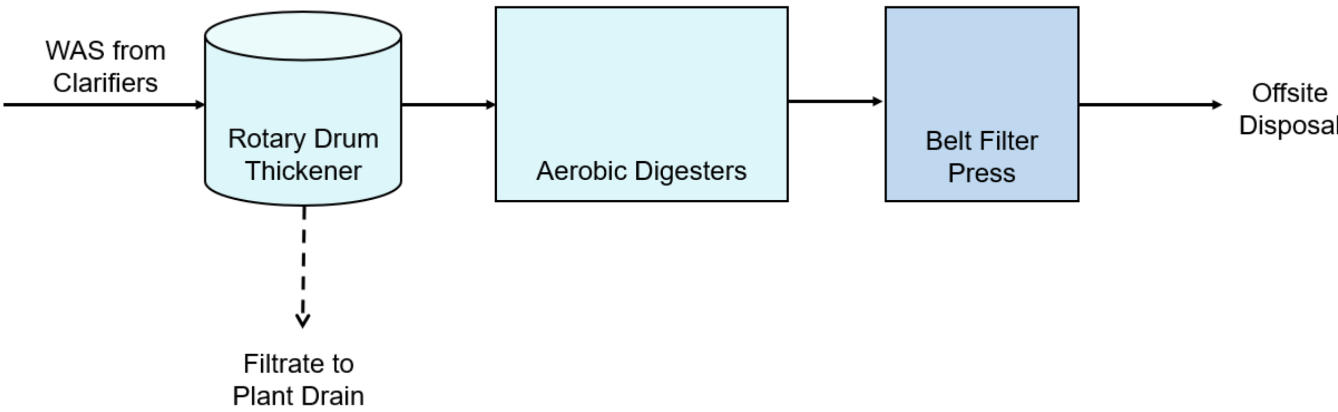


Figure 4-4. Biosolids Process Flow Diagram Schematic

Table 4-5. Existing Sludge Handling System Capacity

Description	Quantity	Capacity (Each)
Rotary Drum Thickener	2	300 gpm
Aerobic Digester	4	0.275 MG
Belt Filter Press		
Hydraulic Loading Rate	2	110 gpm/meter
Solids Loading Rate	2	1,200 lbs/hr
Thermal Sludge Drying		
Solids Loading Rate (Dry)	1	35 tons/week
Solids Loading Rate (Wet)	1	4,860 lbs/hr

4.6 REUSE SYSTEM

The City's WRF produces two main effluents: public access reuse (PAR) and substandard effluent or reject water. Effluent that does not meet public access reuse effluent quality, or substandard effluent, is referred to as reject water. Reject water is either stored in the reject storage ponds prior to being returned to the WRF for re-treatment or sent to the restricted access sprayfields system. Prior to distribution, treated effluent is stored onsite in the existing storage ponds or ground storage tanks (GSTs). The City also has existing offsite facilities that provide additional reclaimed water management capacity; however, this report will focus on the existing reuse capacity within the limits of the WRF and therefore offsite facilities were not used in this evaluation.

Table 4-6 provides a summary of the onsite storage capacity for finished water effluent and onsite reject water storage.

Table 4-6. Existing Storage Facilities Summary

Storage Type	Quantity	Capacity / Each (MG)	Total Capacity (MG)
Onsite Reclaimed Water Storage			
Ground Storage Tank	2	1.0	2.0
Ground Storage Tank	2	2.0	4.0
Storage Pond	2	8.0	16.0
Total Onsite Reclaimed Water Storage			22.0
Onsite Reject Water Storage			
Storage Pond	1	2.0	2.0
Storage Pond	1	7.0	7.0
Total Onsite Reject Water Storage			9.0

4.7 EXISTING CAPACITY EVALUATION

The East Plant has sufficient capacity to treat current influent wastewater flows; therefore, there has been no need to operate the West Plant for additional capacity. The existing East Plant is designed to meet a total nitrogen effluent of 3.0 mg/L in its 4-Stage Bardenpho system. Therefore, no modifications are anticipated to be needed for a flow up to 5.0 MGD AADF, based on the current East Plant permitted capacity.

The West Plant has remained offline since the construction of the East Plant in October 2019. The City has routinely monitored and serviced the existing infrastructure at the West Plant, including major equipment and the concrete basins. However, inactive equipment and maintaining the basins dry for a long period of time can cause damage to the existing infrastructure.

Provisions for additional treatment capacity that complies with the latest regulations, including a TN effluent level of 3.0 mg/L, require evaluation based on the projected wastewater flow entering the WRF. **Section 5** provides an evaluation of projected flows, and **Sections 6** and **7** provide suggested options for achieving future TN limits at projected flows.

5 FLOW PROJECTIONS

Three (3) different methodologies were evaluated to project future wastewater and reclaimed water flows. This Section intends to select one (1) source of the three (3) flow projection approaches for each wastewater and reclaimed water, and thereby establish future flows which will be used in the WRF future capacity analysis from this Report and other evaluations the City will conduct in the near future. The different projection sources evaluated in this Report are summarized in **Table 5-1**.

Table 5-1. Flow Projection Source Summary

Flow Projection Source	Wastewater	Reclaimed Water
Utility Master Plan (Wright-Pierce, 2019)	X	X
Flow projections developed by the City	X	X
Flow projections developed in this Report (linear growth and percent increase)	X	
Reuse Water Balance Modeling Report (LSG, 2023)		X

5.1 MASTER PLAN FLOW PROJECTIONS

Based on a cursory review of the latest City's Wastewater and Reclaimed Water Master Plans (Wright-Pierce, 2019), the Master Plans were developed based on (1) historical wastewater / reclaimed water flows, (2) Bureau of Economics and Business Research (BEBR) population projections, (3) "fill-in" wastewater / reclaimed water demand, and (4) projected flow from planned developments. "Fill-in" projections refer to additional flows projected from existing developed areas which will expand to fill-in any available properties in the existing service area. **Table 5-2** provides a summary of the wastewater and reclaimed water flow projections as developed on their respective master plans.

The Wastewater Master Plan (Wright-Pierce, 2019) is provided in **Appendix C** and the Reclaimed Water Master Plan (Wright-Pierce, 2019) is provided in **Appendix D**.

Table 5-2. Projected Wastewater and Reclaimed Water Flow (Master Plan)

Year	Projected Wastewater Flow, MGD	Projected Reclaimed Water Flow, MGD
2017	3.37	6.51
2020	3.80	7.58
2025	4.75	9.92
2030	5.31	11.4
2035	5.75	12.5

5.2 CITY-DEVELOPED FLOW PROJECTIONS

To predict future wastewater flow, the City used recorded historical flow data for the time period between the years 2017 and 2022, as recorded by the influent flow meter, and known annual population for each year to estimate the average daily wastewater flow per person expressed as gallons per capita per day (gpcd). The average daily wastewater flow based on historical information was determined to be 84 gpcd and a projected annual increase of 1,137 residential units, based on BEBR's database, was used to predict the future wastewater production.

A similar concept was used to predict future reclaimed water flow; however, there are two main differences in the development of reclaimed water flow projections:

1. Reclaimed water consumption was projected separately for residential and commercial users, and the total reclaimed water was assumed to be the sum of the two sources.
2. Historical reclaimed water flow data was measured based off the billed gallons for each customer type (i.e., residential vs commercial).

Between 2017 and 2022, the average daily reclaimed water flow for residential customers was determined to be 191 gpcd and for commercial customers was determined to be 6,576 gallons per commercial unit

A copy of the City-developed wastewater and reclaimed water flow projections is provided in **Appendix E** and **Appendix F**, respectively.

Table 5-3 provides a summary of the wastewater and reclaimed water flow projections through the year 2045, as developed by the City, presented in 5-year increments.

Table 5-3. Projected Wastewater and Reclaimed Water Flow (City)

Year [1]	Projected Wastewater Flow, MGD	Projected Reclaimed Water Flow, MGD
2017	3.37	5.23
2018	3.37	5.27
2019	2.90	5.63
2020	2.96	6.10
2021	3.07	5.94
2022	3.20	5.91
2027	4.90	9.79
2032	6.20	12.9
2037	7.49	16.0
2042	8.79	19.2
2045	9.57	21.1

Notes:

[1] Data between 2017 and 2022 is real historical data. Data presented for future years is projected data.

5.3 WASTEWATER FLOW PROJECTIONS

Historical wastewater flow information as obtained from the DMRs was used to project future flows following the extrapolation estimation method. Historical data was used to assume an existing trend and predict future flows by extending the known series beyond the historical flows. **Table 5-4** summarizes the City's wastewater historical data as recorded in the DMRs between years 2012 and 2022.

Table 5-4. Historical Wastewater Flow

Year	Operating Plant	Flow Rate, MGD
2012	West Plant	2.63
2013	West Plant	2.79
2014	West Plant	2.95
2015	West Plant	3.11
2016	West Plant	3.22
2017	West Plant	3.37
2018	West Plant thru Oct.	3.50 [1]
2019	East Plant	2.90
2020	East Plant	2.96
2021	East Plant	3.08
2022	East Plant	3.20
2023	East Plant	3.25 [2]

Notes:

1 Operations from the West Plant were transitioned to the East Plant in October 2018. Annual average flow for year 2018 excludes recorded data for November and December to avoid introducing a source of error from flow readings of two different flow meters.

2 Includes flow data from January 2023 through August 2023, as available at the time of development of this Report.

Historical wastewater data recorded in the City's monitoring reports show a decrease in flow when operations were transitioned from the West Plant to the East Plant. With this change, a new influent flow meter was used to record influent wastewater flow, which is assumed to be the cause for the difference in flow before and after the East Plant was placed into operation.

Further, it was recognized in mid-2023 that the East Plant influent flow meter had an average deficit of approximately 0.80 MGD that resulted from signal issues in sending correct data to SCADA. Since then, the City has replaced the signal wire and fixed the scale as a corrective measure. However, historical data gathered at the East Plant before the influent meter was repaired is assumed to have a +0.80 MGD margin of error. It is assumed that signal issues caused erroneous influent flow readings at the East Plant from its startup in October 2018 through its repair in mid-2023.

Figure 5-1 presents a timeline for the WRF operational timeline, inclusive of upgrades and expansions to the WRF.

Figure 5-1. City of Apopka's WRF Operational Timeline

Historical data is recognized to have erroneous readings; therefore, two (2) different scenarios were considered to predict future wastewater flow, where:

Scenario 1: Uses a percent increase in flow developed based on *actual* historical wastewater flow.

Scenario 2: Uses a linear regression equation developed based on *adjusted* historical wastewater flow.

Scenario 1: Average Percent Increase

Scenario 1 was developed based on actual recorded historical data between years 2012 and 2022 and is intended to project future flows without modifying historical data to accommodate additional calibration flows. Historical data was used to determine the annual percent increase in flow by first obtaining the difference in flow between two consecutive years and then using that difference to calculate the percent increase compared to the second year. The percent change in flow from 2018 to 2019, the time the new influent flow meter was placed into service, was omitted in the percent increase analysis. **Table 5-5** summarizes the calculations completed to obtain the average annual percent increase in wastewater flow which will be used to project future flows under Scenario 1.

Table 5-5. Scenario 1 – Basis of Flow Projections

Year	Historical AADF, MGD	Flow Difference between 2-Consecutive Years, MGD	Annual Percent Increase, %
2012	2.63	--	--
2013	2.79	0.16	5.81%
2014	2.95	0.15	5.12%
2015	3.11	0.16	5.22%
2016	3.22	0.12	3.63%
2017	3.37	0.14	4.25%
2018	3.50 [1]	0.13	3.76%
2019	2.90	-- [2]	-- [2]
2020	2.96	0.06	1.94%
2021	3.08	0.12	3.88%
2022	3.20	0.12	3.76%
2023	3.25 [3]	0.05	1.58%
Average % Increase			4.15%

Notes:

[1] Excludes flow data from November and December 2018.

[2] Flow difference between 2018 and 2019 was not considered due to now recognized signal errors in the East Plant influent flow meter. It is assumed that the signal errors remained consistent through the flow meter repair in 2023 (i.e., 0.8 MGD); therefore, the annual increase in flow between 2019 and 2023 is assumed to be accurate.

[2] Includes flow data from January 2023 through August 2023, as available at the time of development of this Report.

Scenario 2: Linear Regression

Scenario 2 was developed based on adjusted historical data to account for additional flows that are assumed to be “unread” as a result of signal issues at the East Plant influent flow meter. Erroneous flow readings are assumed to have occurred between 2019 and 2023; consequently, flow data adjustment was only completed for that time period. **Table 5-6** presents the historical recorded wastewater flow data between 2012 and 2018 and the adjusted flow data between 2019 and 2023.

Table 5-6. Scenario 2 – Historical Adjusted Wastewater Flow

Year	Recorded Wastewater Flow	Additional Calibration Flow	Adjusted Wastewater Flow
2012	2.63	--	2.63
2013	2.79	--	2.79
2014	2.95	--	2.95
2015	3.11	--	3.11
2016	3.22	--	3.22
2017	3.37	--	3.37
2018	3.50 [1]	--	3.50
2019	2.90	0.80	3.70
2020	2.96	0.80	3.76
2021	3.08	0.80	3.88
2022	3.20	0.80	4.00
2023	3.25 [2]	0.80	4.15

Notes:

[1] Excludes flow data from November and December 2018.

[2] Includes flow data from January 2023 through August 2023, as available at the time of development of this Report.

Figure 5-2 shows historical wastewater flow data adjusted where needed. Scenario 2 uses the linear regression equation provided in **Figure 5-2** to project future flows.

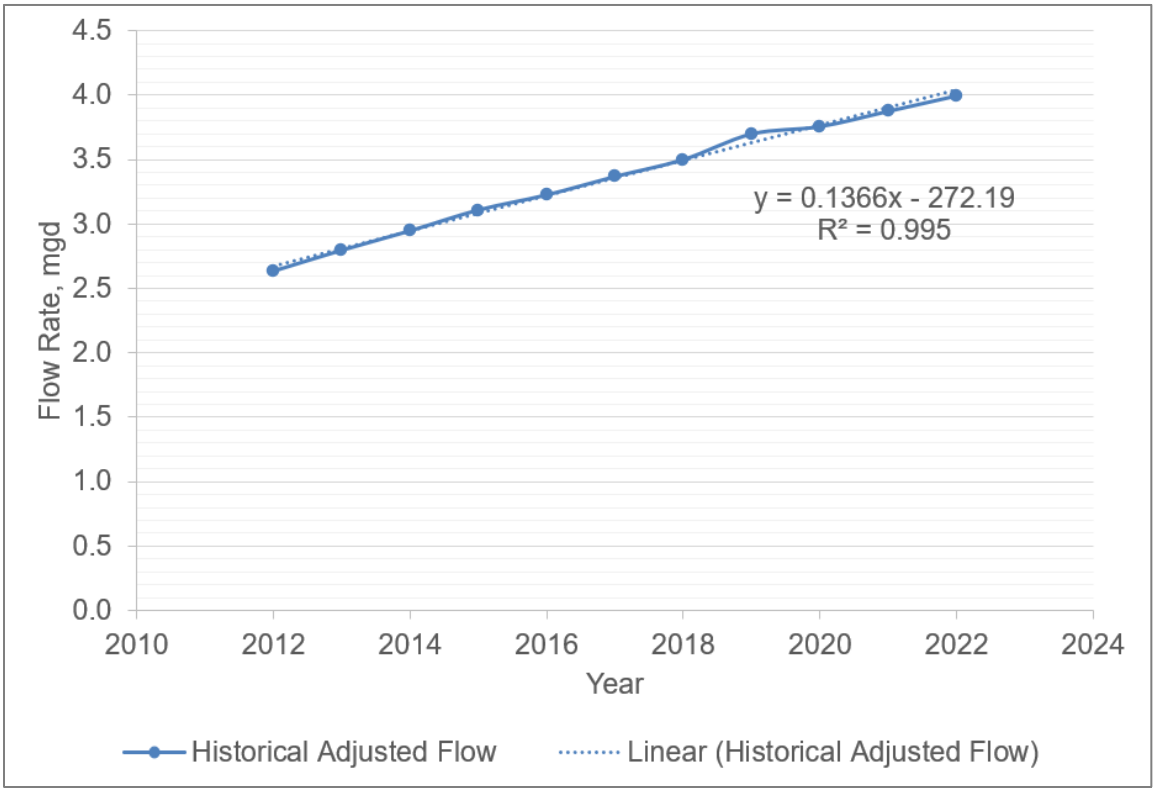


Figure 5-2. Historical Adjusted Wastewater Flow

Extrapolation Analysis Summary

Table 5-7 summarizes the wastewater flow projections developed for Scenarios 1 and 2.

Table 5-7. Projected Wastewater and Reclaimed Water Flow (Extrapolation Analysis)

Year [1]	Scenario 1	Scenario 2
2012	2.63	2.63
2013	2.79	2.79
2014	2.95	2.95
2015	3.11	3.11
2016	3.22	3.22
2017	3.37	3.37
2018	3.50 [2]	3.50 [2]
2019	2.90	3.70
2020	2.96	3.76
2021	3.08	3.88
2022	3.20	4.00
2023	3.25 [3]	4.15 [3]
2024	3.37	4.29
2025	3.50	4.43
2030	4.24	5.11
2035	5.13	5.79
2040	6.21	6.47
2045	7.52	7.16

Notes:

[1] Data between years 2017 and 2023 is actual recorded data. Data presented for future years is projected data.

[2] Excludes flow data from November and December 2018.

[3] Includes flow data from January 2023 through August 2023, as available at the time of development of this Report.

5.4 REUSE WATER BALANCE MODELING REPORT FLOW PROJECTIONS

Tetra Tech's subconsultant Liquid Solutions Group (LSG) used a predictive reuse water balance model to project future reclaimed water flows under a separate report. A copy of the Reuse Water Balance Modeling Report as completed by LSG is provided in **Appendix G**.

The predictive model was developed using historical Apopka WRF treated wastewater flow and supplemental water flows from the different sources the City uses to augment its reuse water supply, including Sunshine Water, Altamonte Springs, and Orange County Utilities, and reclaimed water flows that the City provides to other sources for their use, including Mount Dora. The model also considered tank and pond storage in the offsite reuse facilities and seasonal and climatological factors.

Table 5-8 provides the projected public access demand developed by LSG.

Table 5-8. Projected Reclaimed Water Flow (LSG, 2023)

Year [1]	Projected Reclaimed Water Flow, MGD
2017	5.23
2018	5.27
2019	5.63
2020	6.10
2021	5.94
2022	5.91
2027	9.79
2032	12.9
2037	16.0
2042	19.2
2045	21.1

Notes:

[1] Historical data through 2022 is actual recorded data at the City's WRF 18- and 20-inch reuse meters. Data presented for future years is projected data.

5.5 FLOW PROJECTIONS SUMMARY

5.5.1 Wastewater Flow

Figure 5-3 provides a graphical representation of the flow projections developed in the Master Plan, by the City, and in this Report. The Master Plan and City projections consider flows beginning in year 2017 while Tetra Tech's projections consider flows beginning in year 2012.

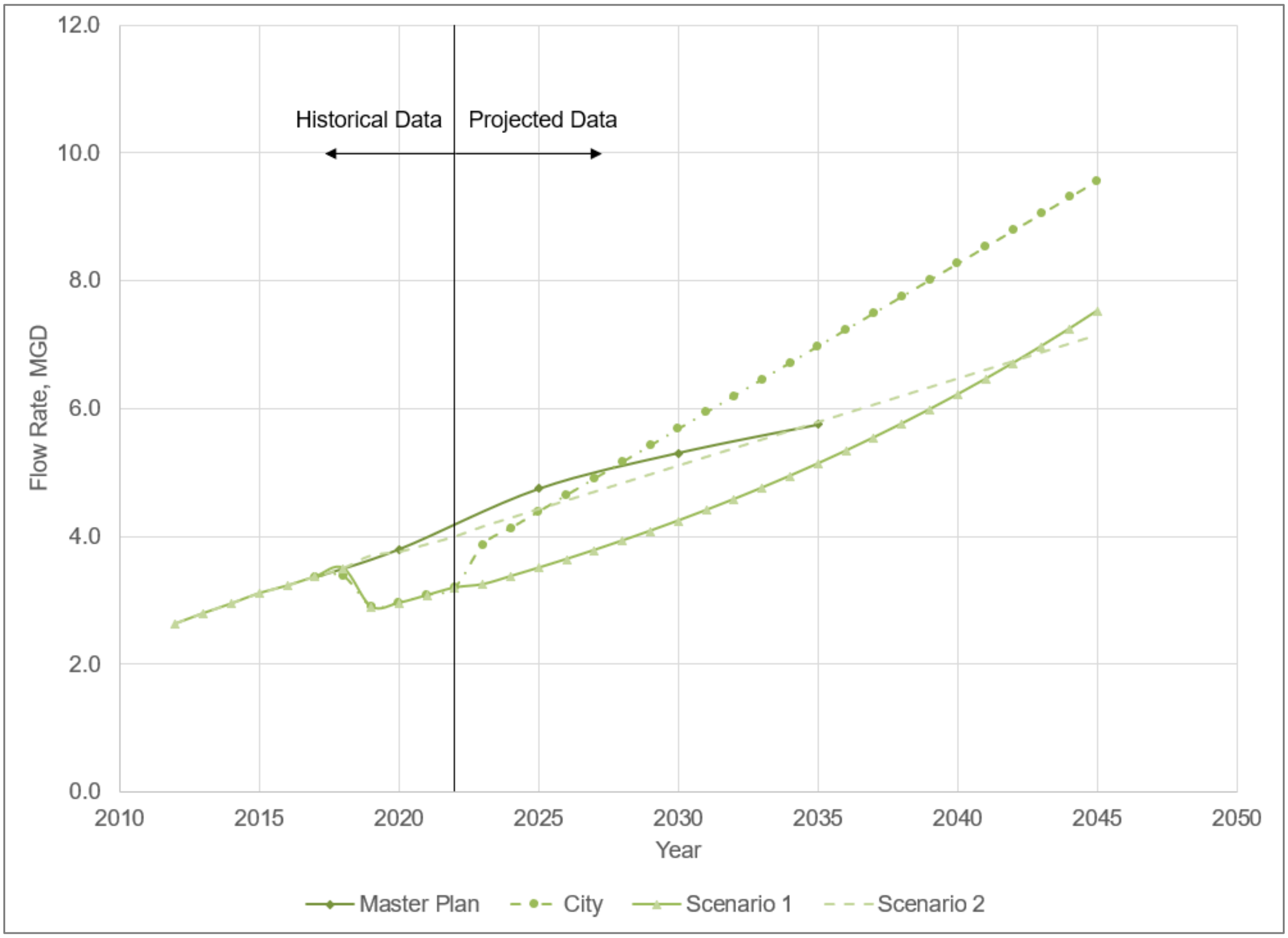


Figure 5-3. Wastewater Flow Projections

Historical data used in the City's and Tetra Tech's Scenario 1 flow projections show a "*drop*" in wastewater flow where an upward trend is observed until year 2019 when wastewater flow decreases prior to commencing a new upward trend. This *drop* in flow is assumed to be caused by the transition of operations from the West Plant to the East Plant.

The City's projection anticipates the current permitted WRF capacity of 8.0 MGD to be exceeded in year 2039. Both of Tetra Tech's projections are reaching the current permitted capacity by year 2045. The Master Plan projection does not appear to be approximate to the City's permitted capacity; however, the Master Plan flow projections were completed through year 2035.

Based on discussions with City Staff, Tetra Tech's Scenario 2 was selected as the flow projection source for future wastewater planning, primarily on the basis that the other sources investigated were not applicable or sufficient for this project per the following:

- The Master Plan assumes higher flows for short-term planning than anticipated based on current flow conditions. In addition, the Master Plan provides a shorter projection of future flows compared to the other alternatives. Consequently, the Master Plan was removed from consideration.
- The City's flow projections assume a rapid development in the future which is not consistent with historical trends. It was concluded that this scenario is unlikely to occur and was therefore removed from consideration.
- Tetra Tech's Scenario 1 projections are reasonable if the influent flows prior to 2019 are accurate. However, both of Tetra Tech's scenarios (1 and 2) converge over time. It was determined that without determining the cause of the *drop* in flows after the new flow meter was installed, using the lower flow data could result in underestimating the short-term capacity needs of the WRF. For this reason, this source was also removed from consideration.

5.5.2 Reclaimed Water Demand

Similarly, reclaimed water demand projections as developed in the Master Plan, by the City, and by LSG as provided in **Figure 5-4**. The Master Plan and City's projections consider historical flow beginning in year 2017; LSG's projections consider flow beginning in year 2013.

Historical data summarized by LSG and the City have different values which is assumed to be due to the different sources used for data collection. Historical reuse flow used in LSG's report was based on measurements recorded at the flow meters before exiting the WRF. The City, on the other hand, used historical flow measurements recorded at the customers' reclaimed water meters, including residential and commercial customers. The main difference between the two approaches is that flow recorded at the WRF is inclusive of reuse water that is stored at City's offsite reuse storage facilities and reuse water that is sent to Mount Dora to supplement their reclaimed water system.

Based on discussions with City Staff, LSG's flow projections were selected as the source to be used for any future planning of reclaimed water projects. This selection was based on the idea that LSG provides a more conservative projection of flow for short-term planning. In addition, LSG developed their flow projections with the use of a model that accounted for reclaimed water facilities as a complete system and is therefore assumed to provide a more accurate prediction of future flows.

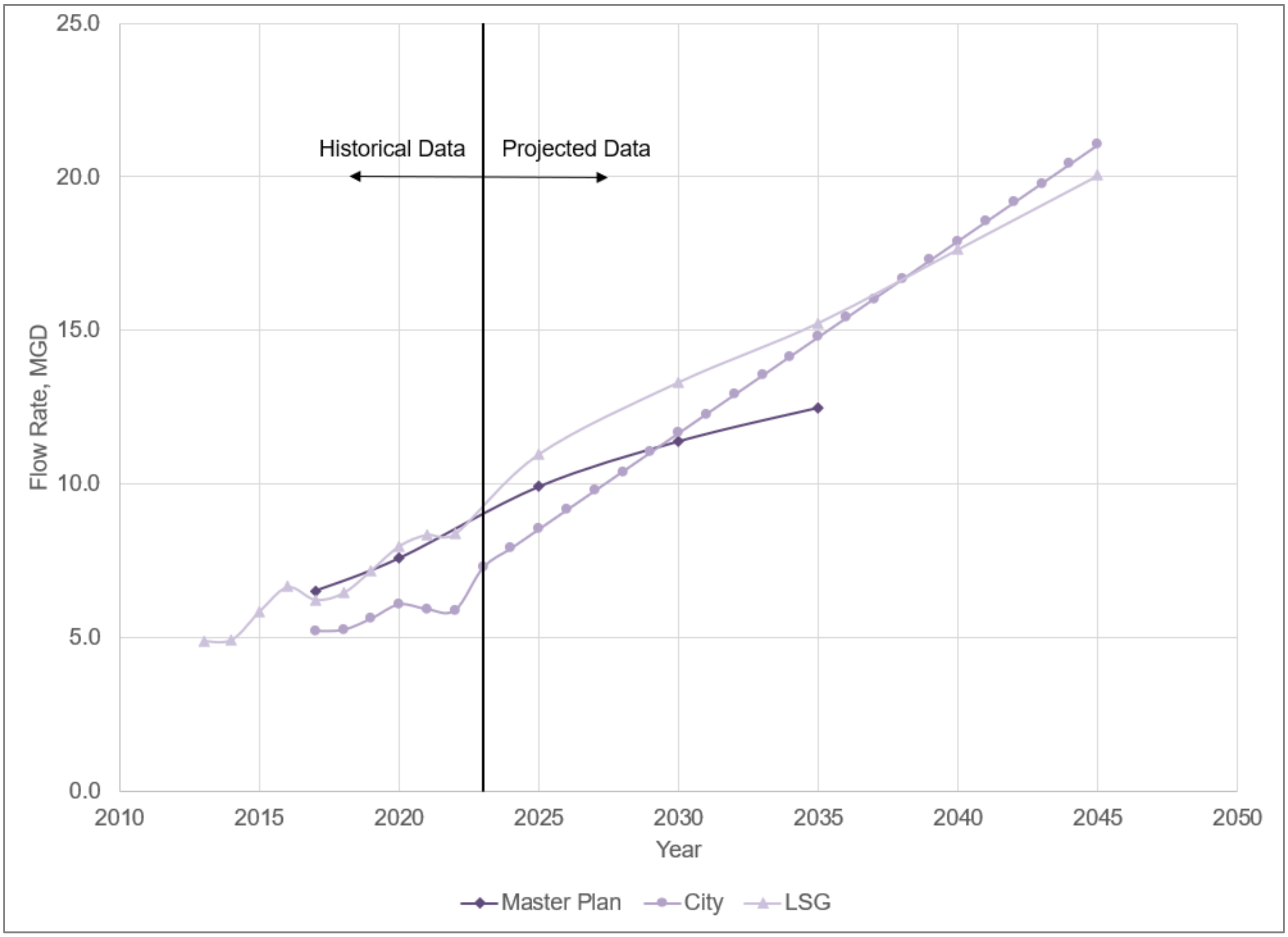


Figure 5-4. Reclaimed Water Demand Projections

6 GENERAL REQUIREMENTS EVALUATION

6.1 GENERAL

The existing WRF capacity was evaluated to determine capacity limitations resulting from future regulatory requirements, future wastewater flows, and existing West Plant operations. This Section provides a conceptual analysis for the future capacity of the WRF and upgrades required to meet future regulatory water quality.

6.2 CAPACITY ANALYSIS

FDEP requires municipalities to conduct a Capacity Analysis Report (CAR) when the three-month average daily flow exceeds 50% of the permitted capacity of the treatment plant or reuse and disposal systems. The CAR is intended to establish a mechanism for assessing operations and physical capabilities of wastewater treatment facilities. The City submitted a preliminary CAR to FDEP in January 2022 indicating compliance with the 50% capacity requirement, based on an average three-month average daily influent flow of 3.037 MGD and a permitted WRF capacity of 8.0 MGD.

In accordance with Rule 62-600.45, FAC, if the initial CAR report or an update of the CAR documents that the permitted capacity will be equaled or exceeded within the next ten (10) years, an updated CAR needs to be submitted to FDEP annually. FDEP requires documentation of timely planning, design, and construction of needed expansions according to the following schedule:

- Begin planning and preliminary design of the necessary expansion if the permitted capacity will be equaled or exceeded within the next five (5) years,
- Begin design of plans and specifications for the necessary expansion if the permitted capacity will be equaled or exceeded within the next four (4) years,
- Submit a complete permit application for the necessary expansion if the permitted capacity will be equaled or exceeded within the next three (3) years.

Flow projections established in **Section 5.5** predict that future flows will be under the WRF permitted capacity through year 2045. However, currently the West Plant is not in operation and the City would need to invest significantly to rehabilitate and replace equipment to treat wastewater and future flows are anticipated to near the East Plant's permitted capacity of 5.0 MGD by year 2030. Based on (1) current operations of the WRF where only the East Plant is in operation and (2) flow projections of influent wastewater to the WRF, it is recommended that the City begins planning for additional future capacity either by repairing, rehabilitating, and recommissioning the West Plant or by expanding the East Plant.

6.3 WATER QUALITY ANALYSIS

As noted in the current operating permit, by July 1, 2028, the WRF needs to comply with the latest Wekiva BMAP which establishes a lower total nitrogen level (3.0 mg/L) in the effluent than the current permitted level (10.0 mg/L). Planning for improved treatment needs to consider influent wastewater characteristics. **Table 6-1** provides a summary of the average influent wastewater quality data between 2019 and 2023, as well as the design values used for the planning of the WRF expansion completed in 2019.

Table 6-1. Influent Wastewater Characteristics

Parameter	2019 WRF Expansion Basis of Design, mg/L	Historical Average
BOD_5, mg/L	260	237
TSS, mg/L	225	265
TKN, mg/L	48	49

Historical data between 2019 and 2023 closely aligns to the basis of design values used for the 2019 WRF expansion. Therefore, this evaluation is based on the same design criteria as the 2019 expansion. The following provides recommendations to comply with the lower total nitrogen level in the effluent.

The East Plant is designed to achieve an effluent TN of 3.0 mg/L at 5.0 MGD. Therefore, no process treatment upgrades are required to comply with the more stringent water quality requirement in the forthcoming permit renewal. However, the West Plant was designed to achieve an effluent of 10.0 mg/L TN in accordance with the current permit requirement. The West Plant will require upgrades to its biological nutrient removal process to achieve an effluent water quality of 3.0 mg/L.

7 ALTERNATIVES ANALYSIS

The following evaluates two alternatives to achieve the future TN limit of 3.0 mg/L at or above the current permitted capacity of 8.0 MGD:

1) Recommission and upgrade the West Plant to place the existing treatment facilities in operation and upgrade the biological nutrient removal process of the treatment plant to enhance TN removal to achieve and effluent of 3.0 mg/L.
2) Construct new treatment facilities at the East Plant and demolish, abandon and/or repurpose all or portions of the West Plant.

7.1 WEST PLANT REHABILIATION AND UPGRADE

7.1.1 General

The feasibility to recommission the West Plant to continue operations as a wastewater treatment facility was evaluated in this Section. The existing conditions of the WRF were evaluated in the Wastewater Utility Asset Management Plan (AMP) (CHA, 2023) in order to identify which equipment or other infrastructure remains in good condition to date. To supplement the AMP, the City completed a visual inspection of the major equipment at the West Plant to assess their existing conditions, based on an Equipment List developed by Tetra Tech.

In addition to rehabilitating the existing facility to place it into operation, major plant upgrades would be required in order to reduce the effluent TN from 10.0 mg/L to 3.0 mg/L to comply with the more stringent future effluent water quality requirements. This Section provides one approach that could be implemented to achieve future water quality requirements at its current permitted capacity, 3.0 mgd.

7.1.2 West Plant Asset Inventory and Condition Assessment Summary

This Section summarizes the findings related to the existing condition of the West Plant, based on the AMP and the City's visual inspection. **Appendix H** includes a copy of the AMP report (CHA, 2023) and **Appendix I** includes a copy of the West Plant condition assessment as completed by the City.

To assess the condition of each asset and infrastructure at the West Plant, the AMP (CHA, 2023) evaluated the useful life of each asset and its service history and current condition. Condition scores were assigned to the assets based upon a 5-point scale to rank assets that are in generally good condition and assets that require replacement, where "1" indicates good condition, "3" indicates fair condition, and "5" indicates poor condition. Similarly, the City's visual inspection of major equipment and components ranked their existing conditions based upon a "good," "okay," or "bad" condition system. For the purpose of this evaluation, the terms "fair" and "okay" will be used interchangeably, and the terms "poor" and "bad" will also be used interchangeably.

At a minimum, Tetra Tech recommends that all process basins, equipment, and other components that are considered to be in *poor* condition be repaired, rehabilitation, or replaced, as applicable, to reinstate the West Plant into service. Any components that are considered to be in *fair* condition should be budgeted to be replaced or rehabilitated over the next 5 to 10 years; however, components in a *poor* condition should be prioritized. The AMP includes a ranking system. The following summarizes the general condition of the West Plant facilities.

- The anoxic basin is not in use but appears to be in good condition. The structure was rehabbed in 2019, however, the original structure was constructed in 1972. It is assumed that the structure is approaching the end of its useful life. It is anticipated that the existing structure will be demolished and replaced if treatment upgrades occur at the West Plant.
- The aeration tank in not in use. The structure appears to be overall in good condition except one of the aeration basins is leaking and requires replacement of an expansion joint. Also, all the gates need

replacement. Due to the one tank being out of service it is assumed the diffusers in that tank will require replacement. One of the supplemental blowers does not work and will need to be fixed or replaced.

- Internal recycle pumps were installed in 2019 and appear to be in good condition, however, the power cables at each pump require replacement.
- The clarifiers were rehabbed in 2019 and appear to be in good condition. Only minor work is anticipated to bring into operation.
- The scum, RAS, and WAS pumps were installed in 2019 and appear to be in good condition.
- The filter structures were constructed in 1988 and 1998 and appear to be in good condition, however, the equipment requires a complete rehab including replacement of mixers and sample pumps.
- The air compressor/MCC building and corresponding equipment at the filters are at the end of its useful life and should be replaced.
- The chlorine contact tanks, and effluent transfer pump station were constructed in 1988 and 1998 and appear to be in good condition. However, some equipment has reached the end of its useful life and should be replaced such as sample pumps and the effluent transfer pumps lock out switches. Also, although the effluent transfer pumps appear to be in fair condition, they are approaching the end of their useful life and should be replaced.
- The existing sodium hypochlorite storage tanks and feed pump skid appear to be in good condition; however, a feed pump is missing and should be replaced. Also, the valve and electric actuators at the upper pond needs replacement.
- The in-plant pump station was rehabbed in 2019 and is in good condition. However, the control panel at the in-plant pump station should be replaced.
- The old blower/generator/chlorine building is past its useful life and in poor condition. It is not in use except for an electrical panel. It is recommended that the electrical panel get relocated to the new air compressor/MCC building and the building demolished.

Table B-1 in **Appendix H** provides a complete summary of such assets that are considered to be in *fair* and *poor* condition in the AMP, and **Table C-1** in **Appendix I** provides a complete summary of such assets that are considered to be in *fair* and *poor* condition in the City's visual inspection report.

7.1.3 West Plant Recommended Improvements

The feasibility to recommission the West Plant to either continue operations as a wastewater treatment facility or be repurposed as a surface water treatment facility used to augment reclaimed water supply was evaluated in this Section. At a minimum, upgrades to the existing West Plant, including repair and rehabilitation of existing infrastructure, would need to be completed to reinstate the plant into service This Section includes recommendations for upgrading and rehabilitating the existing facilities at the West Plant to continue operations as a wastewater treatment plant, as well as recommendations for new facilities in order to comply with upcoming regulations on reclaimed water applicable to the City's WRF.

7.1.3.1 Upgrades to Existing Facility

Based on the findings summarized in the asset inventory and condition assessment provided in **Section 7.1.2**, the following assets at the West Plant are recommended to be further inspected and repaired or rehabilitated, as needed:

- Building Structures:
  - MCC Building Sections A, B, and C
  - Blower Room
- East Filter Chlorine Mixer Sluice Gate
- Aeration Basin 1 – Repair existing leak in expansion joint

- Internal Recycle Pumps and associated power cable
- East and West Filters
- Effluent Pump Station:
    - Vertical Turbine Pumps 4, 5, and 6

Similarly, the following general assets are recommended to be replaced “in kind” should the West Plant be recommissioned to continue operations as part of the wastewater treatment plant, maintaining the current permitted capacity of 3.0 MGD AADF:

- Vertical turbine mixers at the anoxic tank
- Secondary clarifiers:
    - Scum pumps
    - RAS and WAS pumps
- Effluent sample pumps downstream of filters and CCTs
- Chlorine storage tanks and chemical metering pumps

7.1.3.2 Site Plan Upgrades and New Facilities Recommendations

Further, new regulations have more stringent effluent limitations to which the City’s WRF will need to comply, as described in **Section 3**. The main regulatory change is a lower Total Nitrogen effluent level of 3.0 mg/L as set forth by the Wekiva Basin Management Action Plan. The West Plant is currently sized to produce a TN effluent level of 10.0 mg/L and major improvements to the existing process trains would be needed to comply with a lower nitrogen level in the effluent.

To this end, Tetra Tech developed a conceptual schematic to upgrade the existing West Plant to a 4-Stage Bardenpho system. The 4-Stage Bardenpho system follows a pre-anoxic, aerobic, second anoxic, and re-aeration configuration for nitrogen removal, as illustrated in **Figure 7-1**. Internal recycle (IR) from the aeration basin and RAS from the sedimentation process are combined with the raw wastewater, called mixed liquor, at the head of the pre-anoxic tank.

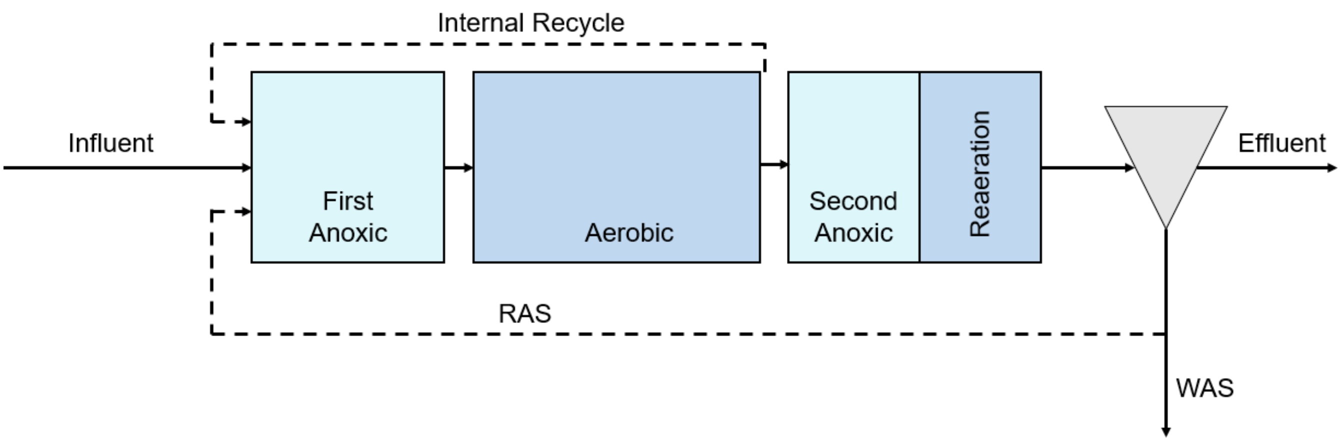


Figure 7-1. Treatment Process of a 4-Stage BNR Process

Converting the West Plant to a 4-Stage Bardenpho system includes various upgrades to the existing infrastructure including the demolition of the old package plant structure which now serves as a pre-anoxic tank, construction of a new dual train pre-anoxic tank upstream of the existing oxidation ditches, construction of a new dual train second anoxic and re-aeration tanks downstream of the oxidation ditches, and associated yard piping improvements. Further, it is recommended that a new EQB equal in size to the existing EQB be installed to provide redundancy and facilitate daily operations of the flow entering the WRF. Additional odor control facilities are anticipated to be needed for the additional odorous air flow produced by the new EQB.

A site plan of the conceptual layout for the recommended 4-Stage West Plant is provided in **Figure 7-3**. Based on a preliminary evaluation, it is anticipated that it is hydraulically feasible to construct the recommended improvements.

7.1.3.3 Permitting

Design of the recommended upgrades to reinstate the West Plant for wastewater operations must take into consideration existing and proposed Federal, State, and other local regulations that will govern the construction and operation of the facility. FDEP and SJRWMD maintain regulatory jurisdiction over the project. At the project area, SJRWMD delegates its jurisdiction to FDEP and therefore no SJRWMD permits are anticipated to be needed. New building construction must meet the requirements of the 2020 Florida Building Code and the City of Apopka's Land Development Code.

The following permits are anticipated to be required for the recommended improvements:

- City of Apopka Application for Building Permit
- FDEP Wastewater Facility or Activity Permit Application – General Information – Form 1
- FDEP Wastewater Permit Application for Domestic Wastewater Facilities – Form 2A
- FDEP Environmental Resource Program (ERP) Permit
- FDEP National Pollutant Discharge Elimination System (NPDES) if the project area is greater than one (1) acre during construction. Based upon a preliminary analysis of the proposed site improvements and necessary demolition, it is expected that more than one (1) acre will be disturbed during construction and this permit is anticipated to be required. An NDPES stormwater permit for off-site discharges that may occur during construction of the facilities associated with the project will be required as part of construction and will be submitted by the contractor completing the work.

7.1.3.4 Additional Recommended Upgrades/Improvements

Sections 7.1.3.1 and **7.1.3.2** summarize the recommended improvements to the West Plant in order to reinstate it into service and comply with the lower total nitrogen effluent requirement. Re-using the West Plant provides an additional 3.0 MGD of treatment capacity, for a total WRF capacity of 8.0 MGD as currently permitted. A new EQB is recommended be constructed equal in size to the existing EQB. Additional flow equalization volume will provide more effective flow attenuation and a more consistent nutrient loading to the biological treatment process which will improve overall unit process control and make the biological process less susceptible to a plant upset due to periodic elevated nutrient loads entering the WRF.

7.1.3.5 Conceptual Engineer's Opinion of Probable Construction Cost

Table 7-1 provides a conceptual engineer's opinion of probable construction cost (EOPCC) to upgrade the existing West Plant to a 4-Stage Bardenpho system, including all new process, structural, electrical, and instrumentation upgrades to the West Plant and miscellaneous upgrades needed to the existing facilities as described herein.

Table 7-1. Preliminary EOPCC – West Plant Upgrades for Wastewater Treatment

Description	Cost
Upgrade to Meet 3.0 mg/L TN (3.0 mgd)	$23,000,000
Rehab & Replacement Costs of Existing Facilities	$6,000,000
Second Flow Equalization Basin (Recommended)	$11,000,000
Subtotal	$40,000,000
Contingency (35%)	$14,000,000
Total	$54,000,000

7.2 EAST PLANT EXPANSION

The East Plant was designed and constructed as a 4-Stage Bardenpho system. Therefore, expansion to the East Plant for additional flows and compliance with the lower nitrogen effluent requirements can be accomplished by adding a second treatment train identical to the existing at the East Plant. The new train would also be rated for 5.0 MGD, for a total WRF treatment capacity of 10.0 MGD. The WRF would need to be re-rated with FDEP for the increased treatment capacity.

The existing headworks and EQB are sized for a flow of 8.0 MGD AADF, consistent with the current WRF treatment capacity. However, similar to the West Plant Upgrade alternative a new EQB is recommended be constructed equal in size to the existing EQB to provide better flow attenuation and provide a more consistent nutrient loading to the biological treatment process.

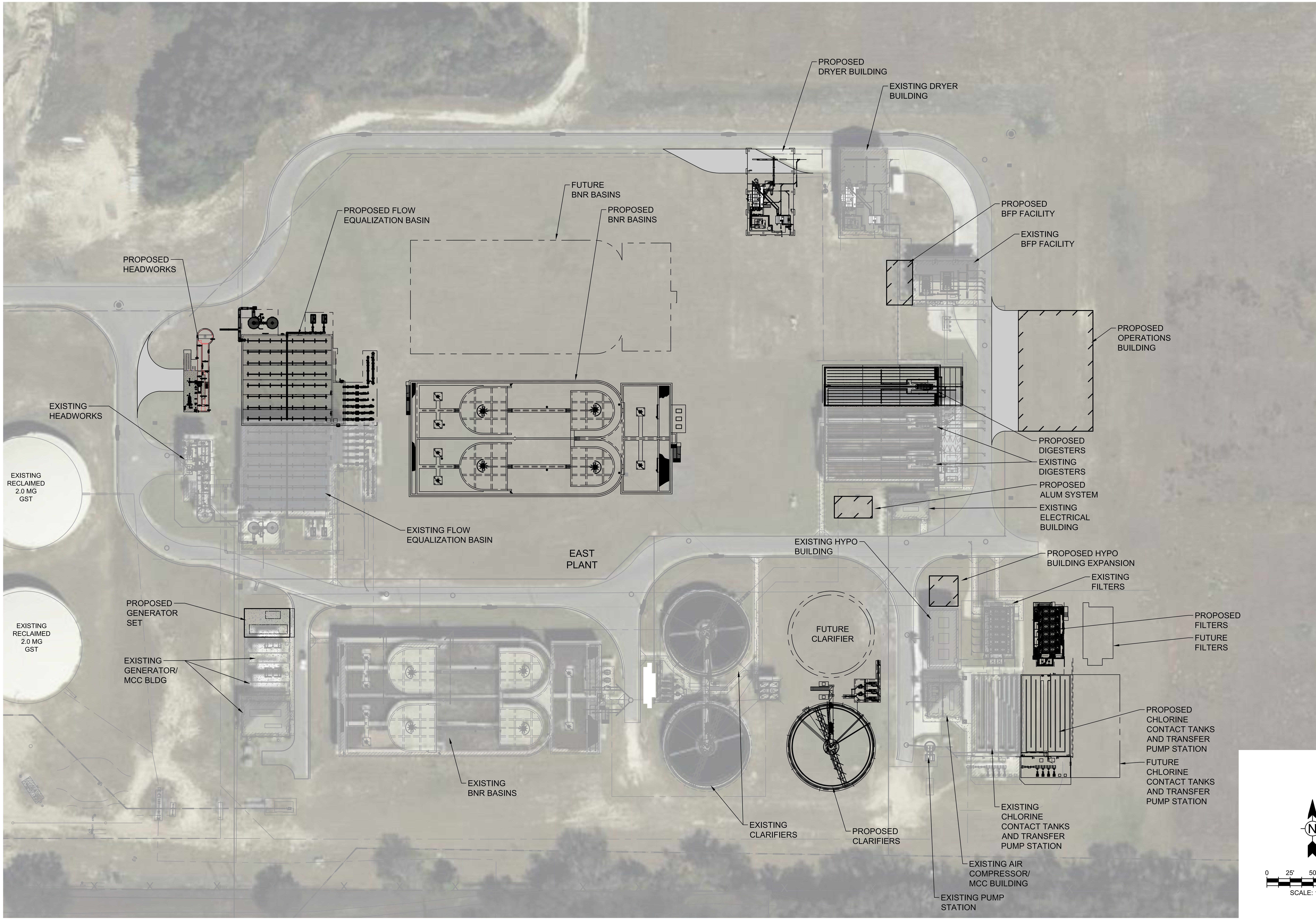
In addition, the overall capacity of the WRF can be increased 10.0 MGD with construction of a new headworks structure.

Figure 7-2 provides a schematic site plan for the upgrades to the East Plant discussed above.

It is not anticipated that additional upgrades are required for the biosolids management facility. The proposed changes, however, will have an impact on the biosolids management operations. The existing digesters are designed to store thickened sludge for approximately 20 days based on an average flow of 8.0 MGD. With an increased flow of 10.0 MGD, the storage time at the digesters will be reduced to 16 days. The belt filter presses (BFP) used to dewater solids are anticipated to operate for an extended period of time due to the reduced digester holding time. The BFPs were designed to operate 8 hours a day, 5 days a week. At the increased flow, the BFPs would need to either operate 10 hours a day, 5 days a week or operate approximately 8.5 hours a day, 6 days a week.

7.2.1.1 Conceptual Engineer's Opinion of Probable Construction Cost

Table 7-1 provides a conceptual engineer's opinion of probable construction cost (EOPCC) to upgrade the existing West Plant to a 4-Stage Bardenpho system, including all new process, structural, electrical, and instrumentation upgrades to the West Plant and miscellaneous upgrades needed to the existing facilities as described herein.



0 25' 50' 100'
SCALE: 1" = 50'

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CITY OF APOPKA
RIB / LINED POND FEASIBILITY EVALUATION

EAST PLANT EXPANSION
SITE PLAN

PROJ:	200-53076-23004
DESN:	MIA
DRWN:	RLM
CHKD:	BLK

FIG 7-2

Bar Measures 1 inch, otherwise drawing not to scale

11/8/2023 8:01:32 AM - O:\PROJECTS\ORLANDO\IER\53076\200-53076-23004\CAD\CONCEPTUAL\FIG-7-1.DWG - MATTHEWS, RUSS

Table 7-2. Preliminary EOPCC – East Plant Expansion

Description	Cost		
	3 MGD/8 MGD Total	5 MGD/10 MGD Total w/o Biosolids	5 MGD/10 MGD Total w/o Biosolids
Second Headworks	--	$9,000,000	$9,000,000
Second Flow Equalization Basin	$12,000,000 [1]	$12,000,000	$12,000,000
Liquid Stream Unit Processes	$66,000,000	$66,000,000	$66,000,000
Solids Handling Expansion (w/o Sludge Drying)	--	--	$13,000,000
Subtotal	$77,000,000	$87,000,000	$100,000,000
Contingency (35%)	$27,000,000	$30,000,000	$35,000,000
Total	$104,000,000	$117,000,000	$135,000,000

Notes:

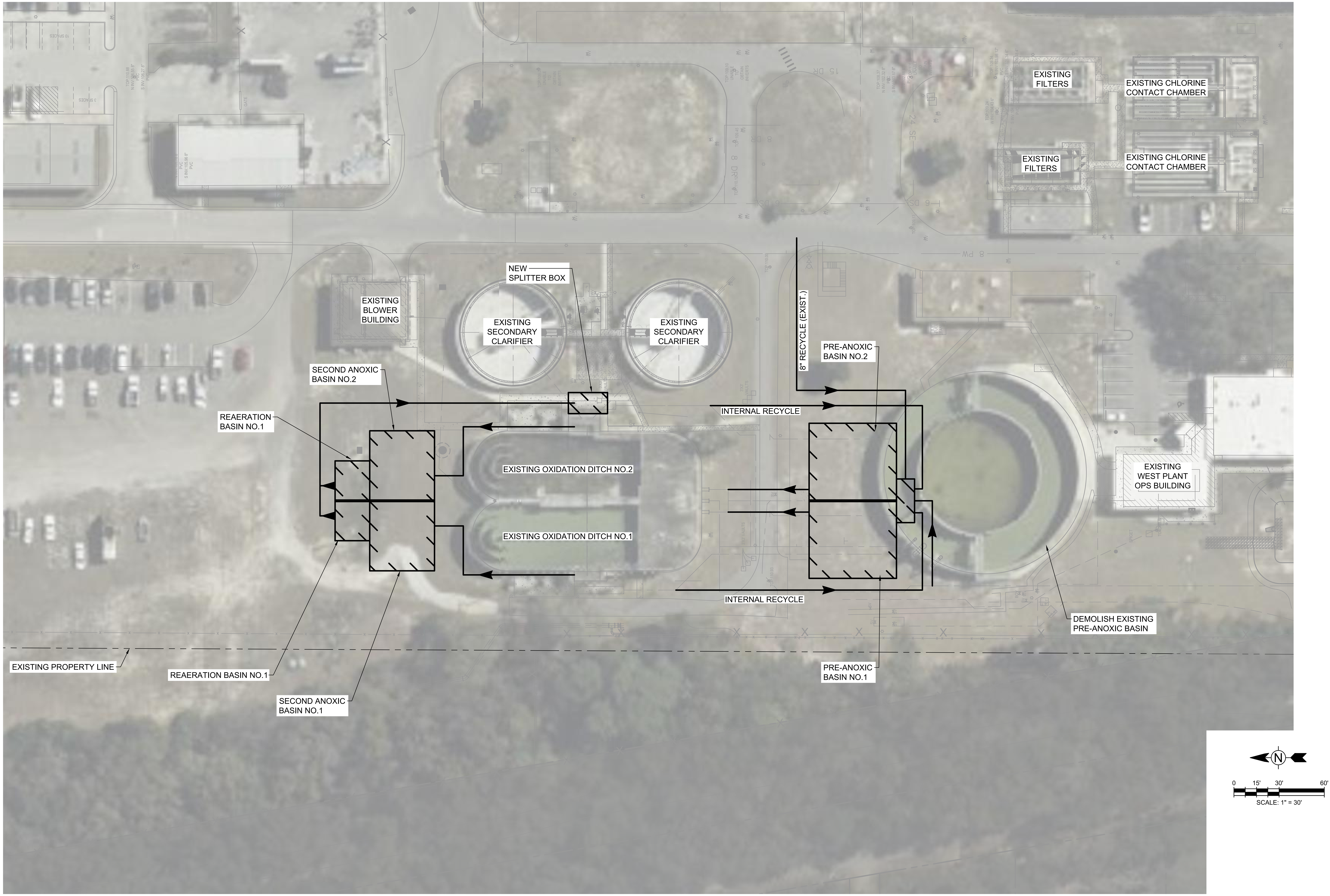
[1] Recommended for this alternative but not required.

7.2.2 Recommended Schedule

Currently, the West Plant is not in operation and flows are approaching the East Plant's permitted capacity of 5.0 MGD. Additionally, the effluent water quality will be required to meet an effluent TN of 3.0 mg/L prior to July 1, 2028. **Table 7-3** provides a recommended schedule for planning and construction of the selected alternative to meet the regulatory requirements.

Table 7-3. Planning and Construction Recommended Schedule

Description	Date
Advertise Request for Qualifications	June 1, 2024
Award and NTP	September 1, 2024
Preliminary Design	February 28, 2025
Permitting	April 30, 2025
Final Design	November 30, 2025
Advertise for Bid	January 2, 2025
Award	April 1, 2025
Begin Construction	July 1, 2025
Complete Construction	December 30, 2027
WRF Compliance with TN limit 3.0 mg/L	June 30, 2028



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MARK	DATE	DESCRIPTION	BY

CITY OF APOPKA
RIB / LINED POND FEASIBILITY EVALUATION
WEST PLANT UPGRADES
WASTEWATER TREATMENT

PROJ: 200-53076-23004
DESN: MIA
DRWN: RLM
CHKD: BLK

FIG 7-3

Bar Measures 1 inch, otherwise drawing not to scale

10/26/2023 6:34:37 AM - O:\PROJECTS\ORLANDO\IER\53076\200-53076-23004\CAD\CONCEPTUAL\FIG-5-1.DWG - MATTHEWS, RUSS

7.3 WEST PLANT – ALTERNATIVE USES OR DECOMMISSION

7.3.1 Surface Water Treatment Operations

7.3.1.1 General

Recent projections and modeling of the City's reclaimed water system have revealed that the City's demand for reclaimed water is not sufficient to dispose of the reclaimed water flow treated at the Apopka WRF. A current modeling project by Tetra Tech and Liquid Solutions Group (LSG) has recommended that the City provide additional alternate effluent disposal methods such as construction of rapid infiltration basins (RIBs), wetlands, or a deep injection well to dispose of excess reclaimed water from the WRF.

In addition to the City having a shortage of reclaimed water disposal capacity, Border Lake, Lake Page, and Lake Pleasant are experiencing elevated water levels. The City currently operates and maintains Border Lake. Orange County currently operates and maintains Lake Page and Lake Pleasant; however, the County intends to turn over operation and maintenance of these lakes to the City. The City has suggested there may be the opportunity to transmit the excess surface water from these Lakes to the Apopka WRF for treatment.

Tetra Tech completed a separate evaluation to determine if a rapid infiltration basin could be constructed south of the WRF in an area known as the "borrow pit area" to provide additional disposal methods for both the WRF and water from the Lakes. It was determined, however, that construction of a RIB at this site was not feasible because (1) ambient groundwater condition can result in the water table rising above the bottom of the excavated area, increasing the probability of the RIBs to pond and reduce the recharge capacity, (2) there are existing thick deposits of buried much which appear to be associated with an ancient sinkhole which could potentially trigger and/or accelerate sinkhole activity due to the downward seepage of water from the RIB, and (3) there are several wells adjacent to the City's property, of which two wells are classified as potable water and additional un-classified wells are assumed to be for potable water use. regulatory agencies require a minimum 500-foot setback between potable water wells and a RIB, which significantly reduces the space available for the construction of a RIB. A copy of this Tetra Tech's RIB / Lined Storage Pond Feasibility Technical Memorandum is provided in **Appendix J**.

As an alternative to a RIB system, a lined pond can be constructed on the "borrow pit area" to store water from the Lakes and treated by the existing West Plant for supplemental reclaimed water supply.

The feasibility to recommission the West Plant to treat surface water from Border Lake, Lake Page, and Lake Pleasant for reclaimed water augmentation assumes that (1) water from the lakes can be sent to the WRF for treatment, and (2) sufficient disposal capacity is made available with the City's conceptual reclaimed water projects.

7.3.1.2 Surface Water Supply to Reclaimed Water System

Using a surface water source to supplement the City's reclaimed water system is allowed under Rule 62-610.742, FAC. Prior to entering the reclaimed water system, surface waters must receive high-level disinfection (HLD) as prescribed in Rules 62-600.440(5)(a) through (f), FAC, for control of pathogens. HLD includes requirements for maximum concentrations of fecal coliform and total suspended solids (TSS) in reclaimed water. Treatment facilities for disinfection requirements typically include filtration facilities designed to reduce TSS to 5.0 mg/L or less, and disinfection facilities (i.e., chlorine contact tanks and chlorine storage and feed facilities or alternate disinfection treatment process as approved by FDEP). If there are fine particles or certain types of algae in the water source, additional coagulation/flocculation and potentially solids settling basins such as clarifiers could be required.

LSG will evaluate under a separate technical memorandum the potential water supply availability from Border Lake, Lake Page, and Lake Pleasant. However, for the purposes of this evaluation, it will be assumed that surface water supply from the lakes will range between 3.0 MGD and 6.0 MGD, depending on surface water quality and the existing West Plant treatment capacity. Further, this Report assumes that a conveyance system to transfer surface water from the lakes to the City's WRF will be already in place.

7.3.1.3 Water Quality

Treating surface water from the lakes to provide high-level disinfection generally consists of filtration and disinfection treatment. However, there are fine particles or certain types of algae that are small enough to pass through the filters thereby increasing the TSS concentration in the effluent. Since algae formation can occur in stagnant water such as lakes or ponds, it is recommended that, at a minimum, the existing clarifiers remain connected to the system to have the ability to settle solids when needed.

TSS can be monitored at the lakes and connected to the SCADA system at the WRF to have real-time information when water quality fluctuates. An average raw water TSS design level can be established for the treatment system so that the City can be notified via SCADA if the raw water exceeds the average TSS design level. If that occurs, the City can consider halting pumping to the West Plant until water quality improves.

Additional coagulation/flocculation may be needed to optimize solids settlement and further reduce TSS in the effluent. Coagulation consists of using a chemical coagulant such as aluminum sulfate (alum) in a rapid mix zone to destabilize the colloidal particles, making them less stable and causing them to come together as *flocs*. After rapid mix, the water proceeds to flocculation where the water is gently mixed to encourage the smaller flocs to adhere, forming larger, heavier flocs that are more easily settleable. Once the flocs are formed, water is allowed to settle in the clarifiers where flocs settle to the bottom due to their increased size and weight and clarified water is removed from the top of the basin.

Should coagulation and flocculation be needed, a new basin can be added to the West Plant with mixers in each the rapid and slow mixing zone. A new chemical feed system would also be needed for alum storage and pumping. For the purpose of this evaluation, it is assumed that new treatment basins and chemical facilities are not needed.

7.3.1.4 Upgrades to Existing Facility

At a minimum, it is recommended that the secondary clarifiers, filtration, and disinfection facilities, including the chlorine feed system, remain in place for surface water treatment. Yard piping modifications consist of routing a new influent raw water main from the lakes into the West Plant. The raw water main is recommended to have a direct connection to the secondary clarifiers and the filters with provisions to add a flocculation/ coagulation treatment basin if needed. That way, the clarifiers can be bypassed if raw water quality, monitored at the ponds, is not anticipated to have high TSS concentrations. The existing transfer pump station used to pump final effluent to the ground storage tanks can remain operational to serve the same purpose.

Figure 7-4 provides a conceptual site plan for the yard piping improvements recommended at the West Plant for surface water treatment as an augmentation source to the reclaimed system.

Based on the existing conditions of the West Plant as summarized in **Section 7.1.2**, the following assets, which are proposed to remain operational for surface water treatment, are recommended to be further inspected and repaired or rehabilitated, as needed:

- Building Structures:
  - MCC Building Sections A, B, and C
- East Filter Chlorine Mixer Sluice Gate
- East and West Filters
- Effluent Pump Station:
  - Vertical Turbine Pumps 4, 5, and 6

Due to their *poor* condition, the following assets are recommended to be replaced "in kind" based on an assumed treatment capacity range of 3.0 MGD – 6.0 MGD:

- Effluent sample pumps downstream of filters and CCTs
- Chlorine storage tanks and metering pumps

10/26/2023 6:28:30 AM - O:\PROJECTS\ORLANDO\ER\53076\200-53076-23004\CAD\CONCEPTUAL\FIG-5-2.DWG - MATTHEWS, RUSS

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CITY OF APOPKA
RIB / LINED POND FEASIBILITY EVALUATION

WEST PLANT UPGRADES
SURFACE WATER
TREATEMNT

PROJ:	200-53076-23004
DESN:	MIA
DRWN:	RLM
CHKD:	BLK

FIG 7-4

Bar Measures 1 inch, otherwise drawing not to scale

7.3.1.5 Permitting

Similarly, the design of the recommended upgrades to repurpose the West Plant for surface water treatment as an augmentation source to the reclaimed water system must consider regulations that will govern the construction and operation of the West Plant.

The following permits are anticipated to be required for the recommended improvements:

- FDEP Wastewater Facility or Activity Permit Application – General Information – Form 1
- FDEP Wastewater Permit Application for Domestic Wastewater Facilities – Form 2A
    - A major modification permit from FDEP is anticipated to remove the West Plant from its existing operating permit and re-permit the facility as a surface water treatment facility. Removing the West Plant from the wastewater operating permit would require provisions to the WRF treatment capacity to compensate for the West Plant capacity (3.0 MGD) that would be removed from the permit.
- St Johns River Water Management District: Consumptive Use Permit (CUP)
    - A CUP permit is anticipated to be required for the withdrawal of surface water from the lakes.

7.3.1.6 Conceptual Engineer's Opinion of Probable Construction Cost

Table 7-4 provides a conceptual EOPCC to repurpose the existing West Plant for treatment of surface water from Border Lake, Lake Page, and Lake Pleasant as a supplemental source to the reclaimed water system. The EOPCC provided herein includes the recommended improvements to the West Plant for surface water treatment operations.

Table 7-4. Preliminary EOPCC – West Plant Upgrades for Surface Water Treatment

Description	Cost
Upgrades for Surface Water Treatment	$17,000,000
Rehab and Replacement of Existing Facilities	$4,000,000
Subtotal	$21,000,000
Contingency (35%)	$7,000,000
Total	$28,000,000

7.3.2 Abandoning the West Plant

A third alternative is to abandon the West Plant in place and fully decommission it from future use. To save on cost, existing concrete basins can be abandoned in place. Yard piping modifications can be completed to remove the connections to the influent force main that feeds the West Plant and the reclaimed water line that exits the West Plant towards the ground storage tanks. Existing equipment, such as transfer pumps, chemical metering pumps, chemical storage tanks, mixers, blowers, and others, installed at the West Plant can be removed from the plant and stored in a covered location to serve as backup equipment for the East Plant. The existing generator and fuel tank can be repurposed and relocated either onsite or to an offsite facility to provide a temporary power supply to an operating facility. The existing Operations Building can be repurposed to better meet City needs.

If the City has funds to demolish the existing infrastructure, the land could be used for other purposes. In the past the City has expressed needs for a maintenance building with workshop and offices for their maintenance group. This space could be used to construct a new maintenance building. With future expansion, additional reject storage will be required. A portion of the area could be used to expand the reject storage ponds or construct reject ground storage tanks.

Appendix A

Appendix B

Appendix C

Appendix D

Appendix E

Appendix F

Appendix G

Appendix H

Appendix I

Appendix J