REQUEST FOR QUALIFICATIONS
No. 24-TA005095SAM
SOUTHWEST WATER RECLAMATION FACILITY EXPANSION TO 18 MGD
PROJECT NO. 6110783
JANUARY 17, 2024

Manatee County BCC
Procurement Division
1112 Manatee Avenue West, 7th Floor, Suite 705
Bradenton, FL 34205
purchasing@mymanatee.org

ADVERTISEMENT
REQUEST FOR QUALIFICATIONS NO. 24-TA005095SAM
SOUTHWEST WATER RECLAMATION FACILITY EXPANSION TO 18 MGD

Manatee County, a political subdivision of the State of Florida (hereinafter referred to as County) will receive qualification proposal responses (Proposals) from individuals, corporations, partnerships, and other legal entities authorized to do business in the State of Florida (Proposers), to provide Professional Engineering Services as specified in this Request for Qualifications.

DATE, TIME AND PLACE DUE:
The Due Date and Time for submission of Proposals in response to this RFQ **is February 23, 2024 by 1:00 PM ET.** Proposals must be delivered to the following location: Manatee County Administration Building, 1112 Manatee Ave. W., 7th Floor, Suite 705, Bradenton, FL 34205 and time stamped by a Procurement representative by the Due Date and Time. Proposals will be opened immediately following the Due Date and Time at the Manatee County Administration Building, 7th Floor, Suite 705.

SOLICITATION INFORMATION CONFERENCE:
There is no Solicitation Information Conference scheduled for this Request for Qualifications.

DEADLINE FOR QUESTIONS AND CLARIFICATION REQUESTS:
The deadline to submit all questions, inquiries, or requests concerning interpretation, clarification or additional information pertaining to this Request for Qualifications to the Manatee County Procurement Division is February 9, 2024. Questions and inquiries should be submitted via email to the Designated Procurement Contact shown below.

Important: A prohibition of lobbying is in place. Review Section A.13 carefully to avoid violation and possible sanctions.

DESIGNATED PROCUREMENT CONTACT: Sherri Meier, Procurement Manager
(941) 749-3014 Ext. 3042, Fax (941) 749-3034
Email: sherri.adamsmeier@mymanatee.org
Manatee County Financial Management Department
Procurement Division

AUTHORIZED FOR RELEASE: Jacob Erickson, MBA, CPPO, NIGP-CPP

Digitally signed by Jacob Erickson, MBA, CPPO, NIGP-CPP
Date: 2024.01.16 13:22:44 -05'00'

TABLE OF CONTENTS

SECTION A, INSTRUCTIONS TO PROPOSERS

In order to receive consideration, Proposers must meet the minimum qualification requirements, submit the required forms and information, and comply with the instructions as follows. Proposals will be accepted from a single business entity, joint venture, partnership or corporation. The County intends to award an agreement(s) for the provision of Professional Engineering services as identified in this RFQ.

A.01 INFORMATION CONFERENCE AND SITE VISIT

There is no Solicitation Information Conference scheduled for thie Request for Qualification.

A non-mandatory site tour will be held at 10:00 AM ET on January 23, 2024 at the Southwest Water Reclamation Facility, 5101 65th Street West, Bradenton, FL 34210.

A.02 DUE DATE AND TIME

The Due Date and Time for submission of Proposals in response to this Request for Qualifications (RFQ) **is February 23, 2024 by 1:00 PM ET.** Proposals must be delivered to the following location: Manatee County Administration Building, 1112 Manatee Ave. W., 7th Floor, Suite 705, Bradenton, FL 34205 prior to the Due Date and Time.

Proposal(s) received after the Due Date and Time will not be considered. It will be the sole responsibility of the Proposer to deliver its Proposal to the Manatee County Procurement Division for receipt on or before the Due Date and Time. If a Proposal is sent by U.S. Mail, courier or other delivery services, the Proposer will be responsible for its timely delivery to the Procurement Division. Proposals delayed in delivery will not be considered, will not be opened at the public opening, and arrangements will be made for their return at the Proposer's request and expense.

A.03 PUBLIC OPENING OF RESPONSES

Sealed Proposals will be publicly opened at Manatee County Administration Procurement Division, 1112 Manatee Avenue West, 7th Floor, Suite 705, Bradenton, Florida 34205, in the presence of County officials immediately upon expiration of the Due Date and Time. Proposers or their representatives may attend the Proposal opening.

Manatee County will make public at the opening the names of the business entities which submitted a Proposal and city and state in which they reside. No review or analysis of the Proposals will be conducted at the Proposal opening.

A.04 SUBMISSION OF RESPONSES

The contents of the Proposal sealed package must include:

- One (1) bound original clearly identifying Proposer and marked “ORIGINAL”.
- Three (3) bound copy(s) clearly identifying Proposer and marked “COPY” with all required information and identical to the original.
- One (1) electronic format copy(s) clearly identifying Proposer.

Electronic format copies should be submitted on separate Universal Serial Bus (USB) portable flash memory drives or compact disc (CD) in MicroSoft Office® or Adobe Acrobat® portable document format (PDF) in one continuous file. Do not password protect or otherwise encrypt electronic Proposal copies. Electronic copies must contain an identical Proposal to the original.

Upon submission, all Proposals become the property of Manatee County which has the right to use any or all ideas presented in any Proposal submitted in response to this Request for Qualifications whether, or not, the Proposal is accepted.

Submit the Proposal package in a sealed container with the following information clearly marked on the outside of the package: RFQ No. 24-TA005095SAM, Southwest Water Reclamation Facility Expansion to 18 MGD, Proposer's name, and Proposer's address. Proposals must be received by the Manatee County Procurement Division prior to the Due Date and Time at the following address:

Manatee County
Procurement Division
1112 Manatee Avenue West, 7th Floor, Suite 705
Bradenton, FL 34205

A.05 ORGANIZATION OF RESPONSES

Proposals must be organized and arranged with tabs in the same order as listed in the subsections within Exhibit 2, Proposal Response, identifying the response to each specific item.

Proposals must clearly indicate the legal name, address and telephone number of the Proposer. Proposal Signature Form must be signed by an official or other individual authorized to make representations for the Proposer.

A.06 DISTRIBUTION OF SOLICITATION DOCUMENTS

All documents issued pursuant to this RFQ are distributed electronically and available for download at no charge at www.mymanatee.org > *Business* > *Bids and Proposals.* Documents may be viewed and downloaded for printing using Adobe Reader® or Microsoft software, as applilcable.

At its sole discretion, the County may utilize a third-party provider to distribute Proposals. For more information regarding this service visit the Procurement webpage of the County website. Utilization of this third-party service is not a requirement for doing business with Manatee County.

Additionally, the RFQ and all related documents are available for public inspection at the Manatee County Procurement Division, 1112 Manatee Avenue West, 7th Floor, Suite 705, Bradenton, FL 34205. Call (941) 749-3014 to schedule an appointment.

Documents are available between the hours of 8:00 A.M. and 5:00 P.M., Monday through Friday, with the exception of County holidays.

As a courtesy, Manatee County notifies the Manatee County Chamber of Commerce and the Manasota Black Chamber of Commerce of all active solicitations, who then distributes the information to its members.

A.07 ADDENDA

Any interpretations, corrections or changes to this RFQ will be made by addendum. Addenda will be posted on the Procurement Division's web page of the County website at http://www.mymanatee.org/> *Business* > *Bids and Proposals*. For those solicitations that are advertised on a third-party website, addenda will likewise be posted on the third-party website.

All addenda are a part of the RFQ and each Proposer will be bound by such addenda. It is the responsibility of each Proposer to obtain, read and comprehend all addenda issued. Failure of any Proposer to acknowledge an issued addendum in its Proposal will not relieve the Proposer from any obligation contained therein.

A.08 RESPONSE EXPENSES

All costs incurred by Proposer in responding to this RFQ and to participate in any interviews/presentations/demonstrations, including travel, will be the sole responsibility of the Proposer.

A.09 QUESTION AND CLARIFICATION PERIOD

Each Proposer shall examine all RFQ documents and will judge all matters relating to the adequacy and accuracy of such documents. Any questions or requests concerning interpretation, clarification or additional information pertaining to this RFQ shall be made in writing via email to the Manatee County Procurement Division to the Designated Procurement Contact or to purchasing@mymanatee.org. All questions received and responses given will be provided to potential Proposers via an addendum to this RFQ

Manatee County will not be responsible for oral interpretations given by other sources including County staff, representative, or others. The issuance of a written addendum by the Procurement Division is the only official method whereby interpretation, clarification or additional information will be given.

A.10 FALSE OR MISLEADING STATEMENTS

Proposals which contain false or misleading statements, or which provide references which do not support an attribute or condition claimed by the Proposer, may be rejected. If, in the opinion of the County, such information was intended to mislead the County in its evaluation of the Proposal, and the attribute, condition or capability is a requirement of this RFQ. Such Proposer will be disqualified from consideration for this RFQ and may be disqualified from submitting a response on future solicitation opportunities with the County.

A.11 WITHDRAWAL OR REVISION OF RESPONSES

Proposers may withdraw Proposals under the following circumstances:

a. If Proposer discovers a mistake(s) prior to the Due Date and Time. Proposer may withdraw its Proposal by submitting a written notice to the Procurement Division. The notice must be received in the Procurement Division prior to the Due Date and Time for receiving Proposals. A copy of the request shall be retained, and the unopened Proposal returned to the Proposer; or

b. After the Proposals are opened but before a contract is signed, Proposer alleges a material mistake of fact if:

    1. The mistake is clearly evident in the solicitation document; or
    2. Proposer submits evidence which clearly and convincingly demonstrates that a mistake was made in the Proposal. Request to withdraw a Proposal must be in writing and approved by the Purchasing Official.

A.12 JOINT VENTURES

Proposers intending to submit a Proposal as a joint venture with another entity are required to have filed proper documents with the Florida Department of Business and Professional Regulation and all other State or local licensing agencies as required by Florida Statute Section 489.119, prior to the Due Date and Time.

A.13 LOBBYING

After the issuance of any solicitation, no prospective Proposer, or their agents, representatives or persons acting at the request of such Proposer, shall contact, communicate with or discuss any matter relating in any way to the solicitation with any County officers, agents or employees, other than the Purchasing Official or designee, unless otherwise directed by the Purchasing Official or designee. This prohibition includes copying such persons on written communications (including email correspondence) but does not apply to presentations made to evaluation committees or at a County Commission meeting where the Commission is considering approval of a proposed contract/purchase order. This requirement ends upon final execution of the contract/purchase order or at the time the solicitation is cancelled. Violators of this prohibition will be subject to sanctions as provided in the Manatee County Code of Ordinances Section 2-26-31 and 2-26-32. Sanctions may include (a) written warning; (b) termination of contracts; and (c) debarment or suspension.

A.14 EXAMINATION OF RESPONSES

The examination and evaluation of the Proposals submitted in response to this solicitation generally requires a period of not less than ninety (90) calendar days from the Due Date and Time.

A.15 ERRORS OR OMISSIONS

Once a Proposal is opened, the County will not accept any request by Proposer to correct errors or omissions in the Proposal other than as identified in paragraph A.11.

A.16 DETERMINATION OF RESPONSIBLENESS AND RESPONSIVENESS

The County will conduct a due diligence review of all Proposals received to determine if the Proposer is responsible and responsive.

To be responsive a Proposer must submit a Proposal that conforms in all material respects to the requirements of this RFQ and contains all the information, fully completed attachments and forms, and other documentation required. Proposals that are deemed non-responsive will not be considered or evaluated.

To be responsible, a Proposer must meet the minimum qualification requirements and have the capability to perform the Scope of Services contained in this RFQ. Proposals submitted by Proposers that are deemed non-responsible will not be considered or evaluated.

A.17 RESERVED RIGHTS

The County reserves the right to accept or reject any and all Proposals, to waive irregularities and technicalities, to request additional information and documentation, and to cancel this solicitation at any time prior to execution of the contract. In the event only one Proposal is received, the County reserves the right to negotiate with the Proposer. The County reserves the right to award the contract to a responsive and responsible Proposer which in its sole determination is the best value and in the best interests of the County.

The County reserves the right to conduct an investigation as it deems necessary to determine the ability of any Proposer to perform the work or service requested. Upon request by the County, Proposer shall provide all such information to the County. Additional information may include, but will not be limited to, current financial statements prepared in accordance with generally accepted accounting practices and certified by an independent CPA or official of Proposer; verification of availability of equipment and personnel; and past performance records.

A.18 APPLICABLE LAWS

Proposer must be authorized to transact business in the State of Florida. All applicable laws and regulations of the State of Florida and ordinances and regulations of Manatee County will apply to any resulting contract. This solicitation process will be conducted in accordance with Manatee County Code of Ordinances, Chapter 2-26.

A.19 TAXES

Manatee County is exempt from Federal Excise and State Sales Taxes. (F.E.T. Cert. No. 59-78-0089K; Florida Sales Tax Exempt Cert. No. 85-8012622206C-6). Therefore, the Proposer is prohibited from delineating a separate line item in its Proposal for any sales or service taxes.

The Successful Proposer will be responsible for the payment of taxes of any kind, including but not limited to sales, consumer, use, and other similar taxes payable on account of the work performed and/or materials furnished under the award in accordance with all applicable laws and regulations.

A.20 SCRUTINIZED COMPANIES

Pursuant to Florida Statute Section 287.135, as of July 1, 2012, a company that, at the time of submitting a response for a new contract or renewal of an existing contract, is on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, created pursuant to Florida Statute Section 215.473, is ineligible for, and may not submit a response for or enter into or renew a contract with an agency or local governmental entity for goods or services of $1 million or more.

A.21 COLLUSION

Proposer certifies that its Proposal is made without prior understanding, agreement, or connection with any other corporation, firm or person submitting a Proposal for the same materials, services, supplies, or equipment and is in all respects fair and without collusion or fraud.

Any such violation may result in contract cancellation, return of materials or discontinuation of services and the possible removal of Proposer from participation in future County solicitations for a specified period.

The County reserves the right to disqualify a Proposer during any phase of the solicitation process and terminate for cause any resulting contract upon evidence of collusion with intent to defraud on the part of the Proposer.

A.22 CODE OF ETHICS

With respect to this Request for Qualifications, if any Proposer violates, directly or indirectly, the ethics provisions of the Manatee County Procurement Code and/or Florida criminal or civil laws related to public procurement, including but not limited to Florida Statutes Chapter 112, Part II, Code of Ethics for Public Officers and Employees, such Proposer will be disqualified from eligibility to perform the work described in this RFQ, and may also be disqualified from submitting any future bids or proposals to supply goods or services to Manatee County.

A.23 PUBLIC ENTITY CRIMES

In accordance with Section 287.133, Florida Statutes, a person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a proposal on a contract to provide any goods or services to a public entity, may not submit a proposal on a contract with a public entity for the construction or repair of a public building or public work, may not submit proposals on leases or real property to a public entity, may not be awarded or perform work as a contractor, Successful Proposer, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017 for Category Two for a period of 36 months from the date of being placed on the convicted vendor list.

In addition, Manatee County Code of Laws Chapter 2-26 Article V prohibits the award of County contracts to any person or entity who/which has, within the past 5 years, been convicted of, or admitted to in court or sworn to under oath, a public entity crime or of any environmental law that, in the reasonable opinion of the Purchasing Official, establishes reasonable grounds to believe the person or business entity will not conduct business in a reasonable manner.

To ensure compliance with the foregoing, Manatee County Code of Laws requires all persons or entities desiring to contract with Manatee County to execute and file with the Purchasing Official an affidavit, executed under the pain and penalties of perjury, confirming that person, entity, and any person(s) affiliated with the entity, does not have such a record and is therefore eligible to seek and be awarded business with Manatee County. Proposer is to complete Form 3 and submit with your Proposal.

A.24 AMERICANS WITH DISABILITIES

Manatee County does not discriminate upon the basis of any individual's disability status. This non-discrimination policy involves every aspect of County's functions including one's access to participation, employment, or treatment in its programs or activities. Anyone requiring reasonable accommodation for an information conference or Proposal opening should contact the person named on the cover page of this document at least twenty-four (24) hours in advance of either activity.

A.25 EQUAL EMPLOYMENT OPPORTUNITY

In accordance with Title VI of the Civil Rights Act of 1964, Title 15, Part 8 of the Code of Federal Regulations and the Civil Rights Act of 1992, Manatee County hereby notifies all Proposers that it will affirmatively ensure minority business enterprises are afforded full opportunity to participate in response to this Request for Qualifications and will not be discriminated against on the grounds of race, color, national origin, religion, sex, age, handicap, or marital status in consideration of award.

A.26 MINORITY AND/OR DISADVANTAGED BUSINESS ENTERPRISE

The State of Florida Office of Successful Proposer Diversity provides the certification process and maintains the database of certified MBE/DBE firms. Additional information may be obtained at http://www.osd.dms.state.fl.us/iframe.htm or by calling (850) 487-0915.

A.27 DISCLOSURE

Upon receipt, all inquiries and responses to inquiries related to this Request for Proposal become “Public Records”, and shall be subject to public disclosure consistent with Florida Statute, Chapter 119.

Proposals become subject to disclosure thirty (30) days after the opening or if a notice of intent to award decision is made earlier than this time as provided by Florida Statutes § 119.071(1)(b). No announcement or review of the Proposals shall be conducted at the public opening.

If County rejects all Proposals and concurrently notices its intent to reissue the solicitation, the rejected Proposals are exempt from public disclosure until such time the County provides notice of an intended decision concerning the reissued solicitation or until County withdraws the reissued solicitation. A Proposal is not exempt for longer than twelve (12) months after the initial notice of rejection of all Proposals.

Pursuant to Florida Statute 119.0701, to the extent Successful Proposer is performing services on behalf of County, Successful Proposer must:

a. Keep and maintain public records required by public agency to perform the service. That information and data it manages as part of the services may be public record in accordance with Chapter 119, Florida Statutes and Manatee County public record policies. Proposer agrees, prior to providing goods/services, it will implement policies and procedures, which are subject to approval by County, to maintain, produce, secure, and retain public records in accordance with applicable laws, regulations, and County policies including but not limited to Section 119.0701, Florida Statutes.

b. Upon request from the public agency's custodian of public records, provide the public agency with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Florida Statutes, Chapter 119, or as otherwise provided by law.

c. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the Successful Proposer does not transfer the records to the public agency.

d. Upon completion of the contract, transfer, at no cost, to the public agency all public records in possession of contractor or keep and maintain public records required by the public agency to perform the service. If the Successful Proposer transfers all public records to County upon completion of the contract, the Successful Proposer shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Successful Proposer keeps and maintains public records upon completion of the contract, the Successful Proposer shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to County, upon request from County's custodian of public records, in a format that is compatible with the information technology systems of County.

IF THE SUCCESSFUL PROPOSER HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO ITS DUTY TO PROVIDE PUBLIC RECORDS RELATING TO ANY RESULTING CONTRACT, CONTACT COUNTY'S CUSTODIAN OF PUBLIC RECORDS AT:

PHONE: (941) 742-5845
EMAIL: LACY.PRITCHARD@MYMANATEE.ORG
ATTN: RECORDS MANAGER
1112 MANATEE AVENUE WEST
BRADENTON, FL 34205

A.28 TRADE SECRETS

Manatee County is subject to Chapter 119, Florida Statutes. Therefore, all documents, materials, and data submitted as part of a Proposal in response to a Request for Proposal are governed by the disclosure, exemption and confidentiality provisions relating to public records in Florida Statutes.

Notwithstanding any other provision in this solicitation, designation of the entire proposal as 'trade secret', 'proprietary', or 'confidential' is not permitted and may result in a determination that the Proposal is non-responsive and therefore the proposal will not be evaluated or considered.

Except for materials that are 'trade secrets' as defined by Chapter 812, Florida Statutes, ownership of all documents, materials and data submitted as part of a Proposal in response to the Request for Proposal shall belong exclusively to County.

To the extent that Proposer desires to maintain the confidentiality of materials that constitute trade secrets pursuant to Florida law, trade secret material submitted must be segregated from the portions of the Proposal that are not declared as trade secret. In addition, Proposer shall cite, for each trade secret claimed, the Florida Statute number which supports the designation. Further, Proposer shall offer a brief written explanation as to why the cited Statute is applicable to the information claimed as trade secret. Additionally, Proposer shall provide a hard copy of its Proposal that redacts all information designated as trade secret.

In conjunction with trade secret designation, Proposer acknowledges and agrees that:

a. Trade secret requests made after the opening will not be considered. However, County reserves the right to clarify the Proposers request for trade secret at any time; and
b. County and its officials, employees, agents, and representatives are hereby granted full rights to access, view, consider, and discuss the information designated as trade

secret throughout the evaluation process and until final execution of any awarded purchase order or contract; and

c. That after notice from County that a public records request has been made pursuant to Proposer's proposal, the Proposer at its sole expense, shall be responsible for defending its determination that submitted material is a trade secret and is not subject to disclosure. Action by Proposer in response to notice from the County shall be taken immediately, but no later than 10 calendar days from the date of notification or Proposer will be deemed to have waived the trade secret designation of the materials.

Proposer shall indemnify and hold County, and its officials, employees, agents and representatives harmless from any actions, damages (including attorney's fees and costs), or claims arising from or related to the designation of trade secrets by the Proposer, including actions or claims arising from County's non-disclosure of the trade secret materials.

A.29 CONFIDENTIALITY OF SECURITY RELATED RECORDS

a. Pursuant to Florida Statutes § 119.071(3), the following records (hereinafter referred to collectively as "the Confidential Security Records") are confidential and exempt from the disclosure requirements of Florida Statutes § 119.07(1):

   1. A Security System Plan or portion thereof for any property owned by or leased to County or any privately owned or leased property held by County.

   2. Building plans, blueprints, schematic drawings, and diagrams, including draft, preliminary, and final formats, which depict the internal layout and structural elements of a building, arena, stadium, water treatment facility, or other structure owned or operated by County.

   3. Building plans, blueprints, schematic drawings, and diagrams, including draft, preliminary, and final formats, which depict the internal layout or structural elements of an attractions and recreation facility, entertainment or resort complex, industrial complex, retail and service development, office development, or hotel or motel development in the possession of, submitted to County.

b. Successful Proposer agrees that, as provided by Florida Statute, it shall not, as a result of a public records request, or for other reason disclose the contents of, or release or provide copies of the Confidential Security Records to any other party absent the express written authorization of County's Property Management Director or to comply with a court order requiring such release or disclosure. To the extent Successful Proposer receives a request for such records, it shall immediately contact the County's designated Contract administrator who shall coordinate County's response to the request.

A.30 E-VERIFY

Prior to the employment of any person under this contract, the Successful Proposer shall utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of (a) all persons employed during the contract term by the Successful Proposer to perform employment duties within Florida and (b) all persons, including subcontractors, assigned by the Successful Proposer to perform work pursuant to the contract with Manatee County. For more information on this process, please refer to United States Citizenship and Immigration Service site at: http://www.uscis.gov/.

Only those individuals determined eligible to work in the United States shall be employed under this contract.

By submission of a Proposal in response to this RFQ, the successful Proposer commits that all employees and subcontractors will undergo e-verification before placement on this contract.

The successful Proposer shall maintain sole responsibility for the actions of its employees and subcontractors. For the life of the contract, all employees and new employees brought in after contract award shall be verified under the same requirement stated above.

A.31 LICENSES AND PERMITS

The successful Proposer shall be solely responsible for obtaining all necessary license and permit fees, including, but not limited to, all license fees, permit fees, impact fees, or inspection fees, and responsible for the costs of such fees. Successful Proposer is solely responsible for ensuring all work complies with all Federal, State, local, and Manatee County ordinances, orders, codes, laws, rules, regulations, directives, and guidelines.

A.32 MINIMUM WAGE REQUIREMENTS

The successful Proposer shall comply with all minimum wage requirements, such as Living Wage requirements, minimum wages based on Federal Law, minimum wages based on the Davis-Bacon Act, and the provisions of any other employment laws, as may be applicable to the Agreement.

A.33 PROTEST

Any actual bidder, Proposer, or contractor who is aggrieved in connection with the notice of intent to award of a contract with a value greater than $250,000 where such grievance is asserted to be the result of a violation of the requirements of the Manatee County Procurement Code or any applicable provision of law by the officers, agents, or employees of the County, may file a protest to the Purchasing Official.

Protest must be in writing and delivered via email at purchasing@mymanatee.org or by hand delivery to the Procurement Division at 1112 Manatee Avenue West, 7th Floor, Suite 705, Bradenton, FL 34205 by 5:00 p.m. on the fifth business day following the date of posting of the Notice of Intent to Award on the County website. There is no stay of the procurement process during a protest. The Purchasing Official shall have the authority to settle and resolve a protest concerning the intended award of a contract.

For additional information regarding the County protest process, visit the Procurement Division webpage on the County website.

A.34 BINDING OFFER

Proposals will remain valid for a period of 120 days following the Due Date and Time and will be considered a binding offer to perform the required services and/or provide the required goods. The submission of a Proposal will be taken as prima facie evidence that the Proposer has familiarized itself with the contents of this Solicitation

A.35 ACCESSIBILITY

The County is committed to making its documents and information technologies accessible to individuals with disabilities by meeting the requirements of Section 508 of the Rehabilitation Act and best practices (W3C WCAG 2). **For assistance with accessibility regarding this solicitation, contact the Manatee County Procurement Division via email at purchasing@mymanatee.org or by phone at 941-748-4501, X3014.**

Successful Proposer shall ensure all its electronic information, documents, applications, reports, and deliverables required in the proposal are in a format that meets the requirements of Section 508 of the Rehabilitation Act and best practices (W3C WCAG 2).

Where not fully compliant with these requirements and best practices, Successful Proposer shall provide clear points of contact for each document and information technology to direct users in how to obtain alternate formats. Further, Successful Proposer shall develop accommodation strategies for those non-compliant resources and implement strategies to resolve the discrepancies.

A.36 SOLICITATION SCHEDULE

The following schedule has been established for this Solicitation process. Refer to the County's website (www.mymanatee.org > *Business* > *Bids & Proposals*) for meeting locations and updated information pertaining to any revisions to this schedule.

Scheduled Item	**Scheduled Date**
Non-Mandatory Site Visit will be conducted in accordance with Article A. 01.	January 23, 2024 10:00 AM ET
Question and Clarification Deadline	February 9, 2024
Proposal due Date and Time	February 23, 2024, by 1:00 PM ET

Technical Evaluation Meeting	TBD
Technical Evaluation Meeting	TBD
Interviews/Presentations/Demonstrations (if conducted)	TBD
Final Evaluation Meeting (if required)	TBD
Projected Award	April 2024

END SECTION A

SECTION B, EVALUATION OF RESPONSES

B.01 EVALUATION

A due diligence review will be conducted to determine if the Proposal is responsive to the submission requirements outlined in this Solicitation and to determine if the Proposer is a responsible Proposer.

A responsive Proposal is one that follows the requirements of this Solicitation, includes all documentation, is submitted in the format outlined in this Solicitation, is of timely submission, and has the appropriate signatures as required on each document. Failure to comply with these requirements may result in the Proposal being deemed non-responsive. A responsible Proposer is a Proposer which the County affirmatively determines has the ability, capability and skill to perform under the terms of the agreement; can provide the materials and/or service promptly within the time specified, without delay or interference; has a satisfactory record of integrity and business ethics; and meets the minimum qualification requirements in this RFQ.

Evaluation of Proposals will be conducted by an evaluation committee. Each evaluation committee member will evaluate and score the Proposals for each of the evaluation criteria. The committee will consider all information submitted by each responsible and responsive Proposer; clarification information provided by Proposer; information obtained during the interviews, presentations, or demonstrations; feedback received from Proposer’s references; and any other relevant information received during any investigation of Proposer to ascertain the ability of the Proposer to perform the Scope of Services as stated in this RFQ.

B.02 EVALUATION CRITERIA

The following evaluation criteria have been established for this RFQ.

Evaluation Criteria	**Maximum Points**
Respondent & Team's Experience	25
Approach to Engineering Serivces	20
Organizational Structure and Capacity	20
Similar Completed Projects	35

B.03 CLARIFICATIONS, INTERVIEWS, PRESENTATIONS, DEMONSTRATIONS

As part of the evaluation process, the evaluation committee will determine a list of those responsive and responsible Proposals that are deemed by the committee as having a reasonable probability of being selected for award (Short List). At a minimum, the evaluation committee shall conduct discussions with the Short List Proposers and may request additional information or clarification from Proposers for the purpose of further evaluation of (a) conformance to the solicitation requirements, (b) the abilities of the Proposer, and (c) understanding of the Proposal submitted. Additional information and clarification must be submitted by Proposer within the requested time-period.

Additionally, interviews, presentations or demonstrations may be conducted with Proposers as part of the evaluation process. If conducted, the Short List Proposers will be invited to meet with the committee. The information gained from these interviews, presentations, or demonstrations will be part of the committee's consideration in making a recommendation for award. Therefore, Proposers should make arrangements to attend, if invited.

The interviews, presentations and demonstrations are closed to the public to the extent permitted by law.

In the final evaluations, each evaluator will consider the information obtained from the proposals as well as the discussions and clarifications presented during the presentations. As part of the final evaluations, the initial technical evaluation scores for each short-listed firm, in each of the evaluation criterion, will be discussed by the evaluation committee and are subject to change.

B.04 RECOMMENDATION FOR NEGOTIATION

The evaluation committee will determine from the responses to this RFQ and subsequent investigations, the Proposer(s) who best meets the County's requirements. Upon completion of the technical evaluations, the evaluation committee will make a recommendation as to the Proposer(s) which the County should enter into negotiations, if any. The County will notice the Intent to Negotiate, in the same manner the original Request for Qualifications document was noticed prior to commencing negotiations.

Upon approval to commence negotiations, the recommended Proposer(s) shall submit one original hard copy and one electronic copy on a CD or USB flash drive of its pricing proposal. The pricing information should show a categorical breakout of the pricing, with any alternates or options clearly identified. The pricing information shall be clear and unambiguous to facilitate evaluation of the prices submitted.

The County will conduct negotiations with the highest scoring Proposer. If the County and the highest-scored Proposer cannot reach agreement on a contract, the County reserves the right to terminate negotiations and may, at its sole discretion, begin negotiations with the next highest-scored Proposer(s). This process may continue until a contract acceptable to the County has been negotiated or all Proposals are rejected.

B.05 RECOMMENDATION FOR AWARD

Upon successful completion of negotiations, a recommendation for award to the successful Proposer(s) will be presented for approval per County ordinances, policies and procedures.

END SECTION B

SECTION C, AWARD OF THE AGREEMENT

C.01 GENERAL

By submitting a Proposal, Proposer understands and agrees:

a. The Proposal and all subsequent information requested by the County during the procurement process will serve as a basis for the Agreement.
b. All products and papers produced during the Agreement period become the property of Manatee County upon termination or completion of the engagement.

C.02 AGREEMENT

The successful Proposer(s) will be required to execute the Agreement in a form and with provisions acceptable to the County (See Exhibit 6, Sample Agreement). The County (as Owner) will execute this Agreement with the successful Proposer (as Consultant).

The negotiated Agreement may or may not include all elements of this RFQ or the Proposal submitted by the successful Proposer(s) where alternatives provide best value, are desirable to the County, and the parties agree to such terms. Negotiations of the terms of the Agreement, may include specifications, scope of project, price, the Agreement period, renewal, or any other relevant provisions.

C.03 AWARD

County does not make award to a Proposer who is delinquent in payment of any taxes, fees, fines, contractual debts, judgments, or any other debts due and owed to County, or is in default on any contractual or regulatory obligation to County. By submitting this solicitation response, Proposer attests that it is not delinquent in payment of any such debts due and owed to County, nor is it in default on any contractual or regulatory obligation to County. In the event the Proposer's statement is discovered to be false, Proposer will be subject to suspension and debarment and County may terminate any contract it has with Proposer.

Award of the Agreement is subject to approval as provided for in the Manatee County Procurement Code.

END SECTION C

SECTION D, FORMS

FORM 1 - ACKNOWLEDGMENT OF ADDENDA

The undersigned acknowledges receipt of the following addenda:

Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:
Addendum No. _____	Date Received:

Print or type Proposer's information below:

Name of Proposer	Telephone Number
Street Address	City/State/Zip
Email Address	Website Address
Print Name & Title of Authorized Officer	Signature of Authorized Official Date

FORM 2 - PROPOSAL SIGNATURE FORM

The undersigned represents that by signing this Proposal Signature Form that:

(1) He/she has the authority and approval of the legal entity purporting to submit the Proposal and any additional documentation which may be required such as the Joint Venture Agreement or Joint Venture Affidavit, if applicable; and

(2) All facts and responses set forth in the Proposal are true and correct; and

(3) If the Proposer is selected by County to negotiate an agreement, that Proposer's negotiators will negotiate in good faith to establish an agreement to provide the services described in this RFQ; and

(4) By submitting a Proposal and signing below, the Proposer agrees to the terms and conditions in this RFQ, which incorporates all addenda, appendices, exhibits, and attachments, in its entirety, and is prepared to sign the Agreement, of which a sample is incorporated into this RFQ as Exhibit 6. The Proposer understands that if it submits exceptions to the Sample Agreement in its Proposal, the Proposer may be determined non-responsive.

Print or type Proposer's information below:

Name of Proposer	Telephone Number
Street Address	City/State/Zip
Email Address	Web Address
Print Name & Title of Authorized Officer	Signature of Authorized Officer Date

FORM 3 - PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES CERTIFICATION

SWORN STATEMENT PURSUANT TO MANATEE COUNTY PROCUREMENT CODE SECTION 2-26 ARTICLE V,

THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

This sworn statement is submitted to Manatee County by

____

[print individual's name and title]

for ____

[name of entity submitting sworn statement]

whose business address is: ____

and (if applicable) its Federal Employer Identification Number (FEIN) is ____________________

______. If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement:

I, the undersigned, understand that no person or entity shall be awarded or receive a County contract for public improvements, procurement of goods or services (including professional services) or a county lease, franchise, concession or management agreement, or shall receive a grant of County monies unless such person or entity has submitted a written certification to County that it has not:

(1) been convicted of bribery or attempting to bribe a public officer or employee of Manatee County, the State of Florida, or any other public entity, including, but not limited to the Government of the United States, any state, or any local government authority in the United States, in that officer's or employee's official capacity; or

(2) been convicted of an agreement or collusion among Proposers or prospective Proposers in restraint of freedom of competition, by agreement to bid a fixed price, or otherwise; or

(3) been convicted of a violation of an environmental law that, as determined by the County, reflects negatively upon the ability of the person or entity to conduct business in a responsible manner; or

(4) made an admission of guilt of such conduct described in items (1), (2) or (3) above, which is a matter of record, but has not been prosecuted for such conduct, or has made an admission of guilt of such conduct, which is a matter of record, pursuant to formal prosecution. An admission of guilt shall be construed to include a plea of nolo contendere; or

(5) where an officer, official, agent or employee of a business entity has been convicted of, or has admitted guilt to, any of the crimes set forth above on behalf of such and entity and pursuant to the direction or authorization of an official thereof (including the person committing the offense, if he/she is an official of the business entity), the business shall be chargeable with the conduct herein above set forth. A business entity shall be chargeable with the conduct of an affiliated entity, whether wholly owned, partially owned, or one which has common ownership or a common board of directors.

For purposes of this Form, business entities are affiliated if, directly or indirectly, one business entity controls or has the power to control another business entity, or if an individual or group of individuals controls or has the power to control both entities. Indicia of control shall include, without limitation, interlocking management or ownership, identity of interests amount family members, shared organization of a business entity following the ineligibility of a business entity under this Article, or using substantially the same management, ownership or principles as the ineligible entity.

Any person or entity who claims that this Article is inapplicable to him/her/it because a conviction or judgment has been reversed by a court of competent jurisdiction, shall prove the same with documentation satisfactory to Manatee County's Purchasing Official. Upon presentation of such satisfactory proof, the person or entity shall be allowed to contract with Manatee County.

I UNDERSTAND THAT ANY CONTRACT OR BUSINESS TRANSACTION SHALL PROVIDE FOR SUSPENSION OF PAYMENTS, OR TERMINATION, OR BOTH, IF THE PROCUREMENT DIVISION OR THE COUNTY ADMINISTRATOR DETERMINES THAT **SUCH PERSON OR ENTITY HAS MADE FALSE CERTIFICATION.**

____

Signature of Contractor Representative

STATE OF ____________________

COUNTY OF___________________

Sworn to and subscribed before me this __________ day of ________________________, 20___

by ____. ☐ Personally known OR ☐ Produced the following identification

____

[Type of identification]

____
Notary Public Signature

My commission expires_______________________

____
[Print, type or stamp Commissioned name of Notary Public]

Signatory Requirement - In the case of a business entity other than a partnership or a corporation, this affidavit shall be executed by an authorized agent of the entity. In the case of a partnership, this affidavit shall be executed by the general partner(s). In the case of a corporation, this affidavit shall be executed by the corporate president.

FORM 4 - CONFLICT OF INTEREST DISCLOSURE FORM

The award of an agreement resulting from this RFQ is subject to the provisions of Manatee County Code of Laws. Proposer must disclose within its Proposal: the name of any officer, director, or agent who is also an employee of Manatee County. Furthermore, Proposer must disclose the name of any County employee who owns, directly or indirectly, an interest of more than five percent (5%) in the Proposer's firm or any of its branches, divisions, or affiliates.

By signing below, Proposer confirms that it is not currently engaged or will not become engaged in any obligations, undertakings or contracts that will require the firm to maintain an adversarial role against the County or that will impair or influence the advice or recommendations it provides to the County.

Please check one of the following statements and attach additional documentation if necessary:

__________ To the best of my knowledge, the undersigned firm has no potential conflict of interest for this RFQ.

__________ The undersigned firm, by execution of this form, submits information which may be a potential conflict of interest for this RFQ.

Acknowledged and attested to by:

____
Firm Name

____
Signature

____
Name and Title (Print or Type)

____
Date

Return this fully executed form with your Proposal.

FORM 5 - NON-COLLUSION AFFIDAVIT

STATE OF ______________

COUNTY OF ____________

Before me, the undersigned authority, personally appeared _____________________________, who, after being by me first duly sworn, deposes and says of his/her personal knowledge that:

a. He/She is ___________________________ of _______________________________, the Proposer that has submitted a Proposal to perform work for the following:

RFQ No.: ______________________ Title: ________________________________

b. He/She is fully informed respecting the preparation and contents of the attached Request for Qualifications, and of all pertinent circumstances respecting such Solicitation.

Such Proposal is genuine and is not a collusive or sham Proposal.

c. Neither the said Proposer nor any of its officers, partners, owners, agents, representatives, employees, or parties in interest, including this affiant, has in any way colluded, conspired, connived, or agreed, directly or indirectly, with any other Proposer, firm, or person to submit a collusive or sham Proposal in connection with the Solicitation and contract for which the attached Proposal has been submitted or to refrain from proposing in connection with such Solicitation and contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Proposer, firm, or person to fix the price or prices in the attached Proposal or any other Proposer, or to fix any overhead, profit, or cost element of the Proposal price or the Proposal price of any other Proposer, or to secure through any collusion, conspiracy, connivance, or unlawful agreement any advantage against the City or any person interested in the proposed contract.

d. The price or prices to be submitted shall be fair and proper and shall not be tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the Proposer or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

Signature: ____

Subscribed and sworn to (or affirmed) before me this _______ day of ______________________ 20__, by _______________________________, who is personally known to me OR has produced ____ as identification.

Notary Signature______________________________
Notary Name: ________________________________
Notary Public (State): ___________________________

My Commission No: ___________________________
Expires on: __________________________________
SEAL

FORM 6 - TRUTH – IN – NEGOTIATION CERTIFICATE

The undersigned warrants (i) that it has not employed or retained any company or person, other than bona fide employees working solely for the undersigned, to solicit or secure the Agreement and (ii) that it has not paid or agreed to pay any person, company, corporation, individual, or firm other than its bona fide employees working solely for the undersigned or agreed to pay any fee, commission, percentage, gift, or any other consideration contingent upon or resulting from the award or making of the Agreement.

The undersigned certifies that the wage rates and other factual unit costs used to determine the compensation provided for in the Agreement are accurate, complete, and current as of the date of the Agreement.

(This document must be executed by an authorized official of Proposer (e.g., President, CEO, Partner, Managing Partner)

Name: ___________________________________

Title:____________________________________

Date:____________________________________

Signature:________________________________

FORM 7 – SCRUTINIZED COMPANY CERTIFICATION

This certification is required pursuant to Florida State Statute Section 287.135 and must be executed and returned with Proposer's Proposal.

As of July 1, 2011, a company that, at the time of bidding or submitting a Proposal for a new contract or renewal of an existing contract, is on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List is ineligible for, and may not bid on, submit a Proposal for, or enter into or renew a contract with an agency or local governmental entity for goods or services of $1 million or more.

Companies must complete and return this form with its response.

Company: ______________________________

FEIN: ______________________________

Address. ______________________________

City/State/Zip. ______________________________

I, ______________________________, as a representative of ______________________________ ______ certify and affirm that this entity is not on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List.

______________________________	______________________________
Signature	Title
______________________________	______________________________
Printed Name	Date

FORM 8, INSURANCE REQUIREMENTS

The Successful Proposer will not commence work under the resulting Agreement until all insurance coverages indicated by an “X” herein have been obtained. The Successful Proposer shall obtain and submit to the Procurement Division within ten (10) calendar days from the date of notice of intent to award, at its expense, the following minimum amounts of insurance (inclusive of any amounts provided by an umbrella or excess policy): Work under this Agreement cannot commence until all insurance coverages indicated herein have been obtained on a standard ACORD form (inclusive of any amounts provided by an umbrella or excess policy):

☒ **Automobile Liability Insurance Required Limits**
Coverage must be afforded under a per occurrence policy form including coverage for all owned, hired and non-owned vehicles for bodily injury and property damage of not less than:

- $1,000,000 Combined Single Limit; OR
- $500,000 Bodily Injury and $500,000 Property Damage
- $10,000 Personal Injury Protection (No Fault)
- $500,000 Hired, Non-Owned Liability
- $10,000 Medical Payments

This policy shall contain severability of interests’ provisions.

☒ **Commercial General Liability Insurance Required Limits (per Occurrence form only; claims-made form is not acceptable)**
Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name ‘Manatee County, a political subdivision of the State of Florida’ as an Additional Insured, and include limits not less than:

- $1,000,000 Single Limit Per Occurrence
- $2,000,000 Aggregate
- $1,000,000 Products/Completed Operations Aggregate
- $1,000,000 Personal and Advertising Injury Liability
- $50,000 Fire Damage Liability
- $10,000 Medical Expense, and
- $1,000,000, Third Party Property Damage
- $ Project Specific Aggregate (Required on projects valued at over $10,000,000)

This policy shall contain severability of interests’ provisions.

☒ **Employer’s Liability Insurance**
Coverage limits of not less than:

- $100,000 Each Accident
- $500,000 Disease Each Employee
- $500,000 Disease Policy Limit

☒ Worker's Compensation Insurance
☐ **US Longshoremen & Harbor Workers Act**
☐ **Jones Act Coverage**

Coverage limits of not less than:

- Statutory workers' compensation coverage shall apply for all employees in compliance with the laws and statutes of the State of Florida and the federal government.
- If any operations are to be undertaken on or about navigable waters, coverage must be included for the US Longshoremen & Harbor Workers Act and Jones Act.

Should 'leased employees' be retained for any part of the project or service, the employee leasing agency shall provide evidence of Workers' Compensation coverage and Employer's Liability coverage for all personnel on the worksite and in compliance with the above Workers' Compensation requirements. NOTE: Workers' Compensation coverage is a firm requirement. Elective exemptions are considered on a case-by-case basis and are approved in a very limited number of instances.

☐ **Aircraft Liability Insurance Required Limits**
Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- $ Each Occurrence Property and Bodily Injury with no less than $100,000 per passenger each occurrence or a 'smooth' limit.
- $ General Aggregate.

☐ **Un-Manned Aircraft Liability Insurance (Drone)**
Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- $ Each Occurrence Property and Bodily Injury; Coverage shall specifically include operation of Unmanned Aircraft Systems (UAS), including liability and property damage.
- $ General Aggregate

☐ **Installation Floater Insurance**
When the contract or agreement **does not** include construction of, or additions to, above ground building or structures, but does involve the installation of machinery or equipment, Installation Floater Insurance shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- 100% of the completed value of such addition(s), building(s), or structure(s)

☒ **Professional Liability and/or Errors and Omissions (E&O) Liability Insurances**
Coverage shall be afforded under either an occurrence policy form or a claims-made policy form. If the coverage form is on a claims-made basis, then coverage must be maintained for a minimum of three years from termination of date of the contract. Limits must not be less than:

- $ 1,000,000 Bodily Injury and Property Damage Each Occurrence
- $ 2,000,000 General Aggregate

☐ **Builder's Risk Insurance**
When the contract or agreement includes the construction of roadways and/or the addition of a permanent structure or building, including the installation of machinery and/or equipment, Builder's Risk Insurance shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- An amount equal to 100% of the completed value of the project, or the value of the equipment to be installed
- The policy shall not carry a self-insured retention/deductible greater than $10,000

Coverage shall be for all risks and include, but not be limited to, storage and transport of materials, equipment, supplies of any kind whatsoever to be used on or incidental to the project, theft coverage, and Waiver of Occupancy Clause Endorsement, where applicable.

☐ **Cyber Liability Insurance**
Coverage shall comply with Florida Statute 501.171, shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County, a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- $ Security Breach Liability
- $ Security Breach Expense Each Occurrence
- $ Security Breach Expense Aggregate
- $ Replacement or Restoration of Electronic Data
- $ Extortion Threats
- $ Business Income and Extra Expense
- $ Public Relations Expense

NOTE: Policy must not carry a self-insured retention/deductible greater than $25,000.

☐ **Hazardous Materials Insurance (As Noted Below)**
Hazardous materials include all materials and substances that are currently designated or defined as hazardous by the law or rules of regulation by the State of Florida or federal government. All coverage shall be afforded under either an occurrence policy form or a claims-made policy form, and the policy shall be endorsed and name 'Manatee County, a political subdivision of the State of Florida' as an Additional Insured. If the coverage form is on a claims-made basis, then coverage must be maintained for a minimum of three years from termination of date of the contract. Limits must not be less than:

☐ ***Pollution Liability***
Amount equal to the value of the contract, subject to a $1,000,000 minimum, for Bodily Injury and Property Damage to include sudden and gradual release, each claim and aggregate.

☐ ***Asbestos Liability (If handling within scope of Contract)***
Amount equal to the value of the contract, subject to a $1,000,000 minimum, for Bodily Injury and Property Damage to include sudden and gradual release, each claim and aggregate.

☐ ***Disposal***
When applicable, Successful Proposer shall designate the disposal site and furnish a Certificate of Insurance from the disposal facility for Environmental Impairment Liability Insurance covering liability.

- Amount equal to the value of the contract, subject to a $1,000,000 minimum, for Liability for Sudden and Accidental Occurrences, each claim and an aggregate.
- Amount equal to the value of the contract, subject to a $1,000,000 minimum, for Liability for Non-Sudden and Accidental Occurrences, each claim and an aggregate.

☐ **Hazardous Waste Transportation Insurance**
Successful Proposer shall designate the hauler and have the hauler furnish a Certificate of Insurance for Automobile Liability insurance with Endorsement MCS-90 for liability arising out of the transportation of hazardous materials. EPA identification number shall be provided.

All coverage shall be afforded under either an occurrence policy form or a claims-made policy form and the policy shall be endorsed and name “Manatee County, a political subdivision of the State of Florida” as an Additional Insured. If the coverage form is on a claims-made basis, then coverage must be maintained for a minimum of three years from termination of date of the contract. Limits must not be less than:

- Amount equal to the value of the contract, subject to a $1,000,000 minimum, per accident.

☐ **Liquor Liability Insurance**
Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name “Manatee County, a political subdivision of the State of Florida” as an Additional Insured, and include limits not less than:

- $1,000,000 Each Occurrence and Aggregate

☐ **Garage Keeper’s Liability Insurance**
Coverage shall be required if the maintenance, servicing, cleaning or repairing of any County motor vehicles is inherent or implied within the provision of the contract.

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name “Manatee County, a political subdivision of the State of Florida” as an Additional Insured, and include limits not less than:

- Property and asset coverage in the full replacement value of the lot or garage.

☐ **Bailee’s Customer Liability Insurance**
Coverage shall be required for damage and/or destruction when County property is temporarily under the care or custody of a person or organization, including property that is on, or in transit to and from the person or organization’s premises. Perils covered should include fire, lightning, theft, burglary, robbery, explosion, collision, flood, earthquake and damage or destruction during transportation by a carrier.

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name “Manatee County, a political subdivision of the State of Florida” as an Additional Insured, and include limits not less than:

- Property and asset coverage in the full replacement value of the County asset(s) in the Successful Proposer’S care, custody and control.

☐ **Hull and Watercraft Liability Insurance**
Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name “Manatee County, a political subdivision of the State of Florida” as an Additional Insured, and include limits not less than:

- $ Each Occurrence
- $ General Aggregate
- $ Fire Damage Liability
- $10,000 Medical Expense, and
- $ Third Party Property Damage
- $ Project Specific Aggregate (Required on projects valued at over $10,000,000)

☐ **Other [Specify]**

BOND REQUIREMENTS
☐ **Bid Bond**
A Bid Bond in the amount of 5% of the total offer. Bid bond shall be submitted with the sealed response and shall include project name, location, and / or address and project number. In lieu of the bond, the bidder may file an alternative form of security in the amount of 5% of the total offer. in the form of a money order, a certified check, a cashier’s check, or an irrevocable letter of credit issued to Manatee County. NOTE: A construction project over $200,000 requires a Bid Bond in the amount of 5% of the total bid offer.

☒ **Payment and Performance Bond**
A Payment and Performance Bond shall be submitted by Successful Bidder for 100% of the award amount and shall be presented to Manatee County within ten (10) calendar days of issuance of the notice of intent to award. NOTE: A construction project over $200,000 requires a Payment and Performance Bond.

INSURANCE REQUIREMENTS

I. THE POLICIES ARE TO CONTAIN, OR BE ENDORSED TO CONTAIN, THE FOLLOWING PROVISIONS:

Commercial General Liability and Automobile Liability Coverages

a. **"Manatee County, a Political Subdivision of the State of Florida," is to be named as an Additional Insured in respect to:** Liability arising out of activities performed by or on behalf of the Successful Proposer, his agents, representatives, and employees; products and completed operations of the Successful Proposer; or automobiles owned, leased, hired or borrowed by the Successful Proposer. The coverage shall contain no special limitation(s) on the scope of protection afforded to the COUNTY, its officials, employees or volunteers.
In addition to furnishing a Certificate of Insurance, the Successful Proposer shall provide the endorsement that evidences Manatee COUNTY being listed as an Additional Insured. This can be done in one of two ways: (1) an endorsement can be issued that specifically lists "Manatee County, a Political Subdivision of the State of Florida," as Additional Insured; or, (2) an endorsement can be issued that states that all Certificate Holders are Additional Insured with respect to the policy.
b. The Successful Proposer'S insurance coverage shall be primary insurance with respect to the COUNTY, its officials, employees and volunteers. Any insurance or self-insurance maintained by the COUNTY, its officials, employees or volunteers shall be excess of Successful Proposer's insurance and shall be non-contributory.
c. The insurance policies must be on an occurrence form.

Workers' Compensation and Employers' Liability Coverages
The insurer shall agree to waive all rights of subrogation against the COUNTY, its officials, employees and volunteers for losses arising from work performed by the Successful Proposer for the COUNTY.

II. General Insurance Provisions Applicable to All Policies

1. Prior to the execution of contract, or issuance of a Purchase Order, and then annually upon the anniversary date(s) of the insurance policy's renewal date(s) for as long as this contract remains in effect, Successful Proposer shall furnish the COUNTY with a Certificate(s) of Insurance (using an industry accepted certificate form, signed by the Issuer, with applicable endorsements, and containing the solicitation or contract number, and title or description) evidencing the coverage set forth above and naming "Manatee County, a Political Subdivision of the State of Florida" as an Additional Insured on the applicable coverage(s) set forth above.

2. If the policy contains an aggregate limit, confirmation is needed in writing (letter, email, etc.) that the aggregate limit has not been eroded to procurement representative when supplying Certificate of Insurance. In addition, when requested in writing from the COUNTY, Successful Proposer will provide the COUNTY with a certified copy of all applicable policies. The address where such certificates and certified policies shall be sent or delivered is as follows:

Manatee County, a Political Subdivision of the State of Florida
Attn: Risk Management Division
1112 Manatee Avenue West, Suite 969
Bradenton, FL 34205

3. The project's solicitation number and title shall be listed on each certificate.
4. Successful Proposer shall provide thirty (30) days written notice to the Risk Manager of any cancellation, non-renewal, termination, material change, or reduction in coverage of any insurance policies to procurement representative including solicitation number and title with all notices.
5. Successful Proposer agrees that should at any time Successful Proposer fail to meet or maintain the required insurance coverage(s) as set forth herein, the COUNTY may terminate this contract.
6. The Successful Proposer waives all subrogation rights against COUNTY, a Political Subdivision of the State of Florida, for all losses or damages which occur during the contract and for any events occurring during the contract period, whether the suit is brought during the contract period or not.
7. The Successful Proposer has sole responsibility for all insurance premiums and policy deductibles.
8. It is the Successful Proposer'S responsibility to ensure that his agents, representatives and subcontractors comply with the insurance requirements set forth herein. Successful Proposer shall include his agents, representatives, and subcontractors working on the project or at the worksite as insured under its policies, or Successful Proposer shall furnish separate certificates and endorsements for each agent, representative, and subcontractor working on the project or at the worksite. All coverages for agents, representatives, and subcontractors shall be subject to all of the requirements set forth to the procurement representative.
9. All required insurance policies must be written with a carrier having a minimum A.M. Best rating of A- FSC VII or better. In addition, the COUNTY has the right to review the Successful Proposer's deductible or self-insured retention and to require that it be reduced or eliminated.
10. Successful Proposer understands and agrees that the stipulated limits of coverage listed herein in this insurance section shall not be construed as a limitation of any potential liability to the COUNTY, or to others, and the COUNTY'S failure to request evidence of this insurance coverage shall not be construed as a waiver of Successful Proposer'S obligation to provide and maintain the insurance coverage specified.
11. Successful Proposer understands and agrees that the COUNTY does not waive its immunity and nothing herein shall be interpreted as a waiver of the COUNTY'S

rights, including the limitation of waiver of immunity, as set forth in Florida Statutes 768.28, or any other statutes, and the COUNTY expressly reserves these rights to the full extent allowed by law.

12. No award shall be made until the Procurement Division has received the Certificate of Insurance in accordance with this section.

BONDING REQUIREMENTS

Bid Bond/Certified Check. By submitting a proposal, the Successful Proposer agrees should its proposal be accepted, **to execute the form of Agreement and present the same to COUNTY for approval within ten (10) calendar days after notice of intent to award**. The Successful Proposer further agrees that failure to execute and deliver said form of Agreement **within ten (10) calendar days** will result in damages to COUNTY and as guarantee of payment of same a bid bond/certified check shall be enclosed within the submitted sealed proposal in the amount of five (5%) percent of the total amount of the proposal. The Successful Proposer further agrees that in case the Successful Proposer fails to enter into an Agreement, as prescribed by COUNTY, the bid bond/certified check accompanying the proposal shall be forfeited to COUNTY as agreed liquidated damages. If COUNTY enters into an agreement with a Successful Proposer, or if COUNTY rejects any and/or all proposals, accompanying bond will be promptly returned.

Payment and Performance Bonds. Prior to commencing work, the Successful Proposer shall obtain, for the benefit of and directed to COUNTY, a Payment and Performance Bond satisfying the requirements of Florida Statutes § 255.05, covering the faithful performance by the Successful Proposer of its obligation under the Contract Documents, including but not limited to the construction of the project on the project site and the payment and obligations arising thereunder, including all payments to Subcontractors, laborers, and materialmen. The surety selected by the Successful Proposer to provide the Payment and Performance Bond shall be approved by COUNTY prior to issuance of such Bond, which approval shall not be unreasonably withheld or delayed provided that surety is rated A- or better by Best's Key Guide, latest edition.

Failure to provide the required bonds on the prescribed form may result in Successful Proposer being deemed nonresponsive. Bonds must be in the form prescribed in Florida Statutes § 255.05, and must not contain notice, demand or other terms and conditions, including informal pre-claim meetings, not provided for in Florida Statutes § 255.05.

Bonds shall be in an amount equal to 100% of the contract price issued by a duly authorized and nationally recognized surety company, authorized to do business in the State of Florida, satisfactory to COUNTY. Surety shall be rated as "A-" or better by Best's Key Guide, latest edition. The attorney-in-fact who signs the bonds must file with the bonds, a certificate and effective dated copy of power-of-attorney. Payment and Performance Bonds shall be issued to "Manatee County, a political subdivision of the State of Florida", **within ten (10) calendar days after issuance of notice of intent to award**.

In addition, pursuant to Florida Statutes § 255.05(1)(b), Florida Statutes, prior to commencing work, the Successful Proposer shall be responsible and bear all costs associated to record the Payment and Performance Bond with the Manatee County Clerk of the Circuit Court. A certified copy of said recording shall be furnished to the Procurement Division upon filing. Pursuant to Florida Statutes § 255.05(1)(b), Florida Statutes, COUNTY will make no payment to the Successful Proposer until the Successful Proposer has complied with this paragraph.

Furnishing Payment and Performance Bonds shall be requisite to execution of an Agreement with COUNTY. Said Payment and Performance Bonds will remain in force for the duration of this Agreement with the premiums paid by the Successful Proposer. Failure of the Successful Proposer to execute such Agreement and to supply the required bonds shall be just cause for cancellation of the award. COUNTY may then contract with the next lowest, responsive and responsible Successful Proposer or re-advertise this RFP.

Failure of COUNTY at any time to require performance by the Successful Proposer of any provisions set out in the resulting Agreement will in no way affect the right of COUNTY, thereafter, to enforce those provisions.

FORM 8, INSURANCE STATEMENT
RFQ NO. 24-TA005095SAM

THE UNDERSIGNED has read and understands the insurance requirements applicable to any Agreement resulting from this solicitation and shall provide the insurances required in this RFQ within ten (10) days from the date of Notice of Intent to Award.

Proposer Name: ________________________________ Date: ____________________

Signature (Authorized Official): ____

Printed Name/Title: ____

Insurance Agency: ____

Agent Name: _________________________ Agent Phone: ____________________

Return this signed statement with your proposal.

FORM 9, INDEMNITY AND HOLD HARMLESS

MANATEE COUNTY, A POLITICAL SUBDIVISION OF THE STATE OF FLORIDA

The Successful Proposer shall indemnify and hold harmless County, its officers, and employees from liabilities, damages, losses, and costs, including but not limited to reasonable attorney's fees, to the extent caused by the negligence, recklessness, or intentionally wrongful conduct of the Successful Proposer, its personnel, design professionals and other persons employed or utilized by the Successful Proposer in the performance of the Agreement, including without limitation, defects in design, or errors or omissions that result in material cost increases to County. Such indemnification shall include the payment of all valid claims, losses, and judgments of any nature whatsoever in connection therewith and the payment of all related fees and costs. County reserves the right to defend itself with its own counsel or retained counsel at Successful Proposer's expense.

Signature of Authorized Official of Proposer: ____

Title: Date: ____

Project Number and /or Name:____

Insurance Agent: ____

Acknowledgement:

STATE OF __________________________

COUNTY OF ________________________

The foregoing instrument was acknowledged before me this _____ day of _________________, 20____ by ____ [FULL LEGAL NAME], who is

☐ Personally known to me
OR
☐ has produced ______________________ as identification.

Notary Signature _____________________________
Print Name __________________________________
Seal

SECTION E, EXHIBITS

Exhibit 1, Scope of Services
Exhibit 2, Proposal Response
Exhibit 3, Conceptual Engineering Report
Exhibit 4, Master Plan Update
Exhibit 5, Capital Improvement Plan Sheets
Exhibit 6, Sample Agreement

EXHIBIT 1, SCOPE OF SERVICES
RFQ NUMBER 24-TA005095SAM

1.01 BACKGROUND

Manatee County, a political subdivision of the State of Florida is seeking proposals from qualified engineering firms (hereinafter in this Scope referred to as Consultant) to provide Professional Engineering Services and other professional services for the expansion of the Southwest Water Reclamation Facility (SWWRF).

The Southwest Water Reclamation Facility is located at 5101 65th Street West in Bradenton, Florida.

Over the last few years, there has been a rise in influent flows and loadings, bring the SWWRF close to its Average Annual Daily Flow (AADF) capacity. The forthcoming expansion aims to enhance the facility's capacity to 18 million gallons per day (MGD), addressing the growing demands and ensuring necessary improvements.

1.02 PROJECT DESCRIPTION

The County will be expanding the treatment capacity of the Southwest Wastewater Reclamation Facility (SWWRF) from 15 to 18 million gallons per day (MGD) as measured on an annual average day flow (AADF) basis. The existing process which utilizes the Modified Lutzack-Ettinger (MLE) process will remain with the added capacity coming through the addition of three (3) Aerobic Granular Sludge/AquaNereda (AGS) reactors and associated ancillary process equipment.

The project will also include modifications to Return Activated Sludge (RAS) and Waste Activated Sludge (WAS) systems for the existing MLE process to achieve design and performance consistency across the five (5) existing secondary clarifiers. There may also be other minor upgrades or modifications to the clarifiers. The effluent filtration system will be modified to relocate and upgrade the oldest existing cloth filter on the site and to convert one traveling bridge multimedia filter to a new cloth filter. This will result in a total of three cloth filters on site and the roof canopy system is to be installed over them. The work will also include demolition of several existing multimedia filters to create space for new chlorine and ammonia storage and feed facilities and the existing quarry and ammonia feed facilities are to be removed. A secondary plant drain station and associated piping will be built, the effluent pumping system will be upgraded and the confluence box for clarifiers 1 through 4 will be replaced. Associated ancillary and support subsystems such as but not limited to electrical feeds, emergency backup power generation and control systems may also be impacted.

1.03 SCOPE

The scope includes design by a Florida Licensed Engineer experienced in wastewater treatment plant design with the MLE process and Aerobic Granular Sludge/AquaNereda (AGS) reactors and associated ancillary process equipment. The county also has additional CIP projects that will need to be included as part of this project. Project 6071781 SWWRF Equalization System Rehabilitation & Cover Addition along with the

Projects SWWRF 2nd Drain Station and SWWRF Secondary Clarifier Confluence Box Replacement shall be incorporated into the design and scheduling of the expansion.

Wastewater treatment plant design shall include permitting with all appropriate state and local agencies.

Successful Proposer (hereinafter in this Scope referred to as Consultant) shall provide all labor, materials, equipment, supplies licensing, transportation and other components necessary to provide Professional Engineering Services and other professional services for the Project to include, but not be limited to, the following disciplines and sub-disciplines:

1. Electrical Engineering
2. Structural Engineering
3. Utility Engineering (including process engineering)
4. Geotechnical Engineering and Materials Testing, in sufficient detail to support the proposed design.
5. Land Surveying, Mapping and Subsurface Utility Engineering (SUE), in sufficient detail to identify conflict points and support the proposed design.
6. Controls and Instrumentation design.
7. Public Information
8. Traffic Engineering
9. Stormwater Management
10. Environmental and Ecological Services
11. Landscaping and Architectural Design Services
12. Mechanical Engineering
13. Civil Engineering

1.04 SERVICE REQUIREMENTS

The Consultant's services shall include, but not be limited to the following:

1. Civil Design and Specification (Includes Drainage Design)
2. Mechanical Engineering Design and Specification
3. Electrical Engineering Design and Specification (Includes Lighting Design)
4. Controls and Instrumentation Design and Specification
5. Utilities Design and Specification
6. Permitting (Meetings, Applications and Certifications)
7. Preliminary Site Investigations
8. Perform Field Reviews
9. Attend Project Meetings, Prepare Meeting Agendas and Meeting Minutes
10. Attend Design Review Meetings
11. Project Scheduling
12. Construction Phasing (Coordination with Existing Operations)
13. Maintenance of Traffic Requirements
14. Engineering Contract Administration and Management
15. Contract File (Setup and Maintenance)
16. Prepare Construction Cost Estimates

17. Topographic and Boundary Survey
18. Construction Services (CEI Services)
19. Quality assurance and control with the selected CMAR
20. Facility Startup and Final Testing
21. Coordination of design services with the county selected CMAR
22. Provide assistance with the CMAR selection process
23. Geotechnical Soil Exploration, Reports and Materials Testing Services
24. Operation & Maintenance Manuals
25. Value Engineering (Coordination with CMAR)
26. Inspection and review of warranty work one year after close out.
27. Prepare Record Drawings
28. Public Presentations (If needed)
29. All Other Services Necessary for Project Completion

1.05 DELIVERABLES

The provider shall prepare draft and final engineering design documents (plans and specifications) at the 30%, 60%, 90% and 100% design level for review and comment. A minimum of two (2) weeks for review of each plan submittal shall be included. All submittals shall be via Manatee County's eBuilder System. The proposed design will be subject to the review and approval of Manatee County

1. Project Management, Coordination, Field Review, Data Collection
    a. Project Schedule
    b. Survey CAD file in "DWG" format
    c. Permitting management within the ebuilder process
    d. Final CAD base files in "DWG" format
    e. Records of correspondence with permitting agencies and utilities
    f. Provide monthly progress reports for the duration of the project
    g. Attend bi-weekly project meetings and provide meeting minutes to the County
    h. Perform survey, and SUE as necessary of the project site within the project limits
    i. Conduct a field review of the project to take photos, note field conditions, and verify survey information within the project limits
    j. Obtain any existing site surveys, existing geotechnical reports, and any existing as-builts from the County to incorporate County and franchise utilities info and update the project documents
    k. A minimum of two (2) weeks for review of each plan submittal shall be included
    l. Detailed cost estimates shall be provided at each design level.
    m. Complete signed and sealed, ready to bid plans and specifications and contract documents must include a final schedule mating the final cost estimate.

2. Design and Permitting
    a. <u>Preliminary Design (30%)</u>
        i. One (1) 11"x17" set of plans, electronic format only through e-builder.

ii. One (1) electronic set of plans in “pdf” format.
iii. One (1) electronic copy of the 30% opinion of probable construction cost with bid quantities in “pdf” format.
iv. One (1) electronic copy of the Geotechnical Report in “pdf” format.
v. All electronic copies of the items listed above are to be submitted via the Design Review (DESR) process in e-Builder.

b. Intermediate Design (60%)
   i. Two (2) 11”x17” sets of plans in “pdf” format.
   ii. One (1) electronic set of plans in "pdf' format.
   iii. One (1) electronic set of technical specifications in "pdf' format.
   iv. One (1) electronic set of the Special Provisions in “pdf” format.
   v. One (1) electronic copy of the updated opinion of probable construction cost with bid quantities in “pdf” format.
   vi. Permit applications for the construction of the project to the authority having jurisdiction. All permitting fees and associated costs for obtaining required approvals are to be paid by the proposer and reimburse by Manatee County.
   vii. All electronic copies of the items listed above are to be submitted via the Design Review (DESR) process in e-Builder

c. Intermediate Design (90%)
   i. Two (2) 11”x17” sets of plans in “pdf” format.
   ii. One (1) electronic set of plans in "pdf” format.
   iii. One (1) electronic set of technical specifications in "pdf' format.
   iv. One (1) electronic set of the Special Provisions in “pdf” format.
   v. One (1) electronic copy of the updated opinion of probable construction cost with bid quantities in “pdf” format.
   vi. All electronic copies of the items listed above are to be submitted via the Design Review (DESR) process in e-Builder.

d. Final Design (100%)
   i. Two (2) sets of Signed and Sealed 11”x17” plans, Technical Specifications and Special Provisions.
   ii. One (1) electronic set of digitally signed and sealed plans, Technical Specifications and Special Provisions in “pdf” format.
   iii. One (1) copy of all base files in AutoCAD "dwg" format and text fonts used.
   iv. One (1) final bid schedule matching the final cost estimate with bid quantities in “pdf” format.
   v. One (1) copy of all permits in “pdf” format.
   vi. SWFWMD permit design calculations
   vii. One (1) electronic copy of the final Geotechnical Report in “pdf” format.
   viii. All electronic copies of the items listed above are to be submitted via the Design Review (DESR) process in e-Builder.

3. Construction Phase Services
   a. <u>Construction Phase</u>
      i. Attend pre-construction meetings, prepare and provide agenda and minutes of the meeting.
      ii. Attend monthly progress meetings during the construction phase.
      iii. Provide inspection services.
      iv. Notify permitting agencies of the start of construction, as necessary and in accordance with permit conditions.
      v. Review monthly pay applications submitted by the Contractor for completeness and make recommendations for payments.
      vi. Review and provide responses/approvals for submittals, RFIs, and shop drawings.
      vii. Provide recommendations of changes, as necessary, which may be required within the scope of the project during construction.
      viii. Conduct a limited number of site visits during construction to observe general construction activities and prepare a one-page narrative on the progress of the work.
      ix. Prepare the punch list items to be corrected or completed at the substantial and final completion stages of the work.
      x. Prepare Facility startup, operations and maintenance manuals.
      xi. Prepare and furnish a final set of reproducible record drawings from the construction contractor's as-built documents and submit to County and to permitting agency for final permit clearance. Record drawing deliverable to County will include:
         (1) One (1) transmittal letter
         (2) One (1) electronic set of record drawings in "pdf' format.
         (3) One (1) set of certified 11"x17" record drawings.
         (4) One (1) CD (or flash drive) with record drawing base files, including text fonts, in AutoCAD "dwg".

1.06 GENERAL DUTIES OF THE CONSULTANT

The relationship of the Consultant to the County will be that of a professional Consultant, and the Consultant will provide the professional and technical services required under the resulting Agreement in accordance with professional practices and ethical standards. No employer / employee relationships shall be deemed to be established and the Consultant, its agents, subcontractors, and employees shall be independent contractors at all times.

It shall be the responsibility of the Consultant to work with the County and apprise it of solutions to problems and the approach or technique to be used towards accomplishment of the County objectives as set forth in the Work Assignment, which will be made a part of this Agreement upon execution by both parties.

The Consultant shall be responsible for the professional quality, technical accuracy, timely completion, compliance with laws, regulations and rules, and the coordination with all appropriate agencies of all designs, drawings, specifications, reports and other Professional Services provided by the Consultant. If the County, in its sole discretion, determines there are errors, omissions or other deficiencies in the Consultant's designs, drawings, specifications, reports and other services, the Consultant shall, without additional compensation, correct or revise said errors or omissions to the satisfaction of the County.

The Consultant shall be familiar with Manatee County Standards, templates and processes.

The Consultant shall be required to use the Internet web-based project management tool, e-Builder Enterprise™ (e-Builder), and protocols included in that software during this project; and shall take any training courses required by the Owner, at no additional cost to the Owner. The use of this project management system does not replace or change any contractual responsibilities of the participants.

User registration, electronic and computer equipment, and Internet connections required for e-Builder are the responsibility of the Consultant. The sharing of user accounts is prohibited. Individuals who are granted log-in access to the County e-Builder platform shall be responsible for the proper use of their passwords and access to data as agents of the Consultant. For documents requiring original signature such as Contracts, Change Orders, Application and Certification for Payment, and Field Directives, paper documents may be required in addition to submittal via e-Builder.

User licenses for e-Builder Enterprise™ will be provided and paid for by the Owner based on assigned roles for the project including Project Manager, Project Fiscal, Project Superintendent, and others as may be required.

1.07 ANTICIPATED PROJECT DELIVERY APPROACH

The project delivery approach will be the Construction Manager at Risk (CMAR) method. At this time, the county is selecting the engineering design team and anticipates a following action to select the CMAR.

END EXHIBIT 1

EXHIBIT 2, PROPOSAL RESPONSE

This section identifies specific information which must be contained within the Proposal response and the order in which such information should be organized. The information each Proposer provides will be used to determine those Proposers with the background, experience and capacity to perform the scope of services as stated in this RFQ and which Proposer(s) best meets the overall needs of the County. For more information on the evaluation process, refer to Section B, Evaluation of Responses.

2.01 INFORMATION TO BE SUBMITTED

The contents of each Response will be organized and arranged with tabs in the same order as listed below and with the same TAB name & numbers. The Response should contain sufficient detail to permit the County to conduct a meaningful evaluation. However, overly elaborate responses are not requested or desired. **NOTE: Tabs 6, 7, 8 & 9 are limited to 30 Single-Sided pages.**

2.02 RESPONSE FORMAT

TAB 1 - INTRODUCTION

Include the following in Tab 1 of the Response.

1. A cover page that identifies Proposer, the RFQ by title and the RFQ number.
2. An introductory letter/statement that describe your Response in summary form.
3. A table of contents.

TAB 2 – MINIMUM QUALIFICATION REQUIREMENTS

In Tab 2 submit the information and documentation requested that confirms Proposers meets the following minimum qualification requirement(s):

1. Must be registered with the State of Florida, Division of Corporations to do business in Florida.

   No documentation is required. The County will verify registration.

2. Proposer and/or its subcontractor(s) must possess current, valid licenses and certifications required under Florida Statute to perform professional engineering services.

   Submit information and documentation from the issuing agency that confirms Proposer and/or its subcontractor(s) meet the following:

   a. Certified under Section 471.023, Florida Statutes, to practice or to offer to practice engineering; or

b. **Certified under Section 481.219, Florida Statutes, to practice or to offer to practice architecture.**

3. Provide a minimum of three (3) client references that Proposer or its subcontractor has completed (which means that certificate of occupancy has been issued) a minimum of three (3) wastewater treatment plant capacity improvements since January 1, 2010.

   a. **Identify who was contracted to complete the project (Proposer or subcontractor)**
   b. **Project name and location**
   c. **Client/Organization name**
   d. **Contact name**
   e. **Contact phone**
   f. **Contact email**
   g. **Project dates (Start/End)**

4. Proposer is not on the Florida Suspended or Debarred Vendor List

   No documentation is required. The County will verify.

5. Proposer is not on the Federal Convicted Vendor or Excluded Parties list (SAM/EPLS)

   No documentation is required. The County will verify.

6. If Proposer is submitting as a joint venture, it must have file the required documents with the Florida Department of Business and Professional Regulation as required by Florida Statute Section 489.119, prior to the Due Date and Time.

   If Proposer is a joint venture, provide a copy of Proposer's approved filing with the Florida Department of Business and Professional Regulation.

7. Proposer has no reported conflict of interests in relation to this RFQ.

   If no conflicts of interests are present, Bidder must submit a fully completed copy of Form 4.

   If there is a potential conflict of interest, on a separate page submit a statement to that affect and disclose the name of any officer, director or agent who is an employee of the County. Disclose the name of any County employee who owns, directly or indirectly, any interest in Bidder's firm or any of its branches.

TAB 3 – FORMS

Provide the completed and executed Forms listed below in Tab 3.

Form 1, Acknowledgement of Addenda
Form 2, Response Signature Form
Form 3, Public Contracting and Environmental Crimes Certification
Form 4, Conflict of Interest Disclosure
Form 5, Non-Collusion Affidavit
Form 6, Truth in Negotiation Certification
Form 7, Scrutinized Company Certification
Form 8, Insurance Statement
Form 9, Indemnity and Hold Harmless

TAB 4 - TRADE SECRETS

Pursuant to Section A.28, Trade Secrets, in Tab 4 identify any trade secret being claimed. Proposer must submit purported trade secret as follows:

1. Trade secret material must be segregated, within the applicable TAB, from the portions of the Response that are not being declared as trade secret. NOTE: Responses cannot be designated as ‘Proprietary’ or ‘Confidential’ in their entirety.

2. Proposer shall cite, for each trade secret being claimed, the Florida Statute number which supports the designation.

3. Proposer shall offer a brief written explanation as to why information claimed as trade secret fits the cited Statute.

4. Proposer shall provide an additional electronic copy of its Response that redacts all designated trade secrets.

TAB 5 - PROPOSER STATEMENT OF ORGANIZATION

In Tab 5, provide information and documentation on Proposer as follows:

1. Legal contracting name including any dba.
2. State of organization or incorporation.
3. Ownership structure of Proposer’s company.
   (e.g., Sole Proprietorship, Partnership, Limited Liability Corporation, Corporation)
4. Federal Identification Number.
5. A fully completed (signed and dated) copy of Proposer’s W-9.
6. Contact information for Proposer’s corporate headquarters and local office (if different) NOTE: local is defined as Manatee, DeSoto, Hardee, Hillsborough, Pinellas or Sarasota counties.
   a. Address
   b. County, State, Zip
   c. Phone
   d. Number of years at this location
7. List of officers, owners and/or partners, or managers of the firm. Include names, addresses, email addresses, and phone numbers.
8. Provide supporting documentation from the certifying agent indicating Proposer is a certified Minority-owned Business Enterprise, if applicable.
9. Contact information for Proposer’s primary and secondary representatives during this RFQ process to include the following information:
   a. Name
   b. Phone
   c. E-mail
   d. Mailing Address
   e. County, State, Zip
10. Provide a brief summary regarding any prior or pending litigation, either civil or criminal, involving a governmental agency or which may affect the performance of the services to be rendered herein, in which the Proposer, any of its partners, employees or subcontractors is or has been involved within the last three years.
11. Provide details of any ownership changes to Proposer’s organization in the past three years or changes anticipated within six months of the Due Date and Time (e.g., mergers, acquisitions, changes in executive leadership).

TAB 6 – RESPONDENT AND TEAM'S EXPERIENCE (MAXIMUM POINTS 25)

In Tab 6, provide details of Proposer and its team's experience to include the following:

1. Provide a summary of Proposer's background, size and years in business.
2. Describe Proposer's experience in professional engineering services for other government agencies, particularly those within Florida.
3. Provide Proposer's years of experience in the design of wastewater treatment plant capacity improvements.
4. Identify and include information regarding experience and qualifications of Proposer's key staff to be assigned to the services. Include a resume for each with the name of the firm(s) for their current and previous employers, their full names, professional credentials (e.g., certifications and/or licenses), and roles and duties which the individuals will provide to the County, that are relevant to the project. Include the address of their current primary office location, email address and phone number.
5. Identify any proposed sub-consultants to accomplish the work. Include the company name, the name of the individual(s) to be assigned, and an overview of their experience and qualifications applicable to their role in the project design.
6. Describe any significant or unique accomplishments, recognition, or awards received by Proposer, its key personnel, or its subcontractors for previous similar services.
7. Provide a minimum of three (3) client references that Proposer or its subconsultant has completed three (3) wastewater treatment plant expansion projects with an aggregate value in excess of 50 million dollars since January 1, 2010 with preference given to firms which have completed at least one wastewater treatment plant expansion project in excess of 120 million dollars in the same timeframe. Provide the following information for each qualifying project.
   a. Client name
   b. Client address
   c. Client contact name
   d. Client contact phone and fax numbers
   e. Client contact email address
   f. Brief description of work (1-2 sentences)
   g. Performance period (start/end dates)
   h. Total dollar value of contract
8. Please list your experience with Construction Manager at Risk (CMAR) contractors for similar type of projects. Include lessons learned both favorable and unfavorable. Describe how your firm and the CMAR worked together to sequence GMP's for early procurement packages.

(Remainder of this page intentionally left blank)

TAB 7 – APPROACH TO ENGINEERING SERVICES (MAXIMUM POINTS 20)

In Tab 7, provide Proposer's project approach to include the following:

1. A narrative of the project approach and an explanation of how this approach meets County objectives and requirements as specified in this RFQ.
2. An explanation of Proposer's technical ability to perform all facets of the scope of services defined in Exhibit 1. If more than one Proposer is jointly filing a Response, details must be provided to clearly demonstrate individual roles and responsibility for all components of the project.
3. Details of implementation plan and schedule. Provide an implementation schedule for each component of services (e.g., design, demolition, construction). Please include a discussion of how the implementation plan will be incorporated while maintaining plant operations.
4. Provide a narrative of the methodology for engaging with County representatives in-the-course of performing the duties.
5. Proposer shall thoroughly explain:
    a. Its accessibility in the areas of availability for meetings, general communications, coordination, and supervision.
    b. How Proposer physically plans on attending pre-scheduled meetings.
    c. How Proposer plans on ensuring accessibility and availability during the term of the Agreement.
6. Proposers are encouraged to propose the use of as many environmentally preferable, sustainable, 'green' products, materials and supplies to promote a safe and healthy environment. Submit a summary of Proposer's environmental sustainability initiatives and any products, materials or supplies that are proposed for the County's work that have documented evidence of reducing adverse effects on the environment.
7. Provide a statement on company letterhead and signed by an authorized official of Proposer attesting to its commitment to meet the County's time and budget requirements for all assigned work.
8. Proposer shall include their approach to value engineering and any innovative or unique solutions that were used on previous projects.
9. Proposer should include their quality control plan and approach to implementation throughout the duration of the project.
10. Submit any additional information not previously requested which Proposer believes would assist County in the evaluation of Proposer's approach to provide the required services.

TAB 8 - ORGANIZATIONAL STRUCTURE AND CAPACITY (MAXIMUM POINTS 20)

1. Submit details of Proposer's staffing resources, at the location that will provide services to the County as well as corporately; by discipline and the number of personnel within each discipline.
2. Detail the location of the managing office and what plans will be adopted to ensure County citizens receive consideration for employment; and suppliers located within the County will be used for the acquisition of goods and services needed to perform the scope of services.
3. If Proposer's staffing resources includes sub-consultants, submit the name of the firm(s) who will perform each discipline. If more than one firm is listed for a discipline, then label which firm is the primary firm for that discipline. Firms may perform more than one discipline.
4. Submit an organizational diagram clearly identifying key personnel as well as other staffing resources who are designated to provide services to the County. For each individual in the organization diagram, include each individual's name, title, firm and indicate their functional relationship to each other.
5. If Proposer is teaming with other entities to provide the required goods and services, detail any prior similar work any two or more team members have jointly performed.
6. If a joint venture is proposed, provide an affidavit attesting to the formulation of the joint venture and provide proof of incorporation as a joint venture or a copy of the formal joint venture agreement between all joint venture parties, indicating their respective roles, responsibilities, and levels of participation in the project.
7. An explanation, in general terms, of Proposers' financial capacity to perform the scope of services. If Proposer is jointly filing a Response with other entities, details must be provided to demonstrate financial capacity of each entity.
8. Provide a statement on company letterhead and signed by a company official authorizing a County auditor and/or financial analysts access to your financial records, including all records prepared by an independent firm, or the financial records of other entities for which you have ownership interest. Such access will occur at the primary location of the Proposer, or such other location as may be agreed, for the purposes of verifying financial representations, and/or to review and assess the historical and current financial capacity of Proposer's business entity and its expected ability to meet ongoing financial obligations related to the required services, if awarded a contract. If an audit is conducted, the County's audit and/or financial analysts will report their findings in a summary report to the Purchasing Official, which will be placed in the Response files for subsequent use, review, and discussions during evaluations.
9. Disclose any ownership interest in other entities proposed for services. This ownership disclosure includes ownership by the Proposer through a parent, subsidiary or holding company or any other form of business entity. Submit entity names and the percent of ownership for each.
10. Detail Proposer and any subcontractor's current workloads and any projected changes to the workload within the next six months.
11. Provide a list of engineering projects that have been awarded to the Proposer by Manatee County in the past two years. Include the following information for each:

a. Name of the project.
b. Date of award.
c. Dollar value of the design work.

12. Provide details of Proposer's capacity to bond the project. Include a letter of intent form Proposer's bonding company which confirms Proposer's bonding capacity.
13. Submit any additional information not previously requested which Proposer believes would assist County in the evaluation of Proposer's capacity to provide the required services.

(Remainder of this page intentionally left blank)

TAB 9 - SIMILAR COMPLETED PROJECTS (MAXIMUM POINTS 35)

Provide a list of up to 3 wastewater capacity improvement projects designed by the proposer with an aggregate value of over 50 million dollars, particularly those aerobic granular sludge/AquaNereda (AGS) reactors, which Proposer has provided design services since January 1, 2010. Wastewater expansion projects over 120 million in aggregate value will be preferred. Include the following information:

a. Organization/Owner name
b. Address (County/State)
c. Project date (Start/End)
d. Proposer's role in the project (e.g., prime/lead, sub)
e. Scope of work (Brief description 1-2 sentences)
f. Total project costs

NOTE: Representative photographs and exhibits supporting the above projects are permitted as an attachment to this section. (limit 25 pages).

END EXHIBIT 2

EXHIBIT 3, CONCEPTUAL ENGINEERING REPORT

MANATEE COUNTY
SOUTHWEST WATER RECLAMATION FACILITY (SWWRF)

REVISED FINAL CONCEPTUAL ENGINEERING REPORT FOR THE EXPANSION TO 18 MGD AADF

Revision Date: February 15, 2023

Prepared for:

Manatee County Utilities Department
4410 66th Street West
Bradenton, FL 34210

Prepared by:

McKim & Creed, Inc.
551 North Cattlemen Road, Suite 106
Sarasota, FL 34232
CA License No. 29588
Michael D. Nixon FL PE No. 87439

McKim & Creed Project 01024-0205

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY MICHAEL NIXON, PE ON THE DATE ADJACENT TO THE SEAL.

PRINTED COPIES OF THIS ITEM ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

CONTENTS

TABLES

FIGURES

APPENDICES

LIST OF ACRONYMS

Abbreviation	Definition
AADF	Annual Average Daily Flow
AGS	Aerobic Granular Sludge
bCOD	Biodegradable Chemical Oxygen Demand
BOD_5	Biochemical Oxygen Demand, Five Day
$CaCO_3$	Calcium Carbonate
CAR	Capacity Analysis Report
CAS	Conventional Activated Sludge
$CBOD_5$	Carbonaceous Biochemical Oxygen Demand, Five Day
CE	Clarified Effluent
CER	Conceptual Engineering Report
COD	Chemical Oxygen Demand
DI, DIP	Ductile Iron, Ductile Iron Pipe
DMR	Discharge Monitoring Report
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FRP	Fiberglass Reinforced Plastic
MDF	Maximum Daily Flow
MGD	Million Gallons per Day
ML	Mixed Liquor
MLE	Modified Ludzack-Ettinger
MLSS	Mixed Liquor Suspended Solids
MLVSS	Mixed Liquor Volatile Suspended Solids
MMADF	Maximum Month Average Daily Flow
M3MADF	Maximum Three Month Average Daily Flow
NH_3-N	Ammonia as nitrogen
NO_3-N	Nitrate as nitrogen
NO_2-N	Nitrite as nitrogen
NRCY	Nitrified Recycle
PD	Positive Displacement
PER	Preliminary Engineering Report
PHF	Peak Hourly Flow
RAS	Return Activated Sludge
rbCOD	Readily Biodegradable Chemical Oxygen Demand
SBR	Sequencing Batch Reactor
SE	Secondary Effluent
SRS	Screened Raw Sewage
SRT	Solids Retention Time
SWWRF	Southwest Water Reclamation Facility
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
VSS	Volatile Suspended Solids
WAS	Waste Activated Sludge

1. INTRODUCTION

Manatee County (County) owns and operates the Southwest Water Reclamation Facility (SWWRF), which is located at 5101 65th Street West in Bradenton, Florida within a predominantly built-out portion of the County. The SWWRF currently has a permitted capacity of 15 million gallons per day (MGD) at annual average daily flow (AADF) conditions at permitted effluent requirements. However, the SWWRF was upgraded in 2017 to a Modified Ludzack-Ettinger (MLE) process for biological nitrogen removal to improve operations and maintenance in the reclaimed water storage and distribution system. At the County's target effluent total nitrogen (TN) of 10 mg/L the SWWRF MLE process was designed for 13.5 MGD AADF. Note that the SWWRF has sufficient capacity to be operated at a lower SRT without biological nitrogen removal at 15 MGD AADF and still meet the current effluent limits. Refer to the Conclusion for more discussion on this topic. Per the Florida Department of Environmental Protection requirements for Rule 62-600.405 of the Florida Administrative Code (F.A.C.), water reclamation facilities (WRF) like the SWWRF must be evaluated routinely to support the prompt planning, design, and construction of wastewater facilities necessary to provide proper treatment and reuse or disposal of domestic wastewater and management of biosolids. All flow projections made for the SWWRF through the capacity analysis reports (CAR) sent to the Florida Department of Environmental Protection (FDEP) have indicated that the SWWRF's designed capacity of 15 MGD AADF is not expected to be exceeded until after 2035. However, since the most recent CAR in 2019, influent flows to the SWWRF have increased to an AADF of approximately 13.5 MGD, and an expansion is required as soon as possible for the County to continue to operate with biological nitrogen removal. As a result, over the past few years, the County has initiated improvements and upgrades to correct specific deficiencies and enhance the performance and reliability of the SWWRF to prepare for a potential expansion of this facility to 18 MGD AADF. In addition, a recent review of design and influent loading documentation for the SWWRF as part of a previous re-rating analysis performed by McKim & Creed indicated that the existing MLE process portion of the plant experiences significant process operation difficulties if exceeding the current AADF of 13.5 MGD. Therefore, immediate improvements are recommended to the facility to prevent difficult plant operations and excessive chemical usage.

The purpose of this CER is to document the identification and development of the capital improvement projects necessary to increase the capacity of the SWWRF to 18 MGD AADF at or below effluent TN of 10 mg/L. This CER also identifies the current capacity of the existing basins and provides the design criteria, process modeling results, and probable costs of new basins and equipment to upgrade the SWWRF to 18 MGD AADF at or below effluent TN of 10 mg/L. This CER focuses on both the liquid treatment unit processes and biosolids processes of the SWWRF to show the feasibility for such an expansion at the existing site. This

CER is prepared in support of the County's planning decision to schedule an expansion of the SWWRF to 18 MGD AADF.

As part of this treatment evaluation for the expansion of the existing SWWRF MLE process to 18 MGD AADF, the County also requested the evaluation and identification of recommended improvements needed to expand the SWWRF with a new process that can meet advanced wastewater treatment (AWT) standards. Per § 403.086, Fla. Stat. (2021) AWT standards require WRF's effluent pollutant concentrations to be less than or equal to 5 mg/L $cBOD_5$, 5 mg/L TSS, 3 mg/L TN, and 1 mg/L TP, when applied. In some instances, the TP concentration limit of the AWT standards may be waived if it can be demonstrated that phosphorus is not the limiting nutrient in the receiving water bodies. It is expected that the SWWRF would qualify for this waiver based on historical knowledge of nitrogen limitation in the surrounding receiving water bodies and due to the fact that the SWWRF does not directly discharge treated effluent to surface water bodies. Additional evaluation and discussion of this topic is provided in **Section 8** of this CER.

Report Revision:

After the finalization of this report in August 2022, the County requested a modification of this report to evaluate the feasibility of incorporating a new aerobic granular sludge (AGS) process into the plant upgrade and expansion. Further, the County requested an evaluation of potential phasing of the AGS expansion to better align capital spending with anticipated future flows. The AGS evaluation has been appended to this report and is attached as Section 9 of this revised CER.

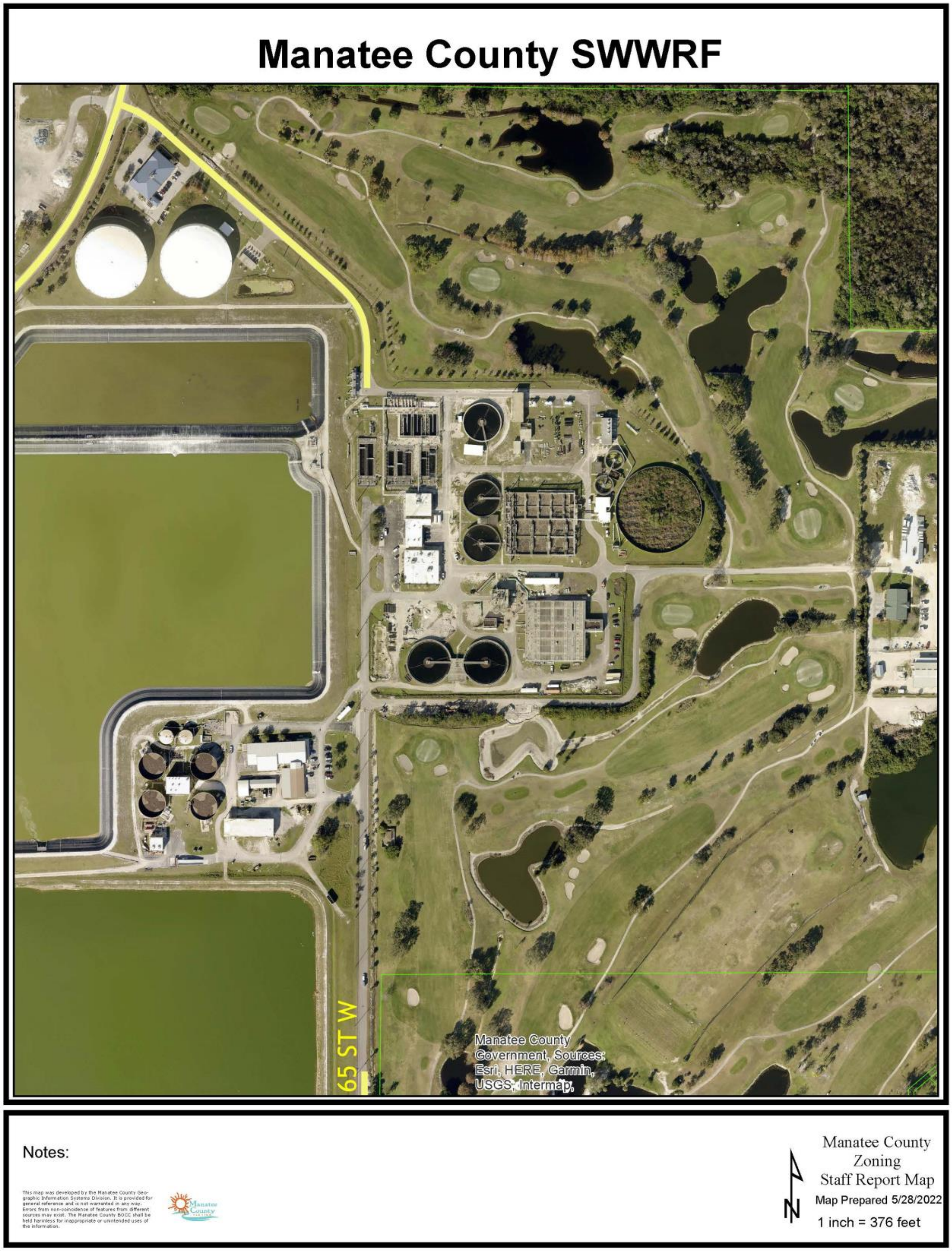
All text added after publishing the August 2022 final CER has been marked by blue font for clarity.

2. EXISTING CONDITIONS

2.1 Background

The SWWRF, FDEP permit No. FLA012619, is owned and operated by Manatee County. A location map is shown in **Figure 2.1**. The current plant was originally designed, permitted, and constructed as a 15 MGD AADF Type I secondary wastewater treatment facility with primary clarifiers. A major modification to the SWWRF's secondary treatment processes was completed in 2017, converting the SWWRF's secondary treatment process to a MLE process to achieve an effluent TN concentration of 10 mg/L or less. This project repurposed the facility's primary clarifiers to serve as anoxic basins to achieve the required level of denitrification. The current SWWRF includes influent mechanical screening, forced vortex grit removal, an MLE secondary treatment process to achieve removal of organic pollutants and nitrogen, secondary clarification, tertiary filtration, chloramine disinfection, and effluent pumping to either a public access reuse (PAR) system or recharge well disposal.

Figure 2.1 – Manatee County SWWRF Location Map



2.2 Previous Basis of Design

The SWWRF is one of the three major plants serving Manatee County and is also the oldest and the largest. The permit requirements and the basis of design for this facility based on the 2013 Preliminary Engineering Report (PER) by CH2M HILL, are shown in **Table 2.1**, **Table 2.2**, and **Table 2.3** below.

Table 2.1 – 2013 PER Basis of Design Influent and Effluent Water Quality

	Influent				Effluent			
2013 Parameters	AADF	MMADF	MDF	PHF	AADF	MMADF	MDF	Single Sample
Flow, MGD	13.5	15.9	23	48	10[1]			
$CBOD_5$, mg/L	132	-	-	-	20	30	-	60
TSS, mg/L	141	-	-	-	20[2]	30[2]		5.0[1] 60[2]
TKN, mg/L	34	-	-	-				
Fecal Coliform, % Less Than Detection						75%[1]		
Fecal Coliform, #/100 mL					200[2]	200 Geo. Mean[2]	-	25[1] 800[2]
Effluent Total Residual Chlorine (TRC), mg/L					-	-	-	1.0[1] 0.5[2]
NO_3-N, mg/L					-	-	-	12[2]

[1]Limits for Public Access Reuse (PAR) Requirements
[2]Limits for Rapid Infiltration Basin Requirements

Table 2.2 – 2013 PER Basis of Design Flow and Loading Peaking Factors

Condition	Flow	$CBOD_5$	TSS	TKN
AADF	13.5 MGD	132 mg/L	141 mg/L	34 mg/L
MMADF:AADF	1.18	1.42	1.56	1.32
MDF:AADF	1.70	2.00	2.75	2.00

Table 2.3 – 2013 PER Basis of Design Influent Loading

2013 Parameters	Flow, MGD	$CBOD_5$, lb/day	TSS, lb/day	TKN, lb/day
AADF	13.5	14,862	15,875	3,828
MMADF	15.9	21,104	24,765	5,053
MDF	23	29,724	43,656	7,656
PHF	48	-	-	-

2.3 Updated Basis of Design

Since the last PER in 2013, and the startup of the existing MLE system in 2017, Manatee County has expressed its desire to see the SWWRF upgraded in the future to 18 MGD. At the time, the flow factor considered for the 18 MGD upgrade was the maximum three-month average daily flow (M3MADF) which corresponds to 16.2 MGD AADF. The Engineer of Record, CH2M HILL, proposed a Phase 2 upgrade to bring the facility to 18 MGD M3MADF that would require an expansion of the aeration basin volume from 3.5 MG to 4.5 MG. However, after the MLE system was placed in service, the County has requested for that upgrade to be based on 18 MGD AADF. In the meantime, the annual average daily flows arriving at the SWWRF have increased substantially. Maximum month average daily flow (MMADF) and maximum daily flow (MDF) peaking factors have increased since CH2M Hill's 2013 PER, although the peak hourly flow peaking factor has since decreased from 3.55 to 3.0.

The existing SWWRF's MLE process, in service since 2017, was designed to treat 15.9 MGD MMADF given that the MMADF peak factor was 1.18. At this flow, the 2013 PER indicated the aerobic solids retention time (SRT) was 4.4 days. The 2013 PER further noted that the aerobic SRT would decrease to 3.2 days if for any reason one of the four existing aeration basins is out of service. With the average influent flow reaching 13.5 MGD AADF over the last three years, the SWWRF is approaching the limits of its design treatment capacity. An updated analysis of the actual influent flows and loads to the SWWRF is required to determine its actual capacity at current conditions, and to support planning for expansion of the facility in the immediate future. Flow and pollutant data for the last three years (2019 – 2021) was used to characterize flows and loads for the SWWRF and to come up with new design loading and peaking factors for the expansion of this facility from 15 MGD AADF to 18 MGD AADF. Peaking factors of interest for this period, with the influent wastewater sampled once per week, include the AADF, the MMADF and the MDF with the understanding that plant design is commonly done at the MMADF peak factor. **Table 2.4**, below, shows the influent flow and pollutant loadings to the SWWRF as well as the important peaking factors for design.

Table 2.4 – 2022 Basis of Design Influent Flow and Loading for Expansion to 18 MGD AADF and 25.2 MGD MMADF

Influent Wastewater					Influent Loadings			Flow/Loading Factors	
Parameter	AADF, mg/L	MMADF	MDF	PHF	AADF, lb/day	MMADF, lb/day	MDF, lb/day	MMADF:AADF	MDF:AADF
$CBOD_5$	132	-	-	-	19,816	24,968	33,489	1.26	1.69
BOD_5	157	-	-	-	23,569	29,697	39,831	1.26	1.69
COD	378	-	-	-	56,745	76,606	80,011	1.35	1.41
TSS	158	-	-	-	23,719	36,764	57,637	1.55	2.43
VSS	135	-	-	-	20,266	35,871	38,506	1.77	1.90
TKN	36	-	-	-	5,404	6,107	7,566	1.13	1.40
NH_3-N	32	-	-	-	4,804	5,765	6,533	1.20	1.36
Alkalinity (as $CaCO_3$)	225	-	-	-	-	-	-	-	-
pH	7.46	-	-	-	-	-	-	-	-
Flow, MGD	18	25.2	34.2	54	-	-	-	1.40	1.90

2.4 Existing Treatment Process Description

Currently, wastewater from Manatee County's southwest service area enters the SWWRF's headworks via a 36-inch diameter force main. An influent flowmeter records the flow from the force main before it enters the influent channel. The influent channel also receives flows from the supernatant lift station, the drain lift station, and the lined reject pond. First, the wastewater undergoes preliminary treatment at the new state of the art headworks facility that was recently completed. The new headworks facility includes the following:

- 48-inch diameter influent force main
- 8-ft wide influent channel and 60-inch Parshall flume
- Three (3) Hydro-Dyne mechanically cleaned center-flow influent screens with 6-mm perforated UHMWPE screen panels, screenings dewatering, and screenings compaction
- Three (3) Hydro International HeadCell® stacked tray vortex grit removal systems with grit washing and dewatering, located downstream of influent screening
- 54-inch diameter screened raw sewage (SRS) piping and 54-inch by 64-inch tapping sleeve and valve from the headworks to Splitter Box No. 1

Following preliminary treatment, influent wastewater flows to Splitter Box No. 1 before continuing to the secondary MLE treatment process. The influent wastewater is combined with process recycle flows in Splitter Box No. 1 including returned activated sludge (RAS) pumped from the bottom of the clarifiers as well as nitrate-rich mixed liquor, also known as nitrified recycle (NRCY), from the internal recycle pump stations at the end of each aeration basin. Splitter Box No. 1 includes five 12-ft wide manually operated weir gates to split the combined influent, RAS, and NRCY flow to four existing anoxic basins. Four of the five 12-ft wide manual operated weir gates in Splitter Box No. 1 are currently in use, while the fifth manual operated weir gate (405-GTE-001-05) is a spare for future expansion of the anoxic basins. Each anoxic basin has eight submerged vertical shaft hyperboloid mixers (two per zone, four zones per basin). From the anoxic basins, flows go to Splitter Box No. 2 which feeds mixed liquor flow to each of the four aeration basins. Flows from the aeration basins, not recycled back to the anoxic basins, pass over a rectangular weir into a common effluent channel which conveys the mixed liquor to the five secondary clarifiers.

Clarified effluent discharged from the secondary clarifiers is directed to the tertiary filters. RAS from the bottom of the clarifiers is conveyed to Splitter Box No. 1, and waste activated sludge (WAS) is transferred to the aerated sludge holding tanks. Currently, WAS can only be wasted from Clarifiers 3, 4, and 5. The existing WAS pumps for clarifiers 1 and 2 are inoperable and must be replaced to allow sludge wasting from clarifiers 1 and 2. Scum is removed from the clarified effluent in the secondary clarifiers before clarified effluent is conveyed to the tertiary filters. There are a total of seven tertiary filters, six automatic backwash (ABW) granular media traveling bridge filters and one Aqua-Aerobic Systems Inc. AquaDiamond® cloth media filter, to polish the clarified effluent before it flows to the chlorine contact chambers for disinfection. The ABW filters' underdrain system supports the filter media consisting of a 12-inch top layer of anthracite, and a 12-inch bottom layer of sand, and a gravel media support layer between the sand and the filter underdrain.

High-level disinfection takes place in three chlorine contact chambers (CCC) with 0.414 MG of total volume. Chloramination is used for disinfection. Sodium hypochlorite and liquid ammonium sulfate (LAS) are used for chloramination, both of which are dosed at the head of each CCC. After disinfection, the effluent reclaimed water can be conveyed either to the recharge well for disposal, the reuse storage, or as a reject water to the lined Reject Pond. Transfer pumps conveyed the reuse-quality water to either the two above-ground storage tanks, the North Pond, or the Aquifer Recharge Well, RW-1. There are two other additional storage ponds that can be used for temporary storage of excess reclaimed water. Reuse water in the above-ground storage tanks can be transferred to the Manatee County Master Reuse System with the High Service Reuse pumps. A process flow schematic for the liquid stream processes at the SWWRF is depicted below in **Figure 2.2**.

WAS and scum from the secondary clarifiers are sent to one of the four aerated sludge holding tanks. Aeration and mixing in the aerated sludge holding tanks is accomplished using jet aeration and mixing equipment with one positive displacement blower and one end-suction centrifugal jet motive pump per aerated sludge holding tank. Polymer is injected into the sludge as it enters each of the six belt filter presses. From there, the dewatered solids are transferred via a conveyor screw into a trailer for transport to the County's Southeast Water Reclamation Facility (SEWRF) for thermal drying to meet Class AA standards for marketing and distribution. Alternatively, dewatered solids may be sent to landfill and/or compost facilities for disposal when the thermal dryer at the SEWRF is offline. A process flow schematic of the biosolids handling processes at the SWWRF is depicted below in **Figure 2.3**.

A summary of the SWWRF's existing treatment processes and process capacities is provided in **Table 2.5** below, based on the information contained in the 2019 Capacity Analysis Report prepared by Carollo Engineers, Inc.

Figure 2.2 – SWWRF Existing Liquid Treatment Process Flow Diagram

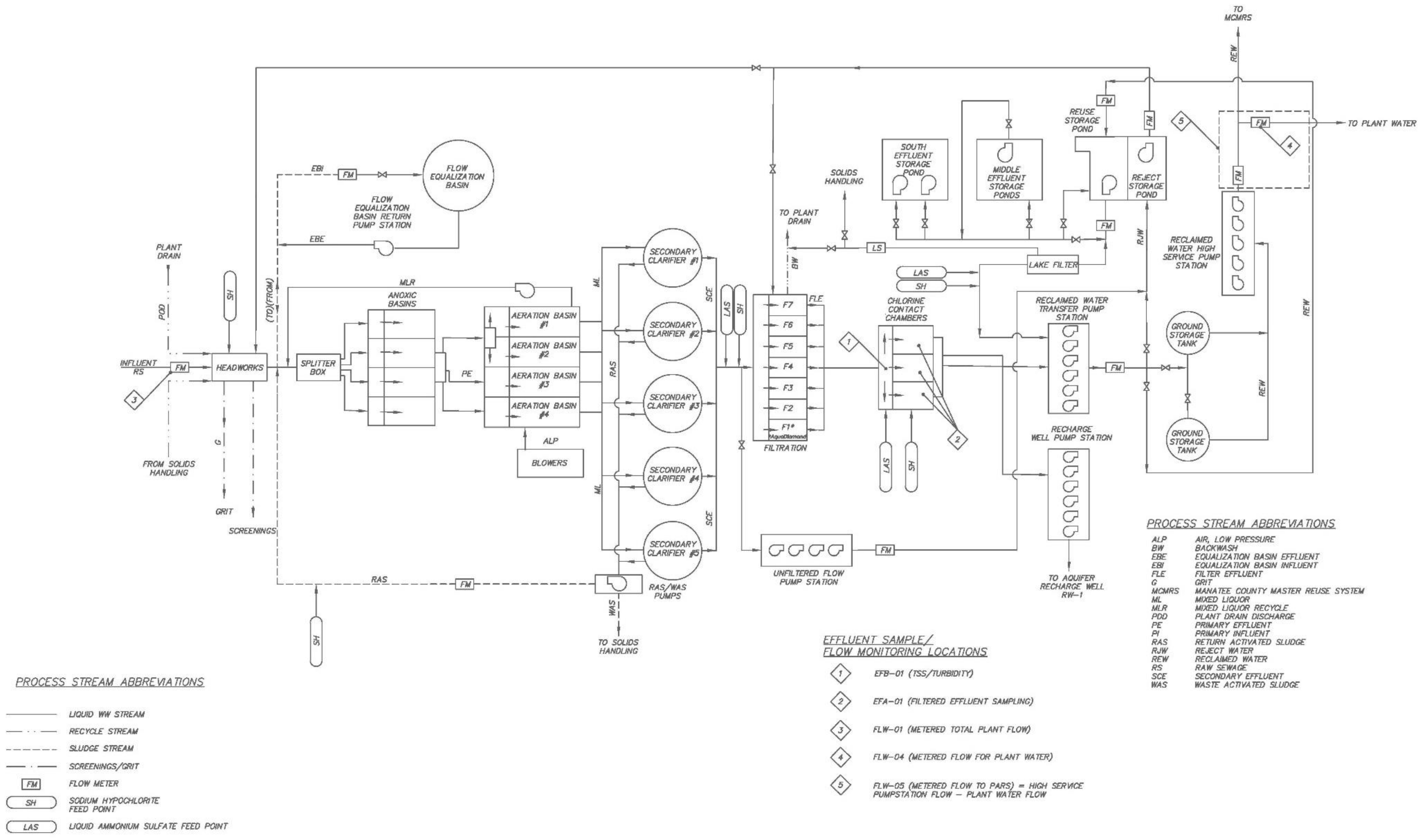


Figure 2.3 – Existing SWWRF Biosolids Process Flow Diagram

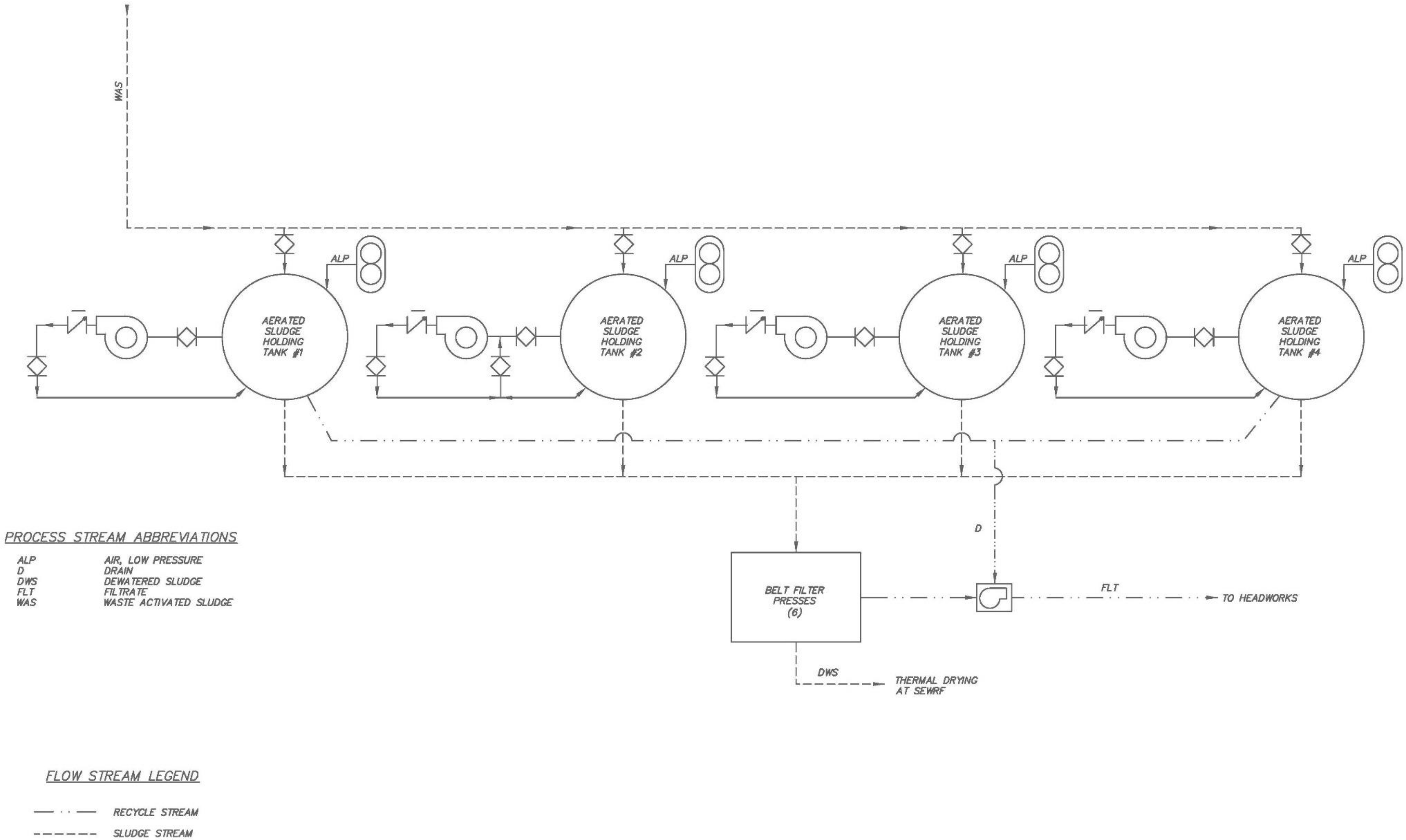


Table 2.5 – Existing SWWRF Treatment Process Capacity Summary

Process	Criteria	Description
Preliminary Treatment		
Headworks Flow Measurement	Number	1
	Type	Fiberglass Parshall Flume
	Size	60-inch
	Capacity (Range)	1.6992 – 66.528 MGD
Mechanical Bar Screens	Number	3
	Type	Mechanically Cleaned, Center-Flow
	Capacity, each	27 MGD
	Screen Grid Opening Size and Type	6 mm Perforated UHMWPE
	Channel Width	36 inches
	Channel Depth	75 inches
	Channel Width at Channel Recess	72 inches
	Channel Recess Depth	89.10 inches
	Maximum System Wash Water Requirement	187 gpm at 60 psi
	Screen Wash Water Requirement	72 gpm/screen (2 running)
Screenings Washing Compactors	Number	2
	Diameter of Screw	12 inches, min.
	Diameter of Shaft	3.5 inches, min.
	Maximum Wash Water Requirement	187 gpm at 60 psi
	Screen Sluice Wash Water Requirement	3 gpm/screen sluice (intermittent)
	Compactor Wash Water Requirement	17 gpm/compactor (2 running)
	Y-Sluice Wash Water Requirement	3 gpm
Grit Removal	Number	3
	Type	Hydraulically Driven Forced Vortex
	Capacity, each	27 MGD
	Diameter of Units	12 feet
	Number of Trays Installed per Unit	10
	Surface Area Installed per Unit	1,130 ft^2
	Headloss at Peak Flow	12 inches
Grit Classifiers	Number	3
	Type	Free Vortex Cyclone
	Capacity, each	300 gpm
	Headloss	72 inches

Process	Criteria	Description
Grit Dewatering Escalators	Number	3
	Type	Dewatering Belt Escalator
	Capacity, each	2.0 yd^3/hr
	Belt Speed	1 – 5 fpm
	Clarifier Minimum Settling Area	17.3 ft^2
	Maximum Clarifier Loading Rate	3.2 gpm/ft^2
	Minimum Dewatered Solids Content	60%
	Maximum Dewater Solids Organic Content	15%
Flow Equalization	Number	1
	Type	Offline
	Diameter	244 ft
	Side Water Depth	11 ft
	Volume	3.8 MG
	No. of Return Pumps	5
	Type of Return Pumps	Centrifugal

Process	Criteria	Description
Secondary Treatment		
Anoxic Basins	Number of Basins	4
	Number of Zones per Basin	4
	Length per Zone	36 ft
	Width per Zone	40 ft
	SWD	12.5 ft
	Volume per Basin	0.54 MG
	Volume, total	2.15 MG
Anoxic Basins Mixers	Number per Basin	8
	Type	Vertical Shaft, Hyperboloid
	Motor Power, each	2 hp
	Output Speed	15.9 rpm
	Power Density	0.08 (hp/1000 ft^3)
Aeration Basins	Number	4
	Length (No. 1 and 2)	192 ft
	Width (No. 1 and 2)	36 ft
	SWD (No. 1 and 2)	14.5 ft
	Volume, each (No. 1 and 2)	0.75 MG
	Length (No. 3 and 4)	192 ft
	Width (No. 3 and 4)	48 ft
	SWD (No. 3 and 4)	14.5 ft
	Volume, each (No. 3 and 4)	1.0 MG
	Volume, total	3.5 MG
	Aeration Type	Fine Bubble Diffusers

Process	Criteria	Description
Aeration Diffusers	Aeration Zones per Basin	4
	Number of Diffusers (per Basins 1 and 2)	1,901
	Number (Zone 1)	688
	Number (Zone 2)	516
	Number (Zone 3)	387
	Number (Zone 4)	310
	Number of Diffusers (per Basins 3 and 4)	2,551
	Number (Zone 1)	946
	Number (Zone 2)	688
	Number (Zone 3)	516
	Number (Zone 4)	401
	Number of Diffusers, total	8,900
	Capacity per Diffuser @ AADF	1.1 – 1.3 scfm
	Capacity per Diffuser @ MDF	2.6 – 3.1 scfm
	Standard Aeration Efficiency @ AADF	8.46 – 8.56 SOR/Bhp-hr
	Standard Aeration Efficiency @ MDF	7.08 – 7.36 SOR/Bhp-hr
Aeration Basin Blowers	Number	5
	Type	Multi-Stage Centrifugal
	Capacity, each	2,900 scfm
	Discharge Pressure	8.0 psig
	Motor Power, each	200 hp
	Number	2
	Type	High Speed, Turbo
	Capacity, each	6,600 scfm
	Discharge Pressure	8.7 psig
	Motor Power, each	300 hp
Nitrification Recycle (NRCY) Pumps	Number, total	4
	Number per Basin	1
	Type	Submersible with VFD
	Recycle Ratio	250% (@ MMADF of 15.9 MGD)
	Capacity (per Pumps 1 and 2)	5,800 gpm
	Capacity (per Pumps 3 and 4)	7,900 gpm
	Head (per Pumps 1 and 2)	18.1 ft
	Head (per Pumps 3 and 4)	16.3 ft
	Motor Power (per Pumps 1 and 2)	50 hp
	Motor Power (per Pumps 3 and 4)	60 hp

Process	Criteria	Description
Secondary Clarifiers	Number	5
	Type	Center Feed, Peripheral Weir
	Sludge Withdrawal	Draft Tube
	Diameter (No. 1 and 2)	105 ft
	SWD (No. 1 and 2)	12 ft
	Diameter (No. 3 and 4)	125 ft
	SWD (No. 3 and 4)	14 ft
	Diameter (No. 5)	105 ft
	SWD (No. 5)	14 ft
	Surface Area, total	50,521 ft^2
RAS Pumps	Number	8
	Type	Non-Clog, Centrifugal
	Control	Variable Speed, Level Control
	Capacity, each	3,500 gpm
	Motor Power, each	25 hp
Tertiary Filters	Number	7
	Type (Filter No. 1)	AquaDiamond® Cloth Media
	Type (Filters No. 2 – 7)	Automatic Backwash Traveling Bridge Sand
	Media Depth (Filters No. 2 – 7)	12 inches (silica sand) 12 inches (anthracite)
	Surface Area (Filter No. 1)	1,920 ft^2
	Surface Area (Filter Nos. 2 – 5)	1,056 ft^2
	Surface Area (Filter Nos. 6 and 7)	1,440 ft^2
	Surface Area, total	9,024 ft^2
	Filter Loading at Peak Hour Flow	6.5 gpm/ft^2 (Filter No. 1) 2.0 gpm/ft^2 (Filters No. 2 – 7)
Disinfection	Type	Chloramination (Sodium Hypochlorite and Liquid Ammonium Sulfate)
	Concentration, Sodium Hypochlorite	12.5% available chlorine w/w
	Concentration, Liquid Ammonium Sulfate	40% solution
Chlorine Contact Chambers	Number	3
	Length, each	61.4 ft
	Width, each	30 ft
	SWD	10 ft
	Volume, each	138,000 gal
	Volume, total	414,000 gal

Process	Criteria	Description
Effluent Handling		
Effluent Ground Storage	Number	2
	Type	Ground Storage Tanks
	Volume, each	10 MG
Reuse Storage	Number	3
	Type	Pond
	Area (North Pond)	12.5 acres (lined)
	Capacity (North Pond)	66 MG (lined)
	Area (Middle Pond)	19.5 acres (unlined)
	Capacity (Middle Pond)	55 MG (unlined)
	Area (South Pond)	45.9 acres (unlined)
	Capacity (South Pond)	139 MG (unlined)
Reuse Transfer (Effluent) Pumps	Number	6
	Type	Vertical Turbine
	Control	Variable Speed
	Capacity, each	5,000 gpm
	Motor Power, each	100 hp
Reuse High Service Pumps	Number	4
	Type	Vertical Turbine (Main)
	Capacity, each	6,000 gpm
	Motor Power, each	350 hp
	Number	1
	Type	Vertical Turbine (Jockey)
	Capacity, each	Unknown
	Motor Power, each	Unknown
Lake Return Disk Filters	Number	3
	Type	Circular Disk, Steel Mesh
	Mesh Opening Size	25 micron
	Filtration Area, per unit	352 ft^2
	Capacity, each	7.5 MGD (AADF) 15 MGD (PHF)
Reject Storage	Number	1
	Type	Lined Pond
	Area	4.5 acres
	Capacity	18 MG
Deep Injection Well (Permitted through Master Reuse System)	Number	1
	Depth	1,659 ft
Recharge Well	Number	1
	Type	Class V Aquifer Recharge Injection
	Capacity	15 MGD (MDF)
	Depth	1,850 ft

Process	Criteria	Description
Biosolids Treatment		
WAS Pumps	Number	5
	Type	Positive Displacement
	Control	#1-4 Variable Speed, #5 Constant Speed
	Capacity, each	100 gpm
	Motor Power, each	5 hp
Aerated Sludge Holding Tanks	Number	4
	Type	Prestressed Concrete Tanks
	Diameter, each	75 ft
	SWD	25 ft
	Volume, each	0.825 MG
	Volume, total	3.30 MG
	Aeration/Mixing System	Jet Aeration and Mixing
Jet Motive Pumps	Number	4
	Number per ASHT	1
	Type	Horizontal, Centrifugal, End-Suction
	Control	Constant Speed
	Capacity, each	6,600 gpm
	Motor Power, each	50 hp
Aerated Sludge Holding Tank Diffusers	Number	-
	Type	Jet Aeration
	Mixing Requirements	30 scfm/1000 ft^3
	Minimum SOR	7,600 lb/day
Aerated Sludge Holding Tank Blowers	Number	4
	Number per ASHT	1
	Type	Rotary, Positive Displacement
	Capacity, each	940 scfm
	Discharge Pressure	10.8 psig
	Motor Power, each	75 hp
Belt Filter Press Dewatering	Number	6
	Type	Belt Filter Presses
	Width	2 meters
	Loading Rate, each	1,200 lb/hr
	Capture Efficiency	95%
	Cake Solids	14.1% – 16.4%[1]
Dewatering Feed Pumps	Number	6
	Type	Progressive Cavity
	Capacity, each	150 gpm

Notes:
[1]Dewatered cake solids concentration based on February 2019 special sampling data.

3. EVALUATION AND MODELING OF EXISTING SWWRF

3.1 Process Evaluation at the Current Flow of 13.5 MGD AADF

3.1.1 Flows and Loading Data

In this process evaluation, an assessment of the true capacity, based on loadings, of the SWWRF over the period of January 2019 through November 2021 is documented. A comparison of recent flows to the SWWRF is shown in **Table 3.1** below.

Table 3.1 – Historical Influent Wastewater Flows from 2019 to 2021

Year	AADF, MGD	MMADF, MGD	MDF, MGD	PHF, MGD
2019	13.5	19.0	29.8	-
2020	13.6	16.4	25.7	-
2021	13.4	16.9	20.8	-

Table 3.1 shows that both the flow at MMADF and MDF are above the permitted design capacity of 15.0 MGD AADF. As seen above, the PHF data was not available for the entire period evaluated, however, peak hourly flow data was evaluated for days with the highest flows over the past three years. Peak hourly flow data from 8/14/2019 – 8/22/2019, 6/5/2020 – 6/8/2020, 9/11/2020, 9/12/2020, 11/11/2020 – 11/13/2020, 8/12/2021, and 8/13/2021 was evaluated to identify the current peak hourly flow peaking factor for the SWWRF. Peaking factors for the design flow rates were developed based on the data from 2019 through 2021. The basis of design flow peaking factors for the SWWRF are summarized in **Table 3.2** below. The historical influent flow data for the SWWRF from 2019 to 2021 is included in **Appendix A**.

Table 3.2 – SWWRF Flow Peaking Factors

Flow Peaking Factor Parameter	Peaking Factor for Jan. 2019 – Nov. 2021
PHF:AADF	3.00
MDF:AADF	1.90
MMADF:AADF	1.40

Historical influent and effluent wastewater pollutant concentrations are summarized in **Table 3.3** below based on data from the SWWRF from 2019 to 2021.

Table 3.3 – SWWRF Historical Influent and Effluent Water Quality from 2019 to 2021

Parameter, mg/L	Influent, AADF	Effluent, AADF
$CBOD_5$	132	<0.19
BOD_5	157	-
COD	378	-
TSS	158	<0.62
TKN	36	2.1
NH_3-N	32	0.9
TP	4.6	-
pH	7.43	7.1

3.1.2 Summary of Influent Loads and Operational Data

A summary of the updated basis of design influent loading information at AADF, MMADF, and MDF based on the most recent three years of data from 2019 to 2021 is included in **Table 2.4** in **Section 2**. This loading information is used to develop the process model for evaluation of the expansion of the SWWRF to and AADF capacity of 18 MGD. The existing process is modeled using the available historical influent data and process control data, as well as the data from the three-week sampling campaign conducted in February 2019, included in **Appendix A**. Historical operating data referenced for process model development, calibration, and validation includes daily mixed liquor suspended solids (MLSS) concentrations, sludge volume index (SVI) for the aeration basins, waste activated sludge (WAS) daily flow rates, daily WAS concentrations, return activated sludge (RAS) daily flow rates, anoxic basins online, aeration basins online, and clarifiers online. This data is used with BioWin process simulator software Version 6.2 to gain a better understanding of facility capacity for individual process units and to predict process modifications/upgrades that will be necessary to improve the performance of the facility with reference to nitrogen removal.

3.1.3 Process Model Development

The first step was to gather the required data to be used for development and calibration of the process model simulator. As noted above, data consisted of information on existing plant processes, influent flow, wastewater characteristics, permitted effluent parameter limits, historical influent & effluent parameters, kinetic and stochiometric model parameters values, plant physical data, and plant operating data. BioWin Influent Specifier Version 6.2.3.0 was used to calculate most of the influent wastewater fractions directly from the input data. Influent wastewater characterization fractions were then adjusted within typical ranges to achieve an “excellent” match status with the historical influent data and influent characterization data from the three-week sampling campaign in February 2019. The output of the influent specifier, containing the influent data and influent fractions utilized for the process modeling described throughout this report, is presented in **Appendix B**.

The second step, following collection and reconciliation of data, was to develop a calibrated model that satisfactorily simulates the facility performance during the sampling and analysis periods. For that purpose, the first requirement was to set up the existing plant configuration in the simulator. Setting up the plant configuration in the simulator involves selecting and connecting the appropriate unit processes and specifying process sizes and operational parameters, as necessary. The unit process geometry data and physical dimensions used to develop the process model were determined from facility record drawings that were provided by the County.

Various simulations were run using the process model simulator to study the impact of varying influent, operating, and physical parameters. Simulations of interest are included in this CER. **Figure 3.1** below shows the BioWin process flow diagram for SWWRF modeling. It is important to note that the BioWin flow diagram shown below is a simplified flow scheme of the SWWRF and does not represent all possible flow paths. A simplified flow scheme was required for model construction to limit the complexity of the model and allow for rapid processing of results within industry accepted error ranges for process simulations. This simplified flow scheme closely approximates the actual flow split during the normal operating conditions simulated following industry standard modeling conventions.

The BioWin software models only the biological process, therefore, the process flow diagram extends from the wastewater influent to the wastewater splitter boxes (including all the return flows within the plant), to the anoxic and aeration basins, and to the secondary clarifiers. Physical and chemical unit processes such as influent screening, grit removal, tertiary filtration, disinfection, sludge storage, and dewatering are not included in the process model simulator to limit the complexity of the model. These unit processes are readily evaluated without the use of the process model simulator. The RAS and WAS rates used in the model are based on operating data received from SWWRF staff for the period of January 2019 through November 2021, with the RAS returning to Splitter Box No. 1 ahead of the anoxic basins and the WAS to the sludge holding tanks.

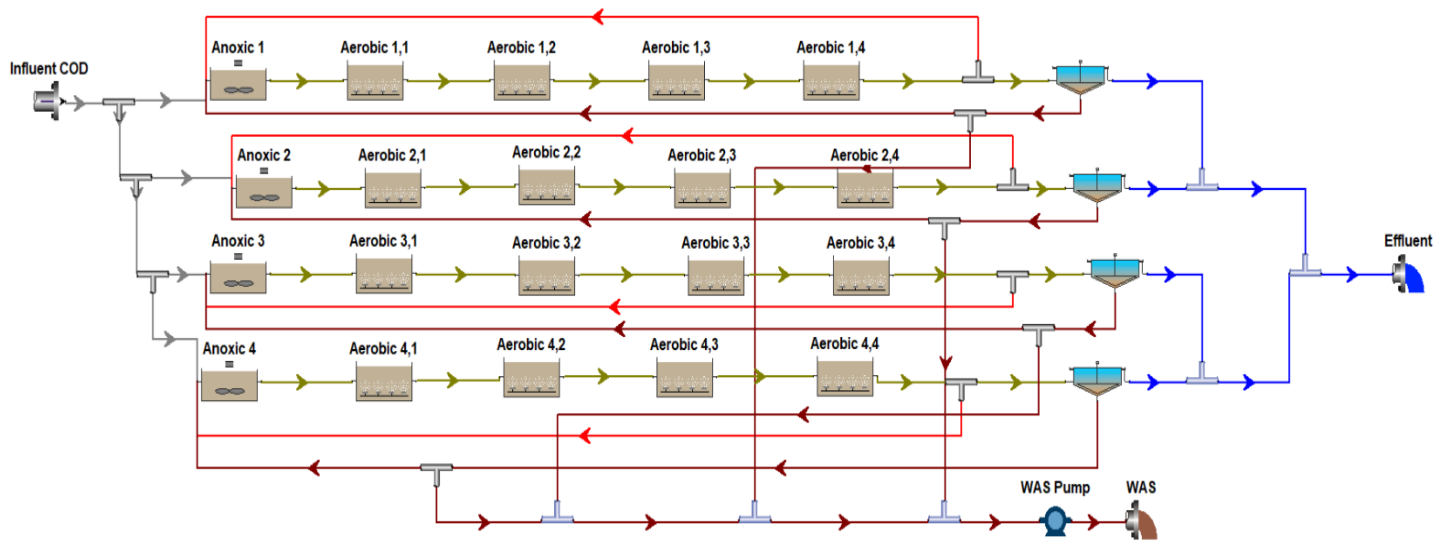
Steady state simulations of the SWWRF were conducted using the BioWin process modeling software based on the existing three-year data set on plant secondary treatment processes, historical data, and other specific parameter sampling conducted on the SWWRF's influent flow and biological treatment system in February 2019. Several assumptions were considered, including the following:

- Modeling was conducted based on total influent load leaving the headworks, combining loading from the influent flows, the supernatant pump station, the plant drain pump station, the lined reject pond, and any other recycle flows that were delivered to the old headworks when the February 2019 detailed sampling was conducted.

- Note, equalization return flows are not included in the influent loading as the model was run at steady state conditions, representing equalized flows and loading

- The impact of the side stream returning flows to the head of the plant was accounted for by using average flows and loads leaving the headworks, as determined from the February 2019 sampling program for model calibration.
- Biological modeling was conducted at steady state for the purposes of this CER. Dynamic modeling of typical diurnal patterns as well as maximum day flow conditions will be required during the detailed design phases for the SWWRF expansion.
- Clarifier capacity analysis assumes at least four clarifiers in service with the four aeration trains.
- Solids retention time (SRT) calculations are based on aerobic SRT to ensure operating conditions exceed the minimum design SRT for complete nitrification.

Figure 3.1 – SWWRF BioWin Process Flow Schematic



3.1.4 Model Calibration

The following summarizes the formulation and calibration of the BioWin process simulator model and results obtained for the SWWRF. In general, model calibration is accomplished with the available data, including:

- Influent flow and pollutant concentrations
- RAS flow
- WAS flow
- WAS concentration
- Air flow in actual CFM to the aerobic reactors
- Effluent flow and pollutant concentrations

- Operations data collected by plant staff

Calibration generally involves combining the operational or controllable aspects of the treatment plant with the input wastewater characteristics and appropriate adjustments to selected parameters, when necessary, to fit a set of plant performance data. It should be noted that often it is not possible to adjust simulator parameters such that an exact match between predicted and observed values is achieved. Rather, the goal in calibrating a simulator is to achieve a good correlation between the overall trend of predicted and observed values while minimizing the error between datasets and simulator predictions. It is also crucial to observe the simulator fit to all important variables. It is preferable to fit most of the measured variables reasonably, rather than perfectly fit one selected component concentration and others poorly. In the case of the simulation runs for the SWWRF, wastewater fractions associated with chemical oxygen demand (COD) and Ammonia-N were automatically adjusted by the software model based on input pollutant data, while the other wastewater fractions stay with their default values.

Before outlining the calibration approach, it is pertinent to distinguish between what information is input (specified) to the simulation and what information is obtained (predicted) from the model. The primary input data are the influent loadings: the plant influent flow, the concentrations of total $CBOD_5$, BOD_5, COD, TSS, VSS, TKN and TP, as well as alkalinity, pH, and the wastewater characteristics fractions for CBOD or COD, TSS, VSS, TKN and TP calculated in the stream by the simulator from the input parameters. Input data also includes certain operating information such as WAS mass rate and RAS flow rate.

After specifying the input data, the simulation is then run to predict the plant behavior subject to the specified inputs. If the predicted parameters generally fall within 15% of the observed data, then the model can be considered calibrated for the purposes of a conceptual or preliminary engineering evaluation. For calibration of the SWWRF model, the simulator was run with the current AADF of 13.5 MGD AADF and with influent pollutant concentrations as shown in **Table 2.4** based on the historical data from 2019-2021. **Table 3.4** below presents a comparison of the predicted operations and effluent data obtained from the model at steady state versus the same data gathered from the SWWRF over the past three years. Based on this comparison, it appears that the simulator prediction for the plant performance is comparable to the operations and effluent pollutant data observed at the current annual average flow of 13.5 MGD to the Facility in 2019.

Table 3.4 – Measured and Predicted Data at Current Flow of 13.5 MGD AADF

Process Variables	WAS (lbs/day)	RAS (MGD)	Aerobic SRT (days)	MLSS (mg/L)	TN (mg/L)	NO_3-N (mg/L)
2019 Average Operating & Effluent Data	13,632	11	6.7	3,240	8.0	6.0
Predicted Model Data	13,697	11	6.97	3,433	6.95	5.3
% Difference	0.48%	0%	4.0%	5.96%	13.1%	11.7%

Average % Difference	5.87%

Based on the results presented above, the process model was then run based on the data collected from February 2019 during a three-week detailed sampling campaign. Comparison of model predictions to actual measured data from this period was important to consider given the significantly increased frequency of data collection in February 2019 compared to most periods of historical data on record. The process model was adjusted to match the operational parameters from February 2019, including the number of basins and clarifiers in service. Based on the historical data, only two anoxic basins were in service while all five clarifiers were in service during this time. **Table 3.5** below presents a comparison of the predicted operations and effluent data obtained from the model to the measured data from February 2019.

Table 3.5 – Measured and Predicted Data at February 2019 Conditions

Process Variables	WAS (lbs/day)	RAS (MGD)	Aerobic SRT (days)	MLSS (mg/L)	TN (mg/L)	NO_3-N (mg/L)
February 2019 Average Operating & Effluent Data	17,666	5.5	6.6	4,113	8.6	7.3
Predicted Model Data for Feb. 2019	14,557	5.5	6.55	3,388	8.74	7.19
% Difference	21.4%	0%	0.8%	21.4%	1.60%	1.53%
Average % Difference	7.77%					

In reviewing the predicted model data depicted in **Table 3.4** and **Table 3.5** above, the average operating and effluent data predicted by the model are well within 15% of the historical average operating and effluent data for SWWRF.

It is noted that the percent differences between predicted and actual WAS mass rate and MLSS concentration for February 2019 average operating conditions shown above in Table 3.5 both exceed 15%. However, in this model scenario, the remainder of the predicted data from the model is in strong agreement with actual measured data when operated at equivalent SRT values. This indicates that the predicted and actual WAS VSS and MLVSS concentrations are also likely to be in strong agreement. The large differences between WAS mass rate and MLSS concentrations under this model scenario are strongly suspected to be the result of insufficient information on the inert suspended solids concentration in the influent wastewater and in the bioreactors. This is not expected to significantly impact the predicted results from the model for the purposes of this evaluation. Therefore, the model can be used as a calibrated tool. Both the steady state simulation run with the average data in 2019 and the simulation run with the average data for the month of February 2019, which includes the sampling data, indicate less than 15% (6.82%) average change between the predicted model data.

3.1.5 Model Validation

To validate the calibrated model, the previous simulation run at 13.5 MGD AADF will be re-run with modified conditions and data different from those used for calibration to confirm that the model performs similarly under these modified conditions and to assess the match between simulated and observed model data. The modified conditions (flow and pollutant concentrations) will be those considered for the month of May 2019, as illustrated in **Table 3.6** below.

Table 3.6 – SWWRF Steady State Simulation #2 at the Average Flow and Data for May 2019

Parameters, mg/L	$CBOD_5$	BOD_5	COD	TSS	TKN	NH_3-N	NO_3-N	TP	pH
Influent AADF	110	131	315	116	32	26	-	7.0	7.0
Effluent AADF	2.4	5.2	34.7	4.2	-	0.1	5.4	5.0	6.65

Table 3.7 presents a comparison of the predicted operating and effluent data obtained from the model at steady state and at the monthly flow of 11.4 MGD ADF for May 2019.

Table 3.7 – SWWRF Steady State Simulation Comparison of Model Predictions with May 2019 Data

Process Variables	WAS (lbs/day)	RAS (MGD)	SRT (days)	MLSS (mg/L)	TN (mg/L)	NO_3-N (mg/L)
Operating & Effluent Pollutant Data	14,649	8.7	6.4	3,326	8.3	6.2
Predicted Model Data	13,115	8.7	6.43	2,968	8.37	6.99
% Difference	11.7%	0%	0.5%	12.1%	0.84%	11.3%
Average % Difference	6.06%					

The simulation results portrayed in **Table 3.7** obtained using modified conditions of flow and pollutant data different than those used during model calibration confirm that the model performs similarly under the modified conditions. Again, the average operating and effluent data predicted are within less than 15% of the average operations and effluent data for SWWRF. Based on these results, the calibrated model may be used as a tool to assist in evaluating the necessary improvements to the SWWRF for the expansion to 18 MGD AADF.

4. EVALUATION AND MODELING OF EXPANSION TO 18 MGD AADF

4.1 SWWRF MLE Process Capacity Check at 18 MGD AADF

The evaluation of any activated sludge process must consider the interaction of the aeration basins and secondary clarifiers. Important parameters in the evaluation are the sizes of the units, influent flows and characteristics, effluent requirements, the SRT required to achieve treatment, observed sludge yield, and settling properties of the mixed liquor. Since the MLE process is already implemented onsite, the expansion to 18 MGD AADF is expected to consist of increasing the bioreactors, clarifiers, and filters capacity with the goal to treat the MMADF and ultimately to meet Class I Reliability. The preliminary number and size of the various basins are calculated with an Excel spreadsheet before running simulation models to determine estimated treatment capacity and expected performance. This initial process capacity check is then used as a "gut check" against the results from process modeling to verify that the modeling is in line with expected results. Many factors combine to establish the capacity of a water reclamation facility to treat wastewater. The most important factors are:

- Influent characteristics, including the magnitude and variability of flows and pollutant concentrations ($CBOD_5$, TSS, TKN, and TP)
- Effluent water quality requirements
- Bioreactor volumes (i.e. anoxic and aeration basins)
- Clarifier surface areas
- Capacity of hydraulic elements (pipes, channels, valves, weirs, pumps, filters, etc.)
- Process control strategies (RAS, WAS, operating DO, mixed liquor recycle rate)

4.1.1 Preliminary Sizing of Aeration Basins and Secondary Clarifiers

The preliminary calculations used to establish the number and size of basins and clarifiers required for the expansion to 18 MGD prior to process modeling are summarized in **Table 4.1**, **Table 4.2**, **Table 4.3**, **Table 4.4**, and **Figure 4.1** below.

Table 4.1 – Flow Peaking Factors for Process Capacity Analysis

Peaking Factor	Value
MMADF:ADF	1.40
MDF:ADF	1.90
PHF:ADF	3.0

Table 4.2 – Aeration System Data for Process Capacity Analysis

Parameter	Value	Units
Aeration Basin Volume	5.5	MG
BOD_5 Removed (S_o - S_e)	153	mg/L
Aerobic SRT	5.0	days

Table 4.3 – Clarifier Data for Process Capacity Analysis

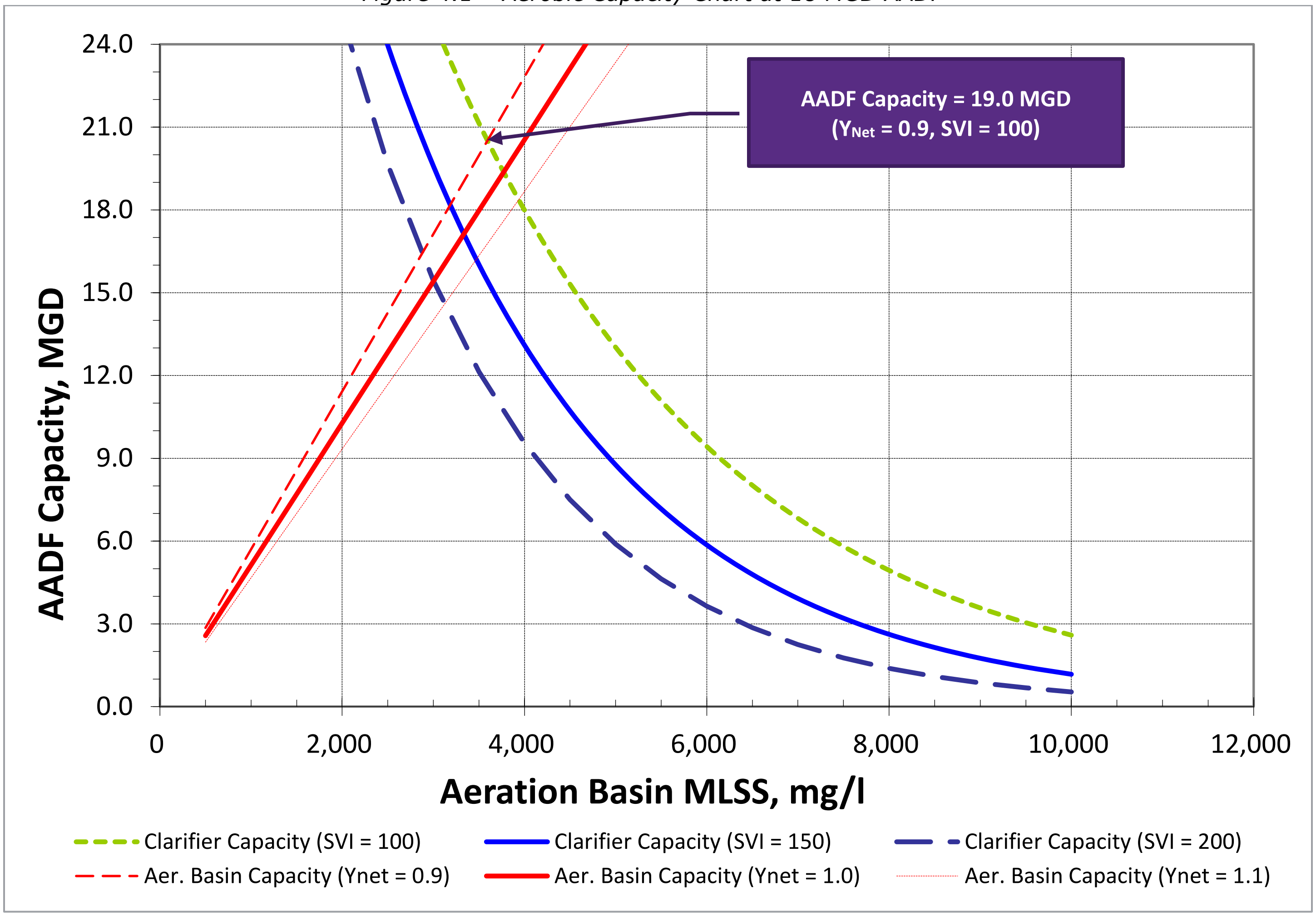
Parameter	Value	Units
Total Number of Clarifiers	6	-
Number of Clarifiers Online (Class I)	5	-
Percentage of Flow Treated With # of Clarifiers Online (Class I)	75%	-
Clarifier Diameter (Average)	113	ft
Surface Area per Clarifier Online (Average)	10,029	ft^2
Total Clarifier Surface Area Online	50,144	ft^2
V_o	21.29	ft/hr
a’	0.1646	-
b’	0.0016	-
$V_S = V_o e^{(-(a'+b''SVI)*(MLSS/1000))}$	-	-
Clarifier Design Safety Factor	1.30	-

Table 4.4 – Estimated Liquid Treatment Capacity vs. MLSS

MLSS	Aeration Basins AADF Capacity @ Y_{net}, MGD			Clarifiers AADF Capacity @ SVI, MGD		
	0.90	1.00	1.10	100	150	200
500	2.9	2.6	2.3	55.8	53.6	51.5
1,000	5.7	5.1	4.7	47.4	43.8	40.5
1,500	8.6	7.7	7.0	40.4	35.8	31.8
2,000	11.4	10.3	9.3	34.3	29.3	25.0
2,500	14.3	12.8	11.7	29.2	24.0	19.6
3,000	17.1	15.4	14.0	24.9	19.6	15.4
3,500	20.0	18.0	16.3	21.1	16.0	12.1
4,000	22.8	20.5	18.7	18.0	13.1	9.5
4,500	25.7	23.1	21.0	15.3	10.7	7.5
5,000	28.5	25.7	23.3	13.0	8.8	5.9
5,500	31.4	28.2	25.7	11.1	7.2	4.6
6,000	34.2	30.8	28.0	9.4	5.9	3.6
6,500	37.1	33.4	30.3	8.0	4.8	2.9
7,000	39.9	35.9	32.7	6.8	3.9	2.2
7,500	42.8	38.5	35.0	5.8	3.2	1.8
8,000	45.6	41.1	37.3	4.9	2.6	1.4
8,500	48.5	43.7	39.7	4.2	2.1	1.1
MLSS	Aeration Basins AADF Capacity @ Y_{net}, MGD			Clarifiers AADF Capacity @ SVI, MGD		
	0.90	1.00	1.10	100	150	200
9,000	51.4	46.2	42.0	3.6	1.8	0.9

9,500	54.2	48.8	44.4	3.0	1.4	0.7
10,000	57.1	51.4	46.7	2.6	1.2	0.5
Optimum MLSS						
3,334	**19.0**	**17.1**	**15.6**	**22.3**	**17.1**	**13.1**

Figure 4.1 – Aerobic Capacity Chart at 18 MGD AADF



Any point on the Aerobic Capacity diagram under both the aeration basin and clarifier capacity lines indicates a safe operating condition. As shown above in **Figure 4.1** and indicated in **Table 4.4**, the intersection of the lines for the aeration basin capacity with a Y_{net} of 0.9, and the clarifier capacity with an SVI of 100 mL/g indicates that an expanded aeration basin total volume of 5.5 MG can treat up to approximately 19.0 MGD at an MLSS concentration of 3,334 mg/L with the five existing clarifiers in service. Also, 22.3 MGD of mixed liquor flow can be clarified assuming an SVI of 100 mL/g. It should be noted that historical SVI's determined from samples from the aeration basins have averaged at or below 80 mL/g, however a conservative value of 100 mL/g was used to determine estimated clarification capacity. Thus, with an additional 2.0 MG of aeration basin volume added and one new 125-ft diameter clarifier, the sizes of the aeration basins and clarifiers seem to be sufficient for the SWWRF expansion to 18 MGD AADF.

4.1.2 Secondary Clarifier Solids Flux Analysis

Following this initial capacity check at the AADF conditions, a secondary clarifier solids flux analysis was performed for the SWWRF to determine the required clarifier capacity at the design MDF condition of 34.2 MGD. The maximum day flow typically sets the capacity of the secondary clarifiers while the peak hour flow establishes the capacity of the facility's hydraulic elements. A combination of maximum day or peak hour flows, mixed liquor settling velocity, and clarifiers safety factor establishes the capacity of the secondary clarifiers. For the SWWRF, a safety factor of 1.3 is chosen at maximum day flow, and the average sludge volume index (SVI) was taken as 100 mL/g given that for the whole historical data, the average SVI was only 80 mL/g. The SVI was used with the Daigger (1995) correlation between SVI and MLSS settling velocity to determine the Vesilind equation zone settling parameters V_0 and K. As shown in **Table 4.5** below, the solids flux analysis performed determined that 47,256 ft^2 of secondary clarifier surface area would be required at the MDF of 34.2 MGD. Based on this, the existing clarifiers at the SWWRF would not have sufficient capacity for MDF conditions with one of the larger 125-ft diameter clarifiers Nos. 3 or 4 offline. Therefore, a sixth 125-ft diameter clarifier is recommended to be constructed as part of the expansion to 18 MGD AADF to meet Class I reliability requirements.

Table 4.5 – Summary of Secondary Clarifier Solids Flux Analysis

Parameter	Description	Value	Units
Vesilind/Daigger Coefficients			
SVI	Sludge Volume Index	**100**	mL/g
V_0	Maximum Settling Velocity of Solids Interface	6.495	m/hr
V_0	Maximum Settling Velocity of Solids Interface	155.875	m/day
V_0	Maximum Settling Velocity of Solids Interface	3,826	gpd/ft^2
K	Vesilind Coefficient	0.323	L/g
Sizing of Secondary Clarifiers			
Q	Influent Flow	**34.2**	MGD
Q_R	RAS Flow Rate	**18.9**	MGD
X_o	MLSS Applied to Clarifiers	**4,340**	mg/L
R	Return Ratio	0.553	-
V_S	Zone Settling Velocity	941	gpd/ft^2
SF	Design Safety Factor	1.3	-
SOR_{Design}	Design Surface Overflow Rate	724	gpd/ft^2
A_S	Surface Area of Clarifiers Required	47,256	ft^2

4.1.3 Anoxic Basin Volume

Following the secondary clarifier solids flux analysis, a preliminary capacity check was also conducted for the anoxic basins to determine the anoxic basin volume required for the expansion to 18 MGD AADF utilizing the current MLE process. This preliminary capacity check was based on ensuring the anoxic basin volume provides sufficient hydraulic retention time (HRT) for denitrification, assuming adequate internal recycle of nitrified mixed liquor is provided from the aeration basins. Typical industry design guidelines, such as Metcalf & Eddy and WEF MOP 8 recommend a hydraulic retention time (HRT) of 1 to 3 hours for the anoxic zones of an MLE secondary treatment process. The existing 2.15 MG of anoxic basin volume provides an HRT of up to 3.25 hours at the current MMADF of 15.9 MGD. In addition, SWWRF operating staff have noted that normal operation of the facility requires a maximum of two (2) anoxic basins online to provide adequate denitrification to meet effluent NO_3-N limits. Under these operating conditions, two of the existing anoxic basins can provide an HRT of up to 1.62 hours at the current MMADF of 15.9 MGD. The range of HRT's provided by the existing anoxic basins is in line with typical design guidelines and recommendations and provides sufficient process volume to meet the facility's effluent NO_3-N limits as evidenced by historical effluent monitoring data.

The expansion of the SWWRF to an AADF capacity of 18 MGD, with a corresponding MMADF of 25.2 MGD, will require total anoxic basin volumes ranging from 1.05 MG to 3.15 MG to provide an HRT ranging from 1 to 3 hours. To provide adequate conservatism in the design for the purposes of this CER, it is assumed that an HRT of 3 hours must be provided at the 25.2 MGD MMADF conditions to ensure sufficient flexibility for potential future changes in influent TKN loading. As noted above, this corresponds to a total anoxic basin volume of 3.15 MG. To provide consistency between process trains, it is assumed that two new 0.5375 MGD anoxic basins will be constructed, matching the size of the four existing anoxic basins. As noted above, this additional anoxic volume is recommended to provide adequate operational flexibility, and it is not anticipated to be required as part of the immediate construction for the expansion of the SWWRF. As an added benefit, the additional anoxic basin volume recommended to be constructed in the future also provides additional flexibility for Manatee County to incorporate an anaerobic zone at the head of each anoxic basin to provide biological phosphorus removal, if regulatory changes require phosphorus removal.

The following evaluation further details this capacity check of the expanded SWWRF utilizing the calibrated BioWin model. The BioWin model is used to demonstrate that the expanded SWWRF unit processes can adequately perform treatment and meet permit requirements at the expansion flows of 18 MGD AADF, 25.2 MGD MMADF, and 34.2 MGD MDF.

4.2 Process Evaluation of the SWWRF Expansion at 18 MGD AADF

The influent pollutant concentrations data for the past three-years of influent data as well as the results of the special sampling performed in February 2019 was used for the process evaluation of the SWWRF expansion to 18.0 MGD AADF. The goal of this process evaluation is to demonstrate that the expanded SWWRF will meet the requirements of the SWWRF's permit at the future design flow of 18.0 MGD AADF with the addition of two 1.0 MG aeration basins and one 125-ft diameter Clarifier No. 6. **Figure 4.2** below depicts the secondary clarifiers state point analysis diagram for the future expansion at 18 MGD AADF with two 105-ft diameter clarifiers and two 125-ft diameter clarifiers in service. As shown in the state point analysis diagram, the existing clarifiers are expected to be well within their design range with one 105-ft clarifier and one 125-ft diameter clarifier out of service at the 18 MGD AADF design condition. **Table 4.6** below shows the process model simulation inputs and results for the future expansion at 18 MGD AADF with two additional anoxic basins and two additional aeration basins. The effluent pollutant concentrations are expected to be well within the facility's permit requirements at the 18 MGD AADF design condition.

Figure 4.2 – Clarifier State Point Analysis Diagram at Future 18 MGD AADF

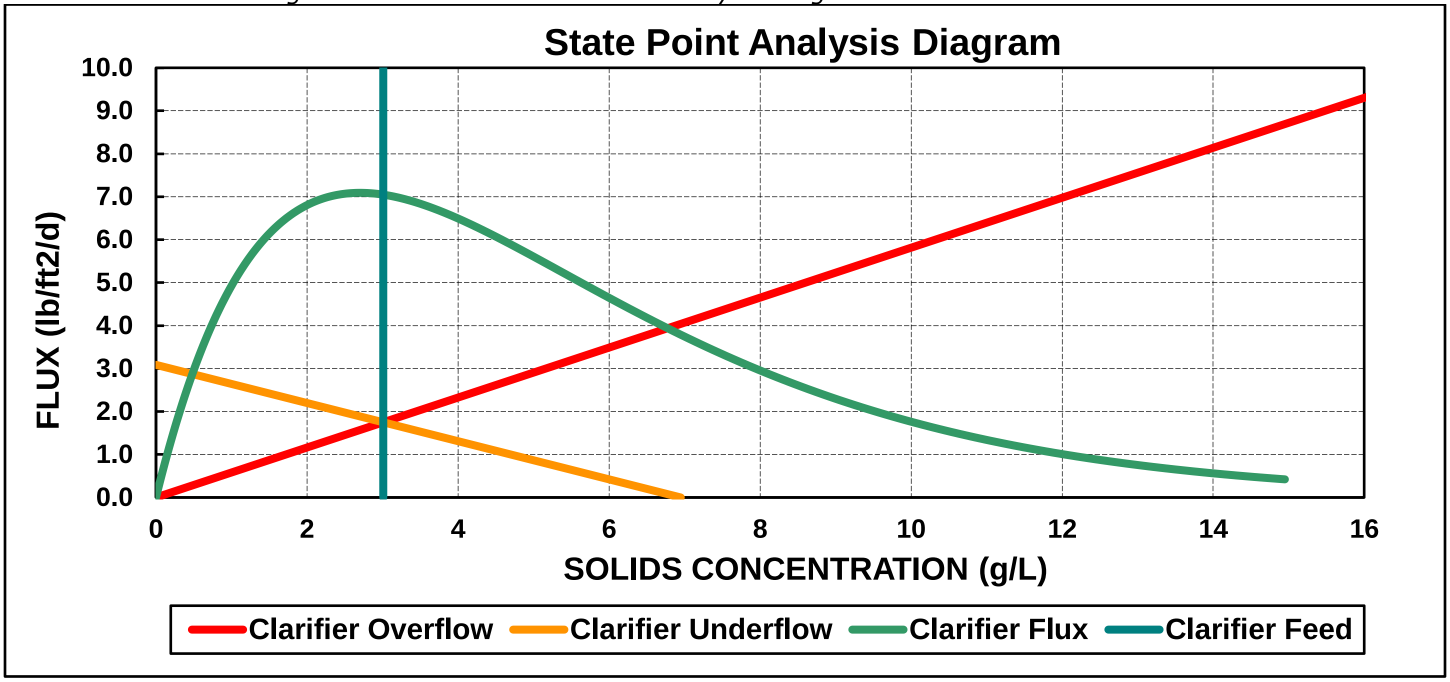


Table 4.6 – Process Model Simulation Inputs and Results at Future 18 MGD AADF

Parameter	Value @ AADF
Influent Design Flow (MGD)	18
Anoxic Process Volume (MG)	3.225
Aerobic Process Volume (MG)	5.5
Aerobic SRT (days)	6.79
Total SRT (days)	10.81
MLSS (mg/L)	2,909
Total HRT (hours)	11.6
Design DO (mg/L)	2.0
Nitrified Recycle Rate (% of Influent Flow)	250%
Air Flow Rate (scfm @ 20 °C, 1 atm)	17,186
Secondary Clarifier Hydraulic Loading (gpd/ft^2)	410.1
RAS (MGD)	13.17
RAS Rate (% of Influent Flow)	73%
Secondary Clarifier Solids Loading (lb/ft^2)	17.4
Design SVI (mL/g)	100
WAS (MGD)	0.33
WAS (lb/day)	18,185
Influent $CBOD_5$ (mg/L)	132
Influent BOD_5 (mg/L)	157
Influent COD (mg/L)	378
Influent TSS (mg/L)	158
Parameter	Value @ AADF
Influent VSS (mg/L)	135

Influent TKN (mg/L)	36
Influent NH_3-N (mg/L)	32
Effluent $CBOD_5$ (mg/L)	3.2
Effluent NO_3-N (mg/L)	5.8
Effluent TSS (mg/L)	7.6
Effluent TN (mg/L)	7.5
Effluent NH_3-N (mg/L)	0.0
Effluent COD (mg/L)	39
Effluent NO_2-N (mg/L)	0.0

4.3 Process Evaluation of the SWWRF Expansion at 25.2 MGD MMADF

Although wastewater treatment facilities are typically rated for their ability to treat annual average daily flows and loads, they are typically designed for the maximum month average daily flows and loads to ensure that the facility can perform adequately under maximum sustained loading conditions. The following simulation was run similarly to the simulation at AADF conditions using the same influent pollutant data from the previous three years in conjunction with the flow and loading peaking factors determined for MMADF conditions, as previously presented above in **Table 2.4**. The clarifier state point analysis for the 25.2 MGD MMADF conditions with three 105-ft diameter clarifiers and two 125-ft diameter clarifiers in service is presented in **Figure 4.3** below. As shown in this figure, the existing clarifiers are still underloaded at the future MMADF conditions with a new 125-ft diameter clarifier No. 6 offline to meet Class I reliability. **Table 4.7** below presents the process model simulation inputs and results for the future 25.2 MGD MMADF design conditions for sustained peak loading to the SWWRF. Again, the process model simulation results indicate that the SWWRF is expected to meet effluent permit requirements with the expansion two additional anoxic basins, two additional aeration basins, and the addition of a sixth 125-ft diameter secondary clarifier.

Figure 4.3 – Clarifier State Point Analysis Diagram at Future 25.2 MGD MMADF

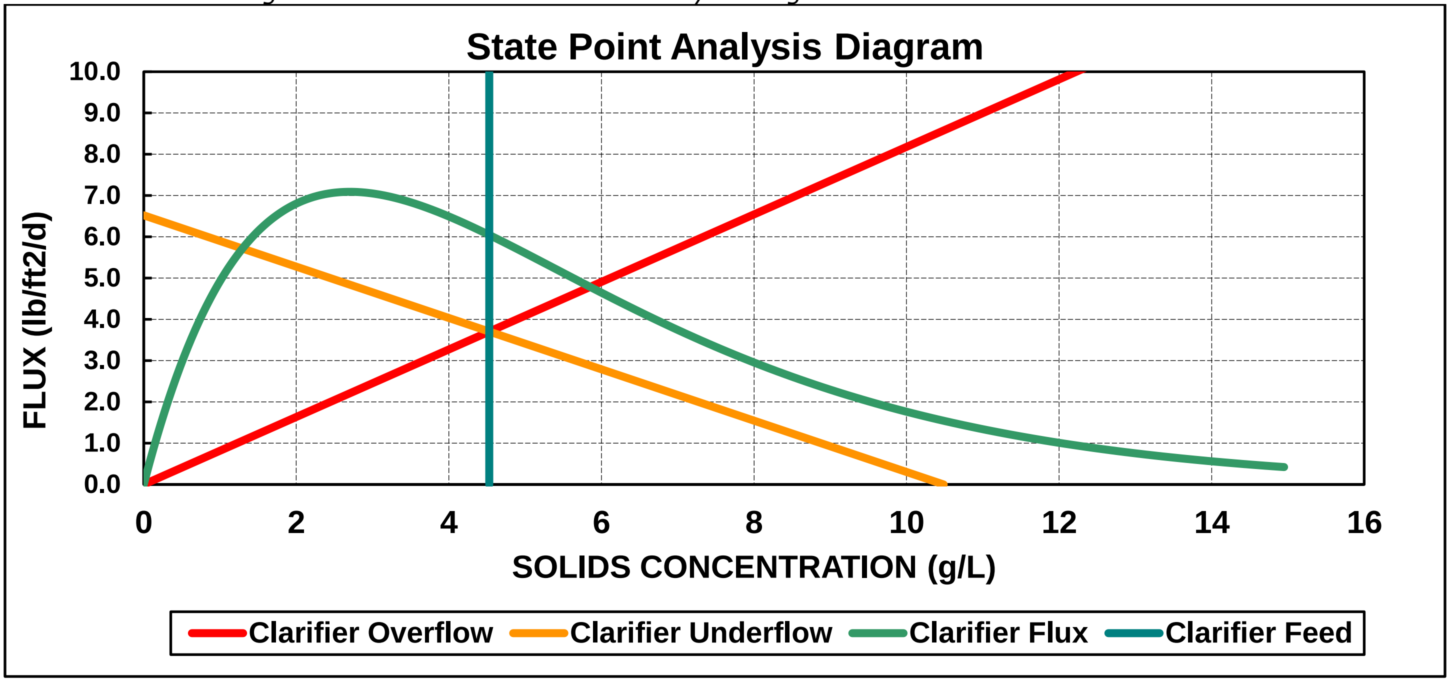


Table 4.7 - Process Model Simulation Inputs and Results at Future 25.2 MGD MMADF

Parameter	Value @ MMADF
Influent Design Flow (MGD)	25.2
Anoxic Process Volume (MG)	3.225
Aerobic Process Volume (MG)	5.5
Aerobic SRT (days)	6.68
Total SRT (days)	10.63
MLSS (mg/L)	4,340
Total HRT (hours)	8.3
Design DO (mg/L)	2.0
Nitrified Recycle Rate (% of Influent Flow)	250%
Air Flow Rate (scfm @ 20 °C, 1 atm)	27,408
Secondary Clarifier Hydraulic Loading (gpd/ft^2)	489
RAS (MGD)	18.57
RAS Rate (% of Influent Flow)	73%
Secondary Clarifier Solids Loading (lb/ft^2/d)	27.7
Design SVI (mL/g)	100
WAS (MGD)	0.33
WAS (lb/day)	27,167
Influent $CBOD_5$ (mg/L)	118.8
Influent BOD_5 (mg/L)	141.3
Influent COD (mg/L)	364.5
Influent TSS (mg/L)	174.9
Parameter	**Value @ MMADF**
Influent VSS (mg/L)	170.7

Influent TKN (mg/L)	29.1
Influent NH_3-N (mg/L)	27.4
Effluent $CBOD_5$ (mg/L)	4.5
Effluent NO_3-N (mg/L)	3.9
Effluent TSS (mg/L)	9.7
Effluent TN (mg/L)	5.8
Effluent NH_3-N (mg/L)	0.0
Effluent COD (mg/L)	49
Effluent NO_2-N (mg/L)	0.0

4.4 Process Evaluation of the SWWRF Expansion at 34.2 MGD MDF

During short duration peak conditions at maximum day flows, which are typically the result of wet weather events, wastewater treatment facilities must also perform adequately. The following simulation was run at the design MDF of 34.2 MGD for the expanded facility to verify that the facility can provide adequate treatment under short duration peak conditions. Again, influent loading to the SWWRF under MDF conditions was based on the most recent three years of influent pollutant data in conjunction with the flow and loading peaking factors determined for the MDF conditions, as previously presented in **Table 2.4** above. Based on the clarifier state point analysis shown below in **Figure 4.4**, the existing five clarifiers will be capable of clarifying the future MDF conditions of 34.2 MGD, with one new 125-ft diameter clarifier No. 6 out of service. The clarifiers are beginning to approach a critically loaded condition in this scenario with all 5 existing clarifiers in service, however, once constructed, the 6th clarifier would normally be in operation and would help to further reduce the hydraulic and solids loading to each clarifier, thus improving the operating state point for each clarifier in service. Based on this, the addition of the 6th clarifier will meet Class I Reliability requirements, which states that the clarifiers must be able to treat 75% of the design flow (MDF) with the largest unit out of service. Also, as shown in **Table 4.8** below, the expanded SWWRF is still capable of meeting all monthly effluent treatment goals under the MDF conditions. However, the aerobic SRT under this condition is very close to the minimum SRT required to maintain nitrification in the winter, and the MLSS concentration is nearing the limit of the maximum MLSS allowable for reliable clarification. Despite this, the duration and frequency of these events are expected to the short-lived and infrequent so as to not impair the ability of the SWWRF to meet monthly permit limits and effluent quality goals.

Figure 4.4 – Clarifier State Point Analysis Diagram at Future 34.2 MGD MDF

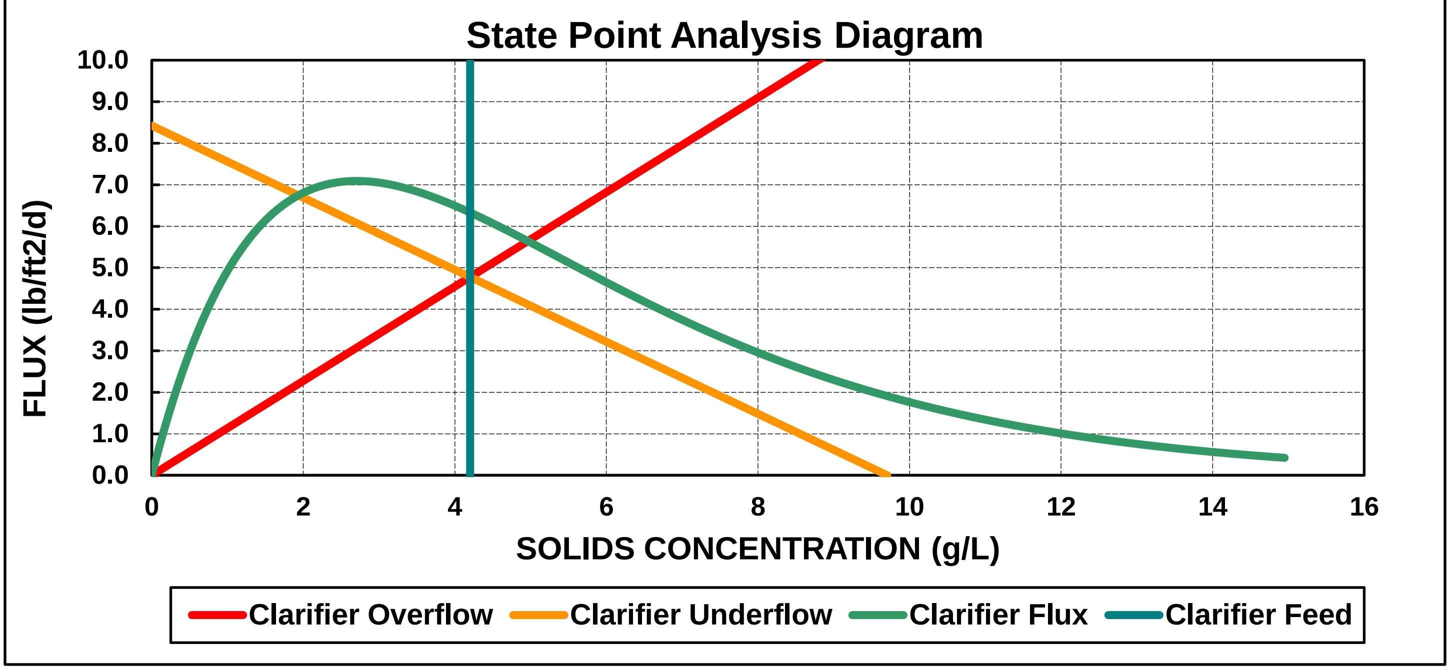


Table 4.8 – Process Model Simulation Inputs and Results at Future 34.2 MGD MDF

Parameter	Value @ MDF
Influent Design Flow (MGD)	34.2
Anoxic Process Volume (MG)	3.225
Aerobic Process Volume (MG)	5.5
Aerobic SRT (days)	3.65
Total SRT (days)	5.80
MLSS (mg/L)	4,213
Total HRT (hours)	6.1
Design DO (mg/L)	2.0
Nitrified Recycle Rate (% of Influent Flow)	250%
Air Flow Rate (scfm @ 20 °C, 1 atm)	37,681
Secondary Clarifier Hydraulic Loading (gpd/ft^2)	665.1
RAS (MGD)	25.05
RAS Rate (% of Influent Flow)	73%
Secondary Clarifier Solids Loading (lb/ft^2/d)	41.1
Design SVI (mL/g)	100
WAS (MGD)	0.60
WAS (lb/day)	48,498
Influent $CBOD_5$ (mg/L)	159.3
Influent BOD_5 (mg/L)	189.5
Influent COD (mg/L)	380.7
Influent TSS (mg/L)	274.2
Parameter	**Value @ MDF**
Influent VSS (mg/L)	183.2

Influent TKN (mg/L)	36.0
Influent NH_3-N (mg/L)	31.1
Effluent $CBOD_5$ (mg/L)	7.2
Effluent NO_3-N (mg/L)	4.2
Effluent TSS (mg/L)	15.5
Effluent TN (mg/L)	6.9
Effluent NH_3-N (mg/L)	0.2
Effluent COD (mg/L)	58
Effluent NO_2-N (mg/L)	0.3

5. FACILITY ASSESSMENT FOR THE EXPANSION TO 18 MGD AADF

This section describes the expected capacity of the equipment for the proposed SWWRF's unit processes for the expansion to 18 MGD AADF, from the headworks to the chlorine contact chambers (CCCs). The capacity requirements of all unit processes within the expanded SWWRF are based on the flows and loading expected at the future design flow rates, industry standard guidelines such as WEF MOP 8 or the 10 State Standards, and Class I Reliability requirements as defined by the United States Environmental Protection Agency (USEPA) and as carried by FDEP. To meet Class I Reliability, the following conditions apply:

- Flow equalization shall not be considered as a substitute for component backup requirements.
- A backup aeration basin shall not be required; however, at least two equal volume basins shall be provided.
- Aeration blowers shall be of a sufficient number to enable the design oxygen transfer to be maintained with the largest capacity unit out of service. At least two units shall be installed.
- The air diffusion system for each aeration basin shall be designed such that the largest section of diffusers can be isolated without measurably impairing the oxygen transfer capability of the activated sludge treatment system.
- For the clarifiers and filters, there shall be a quantity of units of a size of each, such that with the largest flow capacity unit out of service, the remaining units shall have a design flow capacity of at least 75% of the total design flow to that unit operation.
- The chlorine contact chambers shall be of a sufficient number of units of a size, such that with the largest flow capacity unit out of service, the remaining units shall have a design flow capacity of at least 50% of the total design flow to that unit operation.
- A backup pump shall be provided for each set of pumps which perform the same function. The capacity of pumped systems shall be such that with any one pump out of service, the remaining pumps will have capacity to transfer the peak flow. It is permissible for one pump to serve as a backup to more than one set of pumps.

5.1 Preliminary Treatment System

5.1.1 New Headworks Project

The new headworks at the SWWRF has been designed for an AADF of 18 MGD and a PHF of 54 MGD. When commissioned, the new headworks will include the following unit processes:

- Influent screening to remove rags and debris

- Induced vortex stacked tray grit removal system
- Grit washing, compaction, and disposal
- Odor control system

Raw wastewater from the SWWRF's service area will enter the headworks through a 48-inch diameter force main. A 60-inch Parshall Flume will record the flow from the force main before it enters the influent channel. The influent channel also receives flow from the supernatant lift station, the plant drain pump station, and the lined reject pond before passing through the mechanical wastewater screens. According to the new headworks design report, 'the County should consider leaving the current configuration of FM 27-A, FM 1M, the onsite 42-inch FM and the existing 42-inch by-pass in place'. The existing 42-inch by-pass discharges through a manual bar screen located at the anoxic basins which would provide the County with a means to screen the influent if the new headworks needs to be bypassed in the event of an emergency.

Effluent from the new headworks will be transferred to Splitter Box No. 1 by a new 54-inch gravity main. A new 54-inch by 64-inch diameter tapping sleeve and valve will be installed on the existing 64-inch diameter mixed liquor pipe to Splitter Box No. 1 to convey the screened raw sewage from the new headworks 54-inch diameter effluent to Splitter Box No. 1. The existing 64-inch diameter mixed liquor line currently conveys all screened raw sewage from the existing headworks, NRCY flows from the aeration basins, and RAS flows from the secondary clarifiers to Splitter Box No. 1.

The new headworks structure will include three parallel channels, each with a Hydro-Dyne 6-mm perforated center-feed screens followed by a screenings washer/compactor. The new influent screens will be capable of accommodating a peak hourly flow of 54 MGD with two duty screens, and one standby screen. The new headworks also includes three Hydro International HeadCell® stacked tray induced vortex grit removal units, each provided with ten (10) 12-ft diameter trays. The grit slurry from each HeadCell® unit will then be sent to a grit washing/classification unit; a combination of a Hydro International SlurryCup™ for grit washing, and a Grit Snail® clarifier for grit dewatering to meet 95% removal of 106-micron and larger particles.

5.2 Secondary Treatment System

5.2.1 Anoxic/Aerobic System and Clarification

As demonstrated in **Section 4** of this memorandum, the expansion of the anoxic and aerobic unit processes of the MLE process, from 2.15 MG to 3.225 MG for the anoxic basins and 3.5 MG to 5.5 MG for the aeration basins, is expected to meet the facility's permit requirements even at the future maximum day flow of 34.2 MGD. The existing nitrified internal recycle (NRCY) pumping system, which was designed as part of the latest upgrades in 2017 to return up to 250% of the influent wastewater flow rate must be capable of returning at least 300% of the influent wastewater flow rate over normal operation, and at least 250% of the influent flow rate at maximum month conditions to keep the nitrate levels in the effluent under 9.0

mg/L. This can be modified during the expansion to 18 MGD AADF with the upsizing of the existing NRCY pumps, installation of additional NRCY pumps in the new aeration basins, replacement of the existing NRCY pipeline segments where necessary, and extension of the common NRCY pump discharge piping to accommodate the additional NRCY pumps required.

Based on the modeling results for the expansion to 18 MGD AADF presented above, the existing aeration system will not be sufficient to supply the required air flow rate for nitrification at maximum month average daily flow and maximum day flow conditions. Per Class I Reliability requirements, aeration blowers shall be of a sufficient number to enable the design oxygen transfer to be maintained with the largest capacity unit out of service. Currently, the SWWRF has five 200 hp multi-stage centrifugal blowers with a capacity of 2,900 scfm per unit and two 300 hp high-speed turbo blowers with a capacity of 6,600 scfm per unit, for a total firm capacity of 21,100 scfm and a total installed capacity of 27,700 scfm. At the maximum month average daily flow of 25.2 MGD, the required air flow rate to the basins is 27,408 scfm based on model results to maintain a minimum DO concentration of 2.0 mg/L, per **Table 4.7**. At the maximum day flow of 34.2 MGD, the required air flow rate to the basins is 37,681 scfm, which is based on maintaining a minimum DO concentration of 2.0 mg/L, per **Table 4.8**. As a result, the five existing multi-stage centrifugal blowers are recommended to be replaced with five new 350-hp blowers, while the two existing 300-hp high-speed turbo blowers will remain in service. For the purposes of this CER, it is assumed that the five new blowers will be high-speed turbo blowers of the same manufacturer as the two existing 300-hp high-speed turbo blowers. However, it should be noted that the new blowers may consist of a mixture of multi-stage centrifugal blowers for the base aeration requirements, and several high-speed turbo blowers to provide the capacity needed for maximum day conditions and the turn-down range needed for average conditions. This approach may reduce cost and alleviate space limitations in the existing north blower building.

Class I Reliability also requires that the air diffusion system for each aeration basin shall be designed such that the largest section of diffusers can be isolated without measurably impairing the oxygen transfer capability of the activated sludge treatment system. Based on this it is assumed that the existing aeration diffusers must be replaced to meet this requirement. As a result, the improvements to provide the required air flow rate to the aeration basins are expected to include upsizing of the existing air headers, extension of the air headers to the new aeration basins, and replacement of the existing diffusers in the existing aeration basins.

As for the secondary clarifiers totaling 50,521 ft^2 of surface area, the primary issue is that there is no redundancy for clarification as all five existing clarifiers must be in service at the same time at the MDF of 34.2 MGD. If there is any issue with any one of the five existing clarifiers, the SWWRF will not be able to adequately treat the maximum day flow. Therefore, one additional 125-ft diameter clarifier will be required for the expansion to meet the requirements of the maximum day flow with one of the larger 125-ft diameter clarifiers out of service. The WAS system removes solids from the bottom of the existing clarifiers through multiple sets of WAS pumps. There are three sets of two WAS pumps for a total of 6 existing WAS pumps with clarifier Nos. 1 and 2, clarifier Nos. 3 and 4, and clarifier No. 5 each having a set of two WAS pumps, respectively. However, the WAS pumps associated with clarifier Nos. 1 and 2 are currently inoperable and WAS cannot be wasted from these clarifiers as noted in Section 2.4. The WAS removed from each clarifier is pumped to the existing aerated sludge holding tanks on the opposite side of 65th Street West via the existing 8-inch diameter WAS piping for storage prior to dewatering. To accommodate the expansion to 18 MGD AADF, the existing WAS pumps for clarifier Nos. 1 and 2 must be replaced to ensure sufficient WAS pumping capacity. In addition, a new RAS/WAS pump station must be constructed to serve new clarifier No. 6 as part of the expansion.

5.3 Tertiary Treatment

5.3.1 Tertiary Filtration

The SWWRF has an existing tertiary filtration system for removal of additional suspended solids from the treated and clarified secondary effluent. The existing tertiary filtration system comprises of seven (7) tertiary filters with a total combined filtration surface area of 9,024 ft^2, including the following:

- One (1) Aqua-Aerobic Systems, Inc. AquaDiamond® cloth media traveling bridge filter (filter No. 1) with a filtration surface area of 1,920 ft^2
- Four (4) ABW sand and anthracite traveling bridge filters (filter Nos. 2 – 5) with a filtration surface area of 1,056 ft^2 per unit
- Two (2) automatic backwash (ABW) sand and anthracite traveling bridge filters (filter Nos. 6 and 7) with a filtration surface area of 1,440 ft^2 per unit

Clarified secondary effluent flows by gravity to the filter influent channel and through the filter influent gate to each of the seven filters units. Filter influent flows by gravity through the double layer of 12-inch anthracite and 12-inch sand on top of the support gravel and the underdrain system in the ABW filters, and through the cloth media, cloth media diamond laterals, and the effluent wall in the AquaDiamond® filter unit. The filtered effluent continues flowing by gravity to the CCCs for chloramine disinfection. Backwash waste from the tertiary filters containing the solids removed by the filters is collected in a spent backwash mudwell and returned to the plant influent for treatment via the plant drain system.

The hydraulic loading rate (HLR) to the filtration system at the maximum day flow of 34.2 MGD is 6.5 gpm/ft^2 for the Aqua Diamond filter and 1.59 gpm/ft^2 for the ABW filters. If a second Aqua Diamond filter is added, through the retrofit of one of the four 1,056 ft^2 ABW filters (filter Nos. 2 through 5), and assuming one of the two AquaDiamond® filters is out of service for Class I Reliability, the remaining six filters with a total surface area of 7,968 ft^2 and with the AquaDiamond® HLR of 6.5 gpm/ft^2 would result in a HLR of 2.59

gpm/ft² for the five ABW filters, which is higher than the 2.0 gpm/ft² for the ABW filters. Based on this, three AquaDiamond® filters would be necessary to meet the Class I Reliability requirement.

Table 5.1 shows the calculated HLR for each flow condition, assuming the largest filter is always unavailable.

Table 5.1 – Tertiary Filter Hydraulic Loading Rates for the SWWRF Expansion to 18 MGD AADF

Flow Condition	Flow, MGD	Flow, gpm	Peaking Factor	Filter Area, ft²	HLR, gpm/ft²
AADF	18.0	12,500	-	9,024	1.4
MMADF	25.2	17,500	1.40	9,024	1.9
MDF[1]	34.2	23,750	1.90	9,024	6.5/1.59
Class I Reliability[2]	40.5	28,125	3.0	7,968	6.5/2.59
Class I Reliability[3]	40.5	28,125	3.0	8,832	6.5/0.63
Class I Reliability[4]	40.5	28,125	3.0	6,720	6.5/1.10

[1]At MDF, the AquaDiamond® filter will have HLR of 6.5 gpm/ft² and the ABW filters will have an HLR of 1.6 gpm/ft².

[2]Class I Reliability with one of two 1,920 ft² AquaDiamond® filters out of service, the ABW filters HLR would be 2.59 gpm/ft²; does not meet Class I Reliability since ABW filter PHF design hydraulic loading rate is 2.0 gpm/ft².

[3]Class I Reliability with one of three 1,920 ft² AquaDiamond® filters out of service, meets requirements.

[4]Class I Reliability with one of three 1,920 ft² AquaDiamond® filters out of service and only ABW filter Nos. 6 and 7 in service.

As shown in the table above, the addition of two new AquaDiamond® filters for a total of three will allow the SWWRF to meet Class I reliability requirements easily with the remaining four ABW filters in service. In fact, with one of three AquaDiamond® filters out of service, Class I reliability may be met with just the two 1,440 ft² ABW filters (Nos. 6 and 7) in service.

In discussions with the County, it was noted that the County is proceeding with the demolition of existing filter Nos. 1 and 2, the relocation of existing AquaDiamond filter No. 1 to existing ABW filter No. 3, the conversion of ABW filter No. 4 to a new AquaDiamond filter, preparations for ABW filter No. 5 to be converted to an AquaDiamond filter in the future, and the construction of a new canopy structure over filter Nos. 3, 4, and 5 to limit algae growth. Based on the findings described above, the County may proceed with this plan if ABW filter No. 5 is also converted to a new AquaDiamond filter in the future, with a filtration surface area of 1,920 ft², for a total of three (3) equally sized AquaDiamond filters with a peak hydraulic capacity of 17.97 MGD each. In addition, the County has noted this ongoing filter improvements project includes hydraulic improvements to the filter effluent channels and filtered effluent piping to the CCC's to reduce head loss and prevent the filter effluent weirs from being submerged. This would likely require replacement of the existing 36-inch and 54-inch diameter filtered effluent piping with a new common effluent channel from all filters to the CCCs. For the purposes of this report the cost to convert ABW filter No. 5 to an Aqua Diamond filter was included. It is assumed that the County is proceeding with the plan, under a separate project, to demolish existing filters Nos. 1 and 2 and provide three AquaDiamond filters in existing filters

Nos. 3 and 4, complete with a new canopy structure and hydraulic improvements from the filters to the CCCs.

It should be noted that if the County moves forward with this plan, it would resolve flow splitting issues between the ABW filters and AquaDiamond filters under normal operating conditions since only the AquaDiamond filters would be required. At present, there is no way to properly split flow between the AquaDiamond filter No. 1 and the remaining ABW traveling bridge sand and anthracite filters to avoid exceeding the hydraulic loading rate for the ABW filters.

5.3.2 Disinfection

The SWWRF produces high quality advanced level treated effluent which meets the regulatory requirements for Part III public access reuse (PAR). To meet these requirements, the facility provides high level disinfection, using chloramination in three existing chlorine contact chambers (CCC). As described earlier, the filtration unit process that precedes the disinfection system provides the additional TSS removal (beyond secondary treatment levels) in accordance with the requirements of Chapter 62-600 F.A.C. The applicable regulatory requirement for high-level disinfection as stated in the facility permit (# FLA012619) is to maintain a minimum of 1.0 mg/L of total residual chlorine at the end of the CCCs for a minimum contact time of 15 minutes based on peak hourly flow (62-600.440 (5) (b)).

The proposed expansion of the SWWRF is for 18 MGD AADF capacity. The corresponding max day flow is estimated to be 34.2 MGD. The disinfection facility includes three (3) CCCs providing a total operating volume of 0.414 MG. A mixture of Liquid Ammonium Sulfate (LAS) 40% solution and Sodium Hypochlorite (NaOCl) 12.5% w/w is used as the disinfection agent. At the expanded flow of 18 MGD AADF, the existing disinfection facility at the SWWRF will provide a chloramine contact time of approximately 33.1 minutes. At the future MMADF of 25.2 MGD, the contact time would be 23.6 minutes; and at the future MDF of 34.2 MGD, the contact time would be 17.4 minutes. For Class I Reliability, the contact time at 50% of the PHF with one of the three CCCs out of service is 14.72 minutes. This is very close to the 15 minutes stated in the facility permit, and as a result, it is expected that the chloramine dosing rate may be slightly increased at the peak hourly flows to provide additional disinfection that would equate to the same CT value provided if the contact time of 15 minutes was met. The basis of design for the disinfection system is presented below in **Table 5.2**.

Table 5.2 – Chlorine Contact Chambers Basis of Design

Parameter	Current Design at AADF	Current Design at MMADF	Current Design at MDF	Class I Reliability at PHF
Plant Flow	**MGD/gpm**	**MGD/gpm**	**MGD/gpm**	**MGD/gpm**
Q	18 / 12,500	25.2 / 17,500	34.2 / 23,750	27 / 18,750
Contact Time, mins.	33.1	23.6	17.4	14.7

Alternatively, the compliance boundary for the CCC chloramine contact time may be moved to the effluent of the CCC effluent channel, which would provide an estimated total contact time exceeding 15 minutes under all conditions at Class I reliability. Assuming a worst case scenario with only CCC's 1 and 2 in service, all effluent flow directed to the Recharge Well PS, and the low water level in the Recharge Well PS is at an elevation of 9.59 feet above MSL (2.25 feet of water in the wet well), the total combined contact time including the CCC effluent channel is estimated at 15.03 minutes. This meets Class I reliability requirements and requires no changes to current chloramine dosing operations.

5.4 Effluent Pumping and Reject Capacity

The reuse transfer pumps (effluent pumps), pumping from the wetwell at the end of the CCC have a firm capacity to the ground storage tanks at full condition of 36 MGD with five of the six pumps running. These pumps must be replaced to meet the PHF condition of 54 MGD. This assumes that the recharge pump station, which pumps from the same wetwell, is not available and pumping to full ground storage tanks. The flowrate per pump must be 7,500 gpm (10.8 MGD) at an estimated 85 feet of head. The horsepower for these pumps is estimated to be 225 HP. The discharge and valve assemblies for each pump should be upsized for the higher flowrate. The header can remain as-is. The estimated cost for the effluent pump upgrades is listed in **Section 7**. The 36-inch pipelines from the effluent pump station to storage ponds and ground storage tank could result in higher than recommended velocities, over 10 feet per second, at 54 MGD in any one segment. Therefore, it is recommended that the distribution pipelines for this system be evaluated further in preliminary design for the upgrade of the pump station. The reclaimed water storage system and high service pump station are permitted separately under the MCMRS permit. Improvements to these systems are outside the scope the SWWRF expansion.

F.A.C. requirements for reclaimed water state that one day of the facility's design flow is required for reject storage. The existing lined reject pond is 18 MG and meets this requirement. The effluent pump station is valved downstream to pump to the reject storage upon operator control. Therefore, flow to the reject pond will be sufficient with effluent pump station improvements noted above. From the SWWRF Lake Filtration and Pond Improvements project basis of design report the reject pump station was modeled as having 14.5 MGD and 19 MGD capacity going back to the filters and headworks (at the time). The design requirement in the basis of design report was to empty the reject pond in no more than three days. The capacity still meets this requirement. There is no need to upgrade the reject pump station unless the County decides in the future that the reject pond needs to be emptied in less time.

5.5 Biosolids Handling

Waste activated sludge and scum withdrawn from the secondary clarifiers is conveyed to four existing aerated sludge holding tanks for storage prior to dewatering, each with a volume of 0.825 MG, for a total storage volume of 3.30 MG. Each existing aerated sludge holding tank is provided with a jet aeration and mixing system, consisting of one 50 hp end-suction centrifugal jet motive pump with a capacity of 6,600 gpm and one 75 hp positive displacement blower with a capacity of 940 scfm. Aeration and mixing is provided to keep the contents of each tank in suspension and to prevent septic conditions that would degrade the quality of the biosolids and produce foul odors.

The existing aerated sludge holding tanks are arranged with three "primary" tanks, and one "secondary" tank. The southwestern aerated sludge holding tank is the existing "secondary" tank, corresponding to its former service as the secondary anaerobic digester, as shown in the 1988 expansion record drawings, sheet M-86. All WAS and scum from the clarifiers is directed to one of the three primary tanks first, with sludge feed to each primary tank alternated manually by facility operating staff as needed. Sludge stored in the primary aerated sludge holding tanks is transferred to the secondary aerated sludge holding tank before it is fed to the existing belt filter presses for dewatering. Sludge is only fed to the belt filter presses for dewatering from the secondary aerated sludge holding tank.

The biosolids handling processes at the SWWRF must be designed to withstand the maximum month loading conditions to ensure there is sufficient storage and belt filter press dewatering capacity to process the WAS produced under sustained maximum loading conditions. In addition, the sludge holding tanks must have sufficient storage volume to accommodate the WAS produced at maximum day loading conditions to accommodate short-term surges in WAS production. At the future MMADF conditions of 25.2 MGD, the process model simulation predicted a WAS flow rate of 0.33 MGD and a WAS production of 27,167 lb/day. At the future MDF conditions of 34.2 MGD, the process model simulation predicted a WAS flow rate of 0.60 MGD and a WAS production of 48,498 lb TS/day. **Table 5.3** below presents a summary of the storage capacity of the existing aerated sludge holding tanks.

Table 5.3 – Aerated Sludge Holding Tanks Capacity Summary

Flow Condition	WAS Flow, MGD	Sludge Holding Volume, MG	Storage Duration, days
MMADF[1]	0.33	3.30	10.0
MMADF[2]	0.33	2.475	7.50
MDF[1]	0.612	3.30	5.39
MDF[2]	0.612	2.475	4.04

[1]Flow condition with all aerated sludge holding tanks online

[2]Flow condition with three of four aerated sludge holding tanks online

Biosolids dewatering is performed at the SWWRF prior to transport of biosolids to the Manatee County Southeast WRF (SEWRF) for thermal drying and production of class AA biosolids for marketing and distribution. Dewatering at the SWWRF is performed by six (6) 2-meter belt filter presses following aerated sludge holding. The design loading rate for each belt filter press is 1,200 lb/hr. Dewatering capacity of the BFPs is established based on the maximum month loading condition with one BFP out of service to provide process redundancy. Due to the level operational oversight required for BFPs, it is recommended that normal operation not exceed 5 days of operation per week, with normal operating conditions per day not exceeding one full 8 hour shift. Extended shift durations may be allowed to handle short-term peak loading conditions as needed. A summary of the BFP dewatering capacity at the future maximum month average daily flow conditions of 25.2 MGD is presented in **Table 5.4** below. As shown below, the existing BFPs have sufficient capacity to process the sludge production at the future MMADF conditions with one BFP out of service without exceeding 8 operating hours per week day. Based on this summary, the existing aerated sludge holding tanks provide sufficient storage capacity to accommodate the BFP dewatering schedule including the required capacity to accommodate short-term peaks in sludge production at maximum day flow conditions. No modifications to the biosolids handling processes are expected to be required for the expansion of the SWWRF to 18 MGD AADF.

Table 5.4 – BFP Dewatering Capacity Summary

Parameter	Value	Units
WAS Flow at MMADF	330,000	gpd
WAS Production Rate	27,167	lb/day
Recommended Maximum SLR per BFP	1,200	lb/hr
Operating Hours per Week at Max. SLR	158.5	hrs
Maximum Dewatering Days per Week	5	days
Total Required Operating Hours per Day	31.7	hrs
No. of BFPs in Service	5	-
Operating Hours per Week at Max. SLR, per BFP	31.7	hrs
Required Operating Hours per Day, per BFP	**6.34**	**hrs/day**

5.6 Hydraulic Evaluation

The hydraulic profile of the SWWRF was modeled using Visual Hydraulics hydraulic profile modeling software, Version 5.1, to evaluate the hydraulic capacity of the SWWRF at the future peak hourly flow of 54 MGD. The SWWRF's hydraulic profile was modeled assuming the proposed anoxic basins, aeration basins, and secondary clarifier No. 6 required for the MLE expansion to 18 MGD AADF have been installed and are in operation. The hydraulic model flow diagram and the report output from the Visual Hydraulics software is presented in **Appendix C**. The intention of this hydraulic evaluation is to determine if the expanded facility can meet Class I reliability requirements without any major modifications to the existing splitter boxes, channels, and yard piping. As defined by the USEPA and carried by the FDEP, the SWWRF's unit operations shall be designed such that with the largest flow capacity unit out of service, the hydraulic capacity of the remaining units shall be sufficient to handle the peak wastewater flow. In addition, to meet Class I Reliability, flow equalization shall not be considered as a substitute for component backup requirements. Therefore, the hydraulic evaluation considers the full non-equalized peak hourly flow rate of 54.0 MGD through the SWWRF to identify hydraulic deficiencies. Assumptions were made regarding the arrangement and operation of the expansion to the SWWRF's MLE process to meet the 18 MGD AADF design capacity. A list of the assumptions made to complete the hydraulic analysis for the expanded SWWRF is provided below:

- The maximum RAS flow under peak hour flow conditions is 18.9 MGD, or 75% of the MMADF of 25.2 MGD.
- The maximum NRCY flow under peak hour flow conditions is 63 MGD, or 250% of the MMADF of 25.2 MGD.
- The new headworks project is completed and operational.
- Splitter Box No. 1 splits all influent, RAS, and NRCY flows to the six trains (four existing, two new).
- Splitter Box No. 1 is modified to include a sixth weir gate and piping to a sixth anoxic basin, including 36-inch diameter piping to each new anoxic basin.
- Two new anoxic basins Nos. 5 and 6 are constructed immediately south of the existing anoxic basins.
- Two new aeration basins Nos. 5 and 6 are constructed immediately north of the existing aeration basins.
- One new 125-ft diameter secondary clarifier No. 6 is constructed directly to the east of the existing clarifier No. 5, north of the new aeration basins Nos. 5 and 6. Clarifier No. 6 is constructed to match clarifiers Nos. 3 and 4, including a dual sided effluent trough.
- A new Splitter Box No. 3 is constructed downstream of the new anoxic basins Nos. 5 and 6 to split flow equally to the two new aeration basins Nos. 5 and 6 via two new 48-inch mixed liquor (ML) pipelines (one per basin).
- The common effluent channel of the existing anoxic basins is extended to connect to a common effluent channel for the new anoxic basins Nos. 5 and 6 to allow flow from anoxic basins Nos. 5 and 6 to be directed to Splitter Box No. 2, and flow from anoxic basins Nos. 1 through 4 to be directed to new Splitter Box No. 3, if necessary.
- The common effluent channel of the existing aeration basins is extended to connect to a new common effluent channel for the new aeration basins Nos. 5 and 6. A new common effluent pit is constructed at the northern end of the new common effluent channel extension to direct flow to existing clarifier No. 5 and a new 125-ft diameter clarifier No. 6.
- Piping to and from new clarifier No. 6 is 36-inches in diameter.
- A new 54-inch by 36-inch tee is installed on the existing 54-inch clarified effluent pipeline to convey clarified effluent from new clarifier No. 6 to the tertiary filters.

- ABW filter Nos. 2 and 3 are both converted to AquaDiamond filters, each with 1,920 ft^2 of filtration surface area, to match existing AquaDiamond filter No. 1.
    - Note, this was modeled to determine worst case hydraulic conditions with the existing structures and piping in place. It is recognized that this does not reflect the ongoing filter improvements noted above in **Section 5.3**, which includes hydraulic improvements to alleviate filtered effluent conveyance limitations.
- The CCC Rehab and Recharge Well PS project is completed and operational.

5.6.1 Hydraulic Limitations

The hydraulic model was constructed based on existing record drawings of the SWWRF provided by the County and the assumptions listed above. Based on the modeling, two primary hydraulic limitations were identified during the hydraulic analysis, which are summarized as follows.

The first hydraulic limitation identified at the future peak hourly flow rate of 54 MGD is the 54-inch SRS and 64-inch ML piping which convey all screened raw sewage, RAS, and NRCY flow to Splitter Box No. 1 to be distributed to the anoxic basins. The new headworks, once completed, includes a new 54-inch SRS pipeline from the headworks which will connect to the existing 64-inch ML pipeline immediately upstream of Splitter Box No. 1. The screened raw sewage from the new headworks will combine with all RAS flow from the clarifiers and all NRCY flow from the aeration basins in this 64-inch ML pipeline. Without flow equalization, the flow rate in the 64-inch ML pipeline is 135.9 MGD, resulting in a flow velocity of 9.41 ft/s. The total head loss from the piping arrangement between the new headworks and Splitter Box No. 1 is approximately 6.75 feet at the peak hourly flow. The excessive head loss expected from the 54-inch SRS and 64-inch ML piping will cause the new headworks screening, grit removal, and effluent channels to overflow at the peak hourly flow rate if no modifications are made to the piping arrangement and Splitter Box No. 1, or if no flow equalization is provided.

The second hydraulic limitation identified at the future peak hourly flow rate of 54 MGD occurs in the tertiary filters due to head loss from the CCC effluent weirs and filter effluent piping. Based on the modeling, the head loss over the CCC effluent weirs is approximately 1.2-ft with one CCC out of service. Under these conditions with one AquaDiamond filter and one CCC out of service, the tertiary filter effluent weirs will be submerged by approximately 0.6 to 0.8-ft. Submergence of the tertiary filter effluent weirs may result in reduced tertiary filter capacity, submergence of the tertiary filter influent weirs, and other upstream issues.

5.6.2 Recommended Actions to Resolve Hydraulic Limitations

As noted above, two major hydraulic limitations were identified by the model of the hydraulic profile for the expanded SWWRF. Modifications to the SWWRF will be required to ensure that it can meet Class I Reliability which requires that all unit processes must be capable of passing the peak hourly flow rate with the largest flow capacity unit out of service. The recommended modifications to resolve the hydraulic limitations are described below.

5.6.2.1 *Replacement of Splitter Box No. 1*

It is recommended that Splitter Box No. 1 be replaced with a new splitter box in place of the existing headworks once it is demolished. The new Splitter Box No. 1 is recommended to be constructed with the capability to split all influent SRS, RAS, and NRCY flows to at least six equally sized anoxic basins. The new Splitter Box No. 1 is recommended to be constructed similar to existing Splitter Box No. 2 with a baffled influent chamber with submerged ports to a flow distribution chamber. The flow distribution chamber is recommended to include modulating-service motor operated weir gates for each weir to accurately control flow split to each anoxic basin. A dual-chambered design for the new Splitter Box No. 1 presents several advantages compared to the existing upflow-style Splitter Box No. 1:

- SRS may be directed to the new splitter box separately from the combined RAS and NRCY flows
  - Limits friction head loss in piping to the splitter box
  - Limits pipe size to more readily available sizes (54-inch and 64-inch diameter piping vs 78-inch and larger)
- SRS, RAS, and NRCY can be mixed effectively in the mixing chamber prior to entering the distribution chamber, ensuring even distribution of flow and loading to each treatment train
- A baffled influent mixing chamber dissipates excess fluid momentum entering the splitter box and provides more quiescent flow to the distribution chamber, resulting in more accurate flow splitting

The 54-inch SRS pipeline from the new headworks facility is recommended to be extended directly to the influent mixing chamber of new Splitter Box No. 1. A 64-inch ML pipeline for the combined RAS and NRCY flows is recommended to be installed to convey RAS and NRCY flows to the influent mixing chamber of new Splitter Box No. 1.

5.6.2.2 *CCC Weir Replacement*

The existing CCC's each have a single 9-ft long rectangular weir at the effluent end to maintain a consistent water level in each CCC and maximize chloramine contact time. As noted above, the head loss over each 9-ft CCC effluent weir is excessive at the future peak hourly flow of 54 MGD, and is expected to result in submergence of the tertiary filters' effluent weirs. It is recommended that each CCC effluent weir be retrofitted with finger weirs, an arrangement of fixed launders typically constructed of either FRP or stainless steel which extend into the CCC, to increase the weir length within the existing footprint of each basin. The additional weir length provided by retrofitting each CCC with finger weirs will reduce the head loss over each weir and prevent submergence of the filter effluent weirs upstream. The finger weirs for each CCC should be designed to limit the head loss over the weir to a maximum of 0.5-ft at the peak hourly flow rate of 27 MGD per CCC. The peak hourly flow rate of 27 MGD per CCC assumes one CCC is out of service to meet Class I Reliability requirements. Reducing the weir loading rate in the CCC's may also present a secondary benefit in that flow velocity to the effluent weir will be reduced, therefore some short-circuiting within the last pass of the CCC's may also be reduced.

6. SITE PLAN FOR EXPANSION

6.1 Description of Proposed Additional Basins and Accessories

Figure 6.1 shows the proposed additional infrastructure and accessories necessary to expand the SWWRF to meet the future AADF capacity of 18 MGD based on expansion of the existing MLE process. A proposed process flow diagram for the expansion of the existing MLE process is also included in **Figure 6.2** below. The following sections below discuss these requirements in further detail.

6.1.1 New Splitter Box No. 1

A new Splitter Box No. 1 is proposed to be installed in place of the existing headworks structure, once demolished, to replace the existing Splitter Box No. 1 to address the hydraulic deficiencies noted in **Section 5** above. Flow from the new Splitter Box No. 1 is to be conveyed to each existing and proposed anoxic basin via a 36-inch ML pipeline.

6.1.2 Anoxic Basins

The expansion of the existing MLE process to an AADF capacity of 18 MGD is expected to require the addition of two new 0.5375 MG anoxic basins. The new anoxic basins are proposed to be constructed immediately south of the existing anoxic basins, in like kind. The effluent end of proposed anoxic basins Nos. 5 and 6 is proposed to include a common effluent channel that will be connected to the existing anoxic basins effluent channel. A new Splitter Box No. 3 is proposed to be constructed on the effluent end of proposed anoxic basins Nos. 5 and 6 to distribute flow to two new aeration basins Nos. 5 and 6.

The common effluent channel interconnection between the existing anoxic basins and the proposed anoxic basins will allow flow to be sent to either effluent splitter box to ensure flow from any anoxic basin can be sent to any aeration basin. The proposed Splitter Box No. 3 is recommended to include two 15-ft wide weir gates to match the existing 15-ft wide weir gates in Splitter Box No. 2. The new weir gates are proposed to be set at the same elevation as the weir gates in Splitter Box No. 2, and each weir gate is recommended to be provided with inching/positioning-service motor operated actuators. Mixed liquor flow from proposed Splitter Box No. 3 will be directed to proposed aeration basins Nos. 5 and 6 via two 42-inch ML pipelines, one per basin.

Figure 6.1 – Proposed General Arrangement Diagram for SWWRF MLE Expansion to 18 MGD AADF

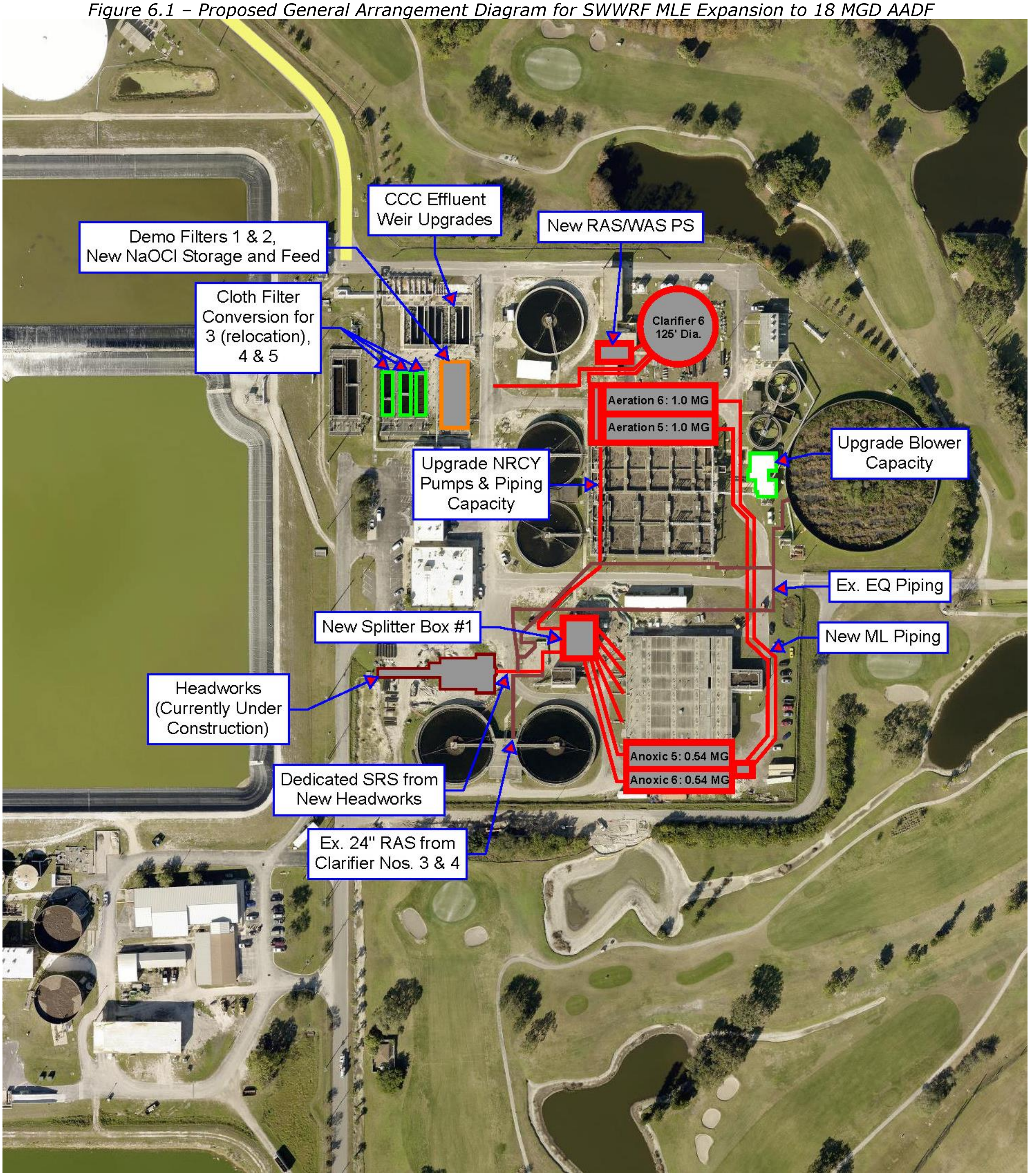
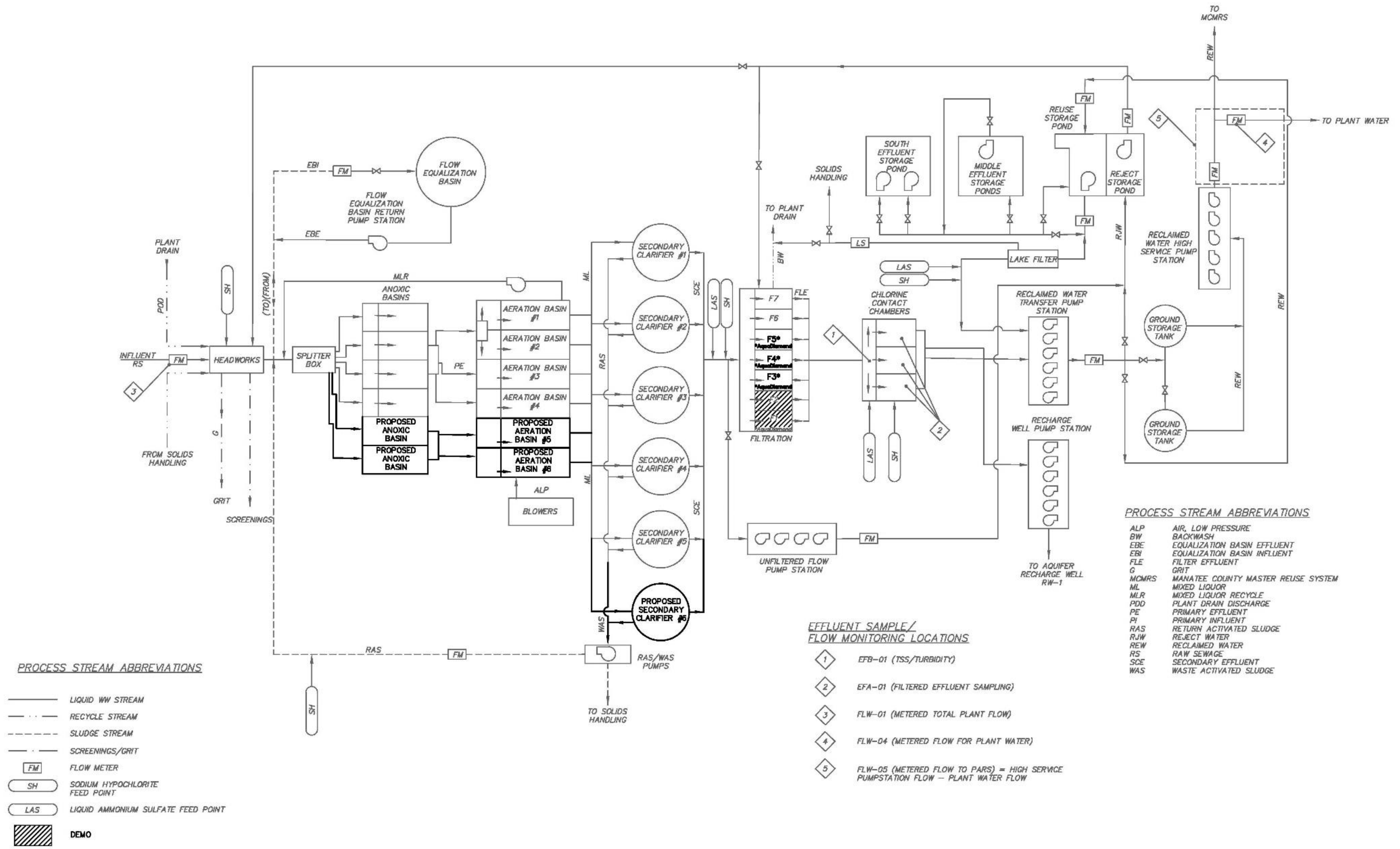


Figure 6.2 – Proposed Process Flow Diagram for SWWRF MLE Expansion to 18 MGD AADF



6.1.3 Aeration Basins

Expansion of the SWWRF to an AADF capacity of 18 MGD will require the addition of two new 1.0 MG aeration basins directly north of the existing aeration basins. The new aeration basins Nos. 5 and 6 are proposed to be constructed matching the dimensions of existing aeration basins Nos. 3 and 4. The effluent end of the proposed aeration basins Nos. 5 and 6 is proposed to include two 32-ft fixed effluent weirs (one per basin) as well as a common effluent channel. The new common effluent channel is recommended to be tied into the existing common effluent channel of the existing aeration basins. This will require demolition of the existing effluent sump that directs ML flow to existing secondary clarifier No. 5. The new aeration basin common effluent channel extension is therefore recommended to include a new effluent sump to direct ML flow to the existing secondary clarifier No. 5 and a new secondary clarifier No. 6.

The increased flows and loading associated with the expansion to an AADF capacity of 18 MGD will impact the sizing of the aeration equipment required. The five existing Hoffman multi-stage centrifugal blowers will require replacement with new blowers with increased capacity to meet the aeration supply requirements for the expansion while also meeting Class I Reliability requirements for firm blower capacity with the largest unit out of service. The existing Hoffman multi-stage centrifugal blowers are assumed to be replaced with new high-speed turbo blowers to increase capacity and provide a wide range of turndown. It should be noted that a combination of new multi-stage centrifugal blowers and high-speed turbo blowers may be provided to accommodate space limitations and potentially reduce cost. The existing blower discharge piping and diffuser grids in the existing aeration basins are also assumed to require upsizing for this expansion to meet the new design requirements, however, this should be confirmed during detailed design efforts.

The increased flows and loading associated with the expansion will also require increased NRCY flows to maintain denitrification. The four existing NRCY pumps are adequately sized to provide a NRCY flow rate of 300% of the AADF to each of the four existing aeration basins, and approximately 250% of the MMADF to each of the existing aeration basins assuming the existing common discharge piping is upsized to maintain similar total dynamic head conditions. However, two new NRCY pumps must be installed with one new pump per new aeration basin. The new NRCY pumps for aeration basins Nos. 5 and 6 are recommended to have a discharge capacity of 7,800 gpm each, to match the discharge capacity of the existing NRCY pumps for aeration basins Nos. 3 and 4. A spare pump of each size is recommended to be stored on-site to meet Class I Reliability requirements.

6.1.4 Secondary Clarifiers

Based on the clarifier capacity check and the preliminary modeling performed, one new 125-ft diameter clarifier No. 6 will be required for the expansion of the SWWRF to an AADF capacity of 18 MGD to meet Class I Reliability. The new clarifier No. 6 is proposed to be constructed north of the new and existing aeration basins, and east of existing clarifier No. 5. Clarifier No. 6 is proposed to be constructed similar to existing clarifiers Nos. 3 and 4 including a dual sided peripheral weir trough. A new RAS/WAS pump station is recommended to be constructed to serve the new clarifier No. 6. The existing chemical and blower buildings directly to the east of existing clarifier No. 5 are recommended to be demolished to accommodate the new RAS/WAS pump station for clarifier No. 6 and to allow for vehicular traffic flow between the new aeration basins and clarifier.

6.1.5 RAS and NRCY Piping

Existing RAS and NRCY flows currently combine into one common 48-inch pipeline to be recycled to Splitter Box No. 1. The increased RAS and NRCY flows associated with the expansion to 18 MGD AADF will require that the common RAS/NRCY piping be upsized to limit pipeline friction loss, prevent overflowing of the new headworks structure, and limit RAS/NRCY pump modifications. The existing NRCY pump common discharge header must also be upsized to accommodate larger capacity pumps and two new pumps for the two new aeration basins. As noted above regarding new Splitter Box No. 1, the common RAS/NRCY piping is recommended to be redirected directly to the new Splitter Box No. 1. Based on the design conditions expected for the expansion, the preliminary pipe sizing for each segment of the new RAS/NRCY piping is summarized in **Table 6.1** below. The preliminary pipe sizes recommended below were selected to maintain a peak velocity of less than 6.0 ft/s to limit friction loss and pump motor sizing. No modifications are necessary for the RAS piping from each existing clarifier other than to redirect the flows to the new common RAS/NRCY piping. It should be noted that a parallel NRCY pump discharge pipeline may also be constructed to serve the new NRCY pumps, in lieu of upsizing the existing pipeline. The RAS flows may also be redirected to a separate pipeline to separate it from the NRCY flows and reduce head loss.

Table 6.1 – Preliminary NRCY Pipeline Upsizing Summary

Pipeline Segment	Pipe Diameter (inches)	Peak Velocity (ft/s)	Description
1	30	4.8	Clarifier No. 6 RAS + AB No. 5 NRCY
2	36	5.9	Segment 1 + AB No. 6 NRCY
3	42	5.7	Segment 2 + AB No. 1 NRCY
4	48	5.4	Segment 3 + AB No. 2 NRCY
5	54	5.4	Segment 4 + AB No. 3 NRCY
6	60	5.3	Segment 5 + AB No. 4 NRCY
7	60	5.7	Segment 6 + Clarifier Nos. 1 & 2 RAS
8	60	5.9	Segment 7 + Clarifier No. 5 RAS
9	64	5.7	Segment 8 + Clarifier Nos. 3 & 4 RAS

6.2 Impacts of Site Modifications on Existing Processes

Based on the proposed improvements described above, impacts to existing processes, maintenance of plant operations, yard piping, site access/vehicle movement, and stormwater were considered. Ongoing improvement projects for the SWWRF were also considered and coordinated with the proposed improvements described above. A summary of the impacts of these improvements is described in sections below.

6.2.1 Existing Processes

Expansion of the SWWRF to an AADF capacity of 18 MGD is expected to significantly impact the secondary and tertiary treatment processes as described above. This expansion is not expected to impact the headworks processes since the selected screening and grit removal technologies for the new headworks will be sufficient for the MLE process expansion. Operation of the flow equalization facilities also will not be impacted by this expansion.

The expansion is also not expected to impact the existing secondary clarifiers, existing RAS pumps, or existing WAS pumps (excluding replacement of WAS pumps for clarifier Nos. 1 and 2) as they will continue to see similar or improved operating conditions with the addition of a new sixth clarifier. Modifications to the existing RAS/NRCY piping as described above is expected to maintain similar TDH conditions for the existing RAS pumps, however, this should be verified during detailed design to confirm that the existing RAS pump sizing is sufficient.

The existing biosolids handling processes, including aerated sludge holding and belt filter press dewatering, are also adequately sized for the expansion to 18 MGD AADF and no modifications will be necessary.

6.2.2 Maintenance of Plant Operations

Maintenance of plant operations (MOPO) is a critical concern during any major WRF expansion project to ensure that construction activities will not impair the County's ability to adequately operate and maintain the WRF, and continue to meet effluent permit limits during construction. Impacts on MOPO for each major recommended improvement for the expansion of the SWWRF to 18 MGD AADF are summarized below:

- Replacement of Splitter Box No. 1
  - Piping tie-ins and transfer of flows from the existing Splitter Box No. 1 to the new Splitter Box No. 1 will likely require bypass pumping, hot tapping of existing pipelines, sequential isolation of the existing anoxic basins, and careful coordination with facility staff to maintain plant flow and prevent SSO's in the collection system.
- Replacement of Process Air Blowers, Distribution Headers, and Diffuser Grids

- Replacement of the existing diffuser grids in each aeration basin will require each aeration basin to be taken offline for removal and replacement of the existing diffuser grids. This will require careful coordination with facility staff to schedule the work during periods of dry weather and to allow for sequential isolation of each aeration basin to always maintain at least three basins in service.
- Replacement of the existing Hoffman multi-stage centrifugal blowers is expected to require an expanded power feed to the existing blower building. Electrical shutdowns must be coordinated with facility staff to minimize outage duration and limit impacts to treatment process operation.
- Replacement of each existing blower and expansion of the process air distribution headers is recommended to be completed sequentially, with installation of a parallel process air distribution header to minimize impacts to the existing process air header and process air supply capacity.
- Temporary blowers and air piping may be required during construction to accommodate the blower shutdowns required for replacement, while maintaining air supply to the aeration basins.

- Construction of Anoxic Basins Nos. 5 and 6
    - Tie-in of the new and existing anoxic basin common effluent channels will require isolation of the existing common effluent channel on the southern end of anoxic basin No. 4 via the use of a temporary bulkhead
- Construction of Aeration Basins Nos. 5 and 6
    - Impacts to existing plant piping, will require rerouting of the existing 6-inch WAS line, 6-inch potable water line, and other small diameter piping directly north of existing aeration basins No. 1.
    - Relocation of the existing process air header on the north side of aeration basin No. 1 will be required prior to construction of the new aeration basins.
    - Extended impacts to operation of clarifier No. 5 due to demolition of the existing effluent pit and 30-inch ML piping to clarifier No. 5 for construction of the new aeration basins common effluent channel extension and new effluent sump to clarifiers Nos. 5 and 6.
        - Work is recommended to include temporary bypass pumping to maintain operation of clarifier No. 5 when necessary.

- Extended impacts to vehicular traffic on the eastern side of the facility, will require coordination with facility staff to maintain access to all process areas for regular operation and maintenance.

- Construction of Secondary Clarifier No. 6 and RAS/WAS PS
  - Construction of clarifier No. 6 will require demolition of the existing sodium hypochlorite storage and feed facilities to the east of existing clarifier No. 5. The new sodium hypochlorite storage and feed facilities proposed to be installed in this location must be relocated and constructed prior to construction of clarifier No. 6 to maintain supply and feed of sodium hypochlorite for effluent disinfection. Construction of the new sodium hypochlorite storage and feed facilities is not included in the cost estimates provided below since this project is currently underway and it is assumed that this project will be completed prior to the expansion.
  - Construction of the new RAS/WAS pump station to serve clarifier No. 6 will require demolition of the existing chemical building and blower building to the east of existing clarifier No. 5. These buildings are unused and their demolition will not impact facility operations.
  - Extended impacts to vehicular traffic on the eastern side of the facility, will require coordination with facility staff to maintain access to all process areas for regular operation and maintenance.
  - Connection of the proposed 36-inch CE pipeline to the existing 54-inch CE pipeline will require a hot tap with tapping sleeve and valve to maintain uninterrupted flow of clarified effluent to tertiary treatment. Alternatively, a parallel pipeline to the existing tertiary filters may be constructed to reduce potential down time and limit head loss in the existing 54-inch CE pipeline.

- Conversion of existing ABW filters No. 5 with AquaDiamond cloth media filter
  - Conversion of ABW filter No. 5 to an AquaDiamond filter as part of the expansion to 18 MGD AADF capacity is not expected to result in any major disruptions to facility operations. At that time, two AquaDiamond filters will be operational, and the current ABW filter Nos. 6 and 7 will also remain operational, providing sufficient filtration capacity during the conversion of ABW No. 5.
  - Construction of the new sodium hypochlorite storage and feed facilities is recommended to take place in the space vacated by existing filters Nos. 1 and 2, once demolished, prior to construction of new clarifier No. 6.

- Retrofit of CCC's with Effluent Finger Weirs
  - Each CCC must be removed from service, one at a time, to install the new effluent finger weirs in each basin. This will require coordination with facility staff, however, no major impacts to plant operation or effluent quality are expected.
- Replacement of Reuse Transfer Pumps (Effluent Pump Station)
  - The existing six vertical turbine pumps must be replaced with higher capacity, higher horsepower pumps as described in **Section 5.4**.

6.2.3 Yard Piping

The existing yard piping within the project area is generally shown in **Figure 6.1**. The major yard piping modifications proposed for the expansion include the following:

- 54-inch SRS piping extended from the new headworks to the new Splitter Box No. 1
- Upsizing of the common RAS/NRCY piping as described in **Section 6.1.5** above
- 36-inch ML pipelines from new Splitter Box No. 1 to the new and existing anoxic basins
- 42-inch ML pipelines from new Splitter Box No. 3 to the new aeration basins
- 30-inch ML from new aeration basins Nos. 5 and 6 to existing clarifier No. 5 (relocation)
- 36-inch ML from new aeration basins Nos. 5 and 6 to new clarifier No. 6
- Relocation of the existing 24-inch process air header on the north side of the existing aeration basins
- Installation of one additional process air header from the blower building to serve new aeration basin Nos. 5 and 6
- 20-inch RAS from new clarifier No. 6 to the common RAS/NRCY pipeline
- 6-inch WAS from new clarifier No. 6 to a new 8-inch common WAS pipeline
- 36-inch CE from new clarifier No. 6 to the existing 54-inch CE piping
- 6-inch WAS from existing clarifier No. 5 to a new 8-inch common WAS pipeline
- 8-inch WAS from existing clarifier No. 5 and new clarifier No. 6 to existing 8-inch WAS piping west of existing clarifiers Nos. 3 and 4
- Demolition of the existing 36-inch and 54-inch filtered effluent piping and replacement with a new open channel conveyance to the CCCs influent channel
- Demolition of old abandoned 12-inch ML piping southeast of clarifier No. 5

- Demolition and rerouting of other small diameter piping in the vicinity of the new aeration basins and clarifier

It should be noted that the existing 24-inch RAS piping from existing clarifier Nos. 3 and 4 will remain in service as it is currently installed. The extension of the 54-inch SRS from existing Splitter Box No. 1 to the new Splitter Box No. 1 will convey all SRS and RAS flow from clarifier Nos. 3 and 4, as they combine upstream of this extension point.

6.2.4 Site Access/Vehicle Movement

Vehicles can access the project area from the north or south via 65th Street West which is a two-lane asphalt surface roadway in a rural section with drainage ditches on both sides of the pavement. Access roads within the SWWRF vary between 16 and 24 feet in width, are constructed of asphalt, and are provided with a turning radius of approximately 35 feet in order to accommodate larger tractor trailer trucks. Due to the proposed construction of the additional aeration basins, the on-site east-west roadway between clarifier #2 and clarifier #5 must be demolished and removed from service. However, the removal of this roadway segment will not significantly impact the operation of vehicles throughout the SWWRF.

6.2.5 Stormwater

The SWWRF site is relatively flat with surface flow from northeast to southwest across the project site. An existing drainage ditch is located on the east side of 65th Street West and accepts stormwater flow from the project site. This stormwater flow travels south through this ditch system and eventually enters a piped stormwater system that continues to flow south. The piped stormwater system intersects with other stormwater piping at the intersection of 53rd Avenue West and continues under 53rd Avenue West and into a drainage ditch that flows toward the south. Based on the proposed process improvements being primarily pervious surface and removal of existing roadway for the proposed aeration basins, it is expected that the expansion project will result in nearly net-zero increase in impervious surface area. The proposed anoxic basins for the expansion must be constructed with open tops or allow rainwater in to ensure there will be little to no increase in impervious surface area. As a result, there will be minimal impacts to the existing stormwater system. No additional stormwater improvements are expected as part of these site improvements and proposed sitework will primarily match existing grades.

7. OPINION OF PROBABLE PROJECT COST

To allow for the planning of projected future capital costs associated with the expansion of the SWWRF, **Table 7.1** below presents a summary of the conceptual project costs based on the expansion of the SWWRF to an AADF capacity of 18 MGD using the MLE process. This cost opinion has been prepared meeting the classification as an AACE Class 4 cost estimate. As such, it should noted that the level of project definition associated with this cost estimate is less than 15%. Per the definition of an AACE Class 4 cost estimate, the expected range of accuracy for this cost estimate on the high end is +20% to +50% and -15% to -30% on the low end. As a result, the total opinion of probable project cost listed below may vary from $104,643,000 on the low end, to $224,235,000 on the high end. Various factors may combine to result in cost fluctuations within this range including fluctuations in market conditions, changes in project scope, improved project definition, and value engineering.

In estimating construction costs, it is assumed that the new upgrades and equipment are being installed at present day costs. Further, markups are used to estimate the costs for site improvements, yard piping, electrical improvements, I&C and SCADA, and indirect costs incurred by the contractor(s). The markup factors listed below for direct project costs including sitework and demo, yard piping, electrical, and SCADA/I&C are based on recent project experience, anticipated project scope, current market conditions, and input from local contractors. The markup factors listed below for indirect project costs incurred by the contractor are based on the following:

- Mobilization/Demobilization = 5% per WEF MOP 8
- General Conditions = $175,000 per month per input from local contractors for a project of this general scope and duration
- Contractor Overhead and Profit = 20% per WEF MOP 8
- Maintenance of Plant Operations = 10% per input from local contractors for a project of this general scope and complexity
- Contractor Bonds/Insurance = 4% per local contractors for projects of this general scope and cost

An estimating contingency is also applied to all facility and disciplines estimates due to the preliminary nature of this evaluation to account for additional costs that will be realized during the detailed stages of design. Project cost escalation between present day and the estimated date of project bid opening in 2026 is included to estimate the rate of future inflation. Estimated inflation has been included to aid in capital improvement planning, however, this should be re-evaluated annually and capital improvement budgets adjusted accordingly. Finally, engineering, administrative, and legal costs were estimated based on the direct construction costs at present day costs.

Costs were estimated based on past projects of similar size and scope; and McKim & Creed has no control over the costs of labor, materials, and equipment in the future. This is only an estimate of conceptual construction costs based on materials and equipment costs as of June 2022.

Table 7.1 – Cost Opinion for SWWRF MLE Expansion to 18 MGD AADF

Description	Cost
STRUCTURAL/MECHANICAL	
New Splitter Box No. 1	$2,500,000
Anoxic Basins Nos. 5 & 6 and Splitter Box No. 3	$7,300,000
Aeration Basins Nos. 5 & 6	$7,775,000
New Aeration Blowers	$1,500,000
New NRCY Pumps, Submersible	$1,260,000
Clarifier No. 6, 125-ft Diameter	$3,275,000
RAS/WAS Pump Station No. 4	$700,000
AquaDiamond Filters: 1 refurbished, 1,920 ft^2	$4,000,000
CCC Finger Weirs Retrofit	$51,000
New Effluent Pumps	$2,100,000
Structural/Mechanical Subtotal	***$30,461,000***
OTHER DISCIPLINES	
Overall Sitework and Demo (25%)	$7,616,000
Yard Piping (25%)	$7,616,000
Electrical (20%)	$6,093,000
SCADA/I&C (15%)	$4,570,000
Other Disciplines Subtotal	***$25,895,000***
INDIRECT COSTS	
Mobilization/Demobilization (5%)	$2,818,000
General Conditions	$7,350,000
Contractor Overhead & Profit (20%)	$11,272,000
Maintenance of Plant Operations (10%)	$5,636,000
Contractor Bonds/Insurance (4%)	$2,255,000
Indirect Costs Subtotal	***$29,331,000***
Construction Cost Subtotal	***$85,687,000***
Estimating Contingency (30%)	***$25,707,000***
OPINION OF PROBABLE CONSTRUCTION COST (2022 VALUE)	**$111,394,000**
Project Cost Escalation Due to Inflation (5% Compounded Annually, 4 Years)	***$24,007,000***
OPINION OF PROBABLE COSNTRUCTION COST (INC. EST. INFLATION TO 2026)	**$135,401,000**
OTHER PROJECT COSTS	
Engineering, Administration, and Legal (25% of Direct Costs)	***$14,089,000***
OPINION OF PROBABLE PROJECT COST	**$149,490,000**

8. ALTERNATIVE TO MEET AWT REQUIREMENTS

8.1 Overview of AWT Requirements

As an alternative to the expansion of the existing MLE process at the SWWRF, Manatee County has also requested the evaluation of an alternative for the expansion to an AADF capacity of 18 MGD that can produce effluent reclaimed water meeting Florida Advanced Wastewater Treatment water quality requirements. As noted in **Section 1**, the AWT standards described in § 403.086, Fla. Stat. (2021) require effluent pollutant concentrations to be less than or equal to 5 mg/L $cBOD_5$, 5 mg/L TSS, 3 mg/L TN, and 1 mg/L TP.

It is important to note that § 403.086, Fla. Stat. (2021) includes provisions to waive the compliance requirements for phosphorus where it can be demonstrated that phosphorus is not a limiting nutrient in the receiving water bodies. While the SWWRF does not discharge effluent to any surface water bodies, it may be inferred that the compliance requirements for phosphorus would be based on indirect discharge of reclaimed water to the surrounding water bodies such as the Manatee River, Tampa Bay, Palma Sola Bay, and Sarasota Bay. It has been widely demonstrated in recent history that nitrogen is the limiting nutrient in these water bodies. In addition, nearby WRF's such as the City of Tampa's Howard F. Curren AWTF have been granted waivers for compliance with the AWT effluent phosphorus requirements. Therefore, it is expected that the compliance requirements for effluent phosphorus would be waived for the expansion of the SWWRF using processes capable of meeting AWT requirements. As a result, the following evaluation of the SWWRF expansion alternative to meet AWT requirements is based on meeting effluent limits of 5 mg/L $cBOD_5$, 5 mg/L TSS, and 3 mg/L TN, excluding the requirements for TP.

8.2 Options to Meet AWT Requirements

Under this alternative, the SWWRF must be converted to a new secondary treatment process since the existing MLE process is not capable of meeting effluent TN concentrations of 3 mg/L or less. The most appropriate conventional nitrogen removal treatment process for the SWWRF is expected to be the four-stage Bardenpho process due to the existing process configuration of the SWWRF. The four-stage Bardenpho process is very similar to the existing MLE process, with the addition of a post-anoxic zone and a reaeration zone. The four-stage Bardenpho process would allow continued use of the existing anoxic and aeration basins and is expected to require minimal supplemental carbon feed to meet the effluent TN limit of 3 mg/L.

Other conventional processes capable of meeting an effluent TN concentration of 3 mg/L or less include deep bed denitrification filters or sequencing batch reactors (SBR). In addition to conventional processes, the AquaNereda aerobic granular activated sludge (AGS) process is a cutting-edge treatment technology that is quickly gaining popularity in the US and is capable of meeting AWT requirements. AGS is discussed as additional treatment alternatives in Section 9.

Implementation of deep bed denitrification filters at the SWWRF would require complete reconstruction of the existing tertiary filters, additional tertiary filters due to low hydraulic loading rates (2 to 5 gpm/ft^2), an intermediate pump station due to additional head requirements for deep bed filters, and a significant supply of supplemental carbon (typically methanol or glycerol). Therefore, deep bed denitrification filters are not expected to be feasible for the SWWRF due to the additional space requirements and high operating costs associated with the supplemental carbon feed.

The stages of the four-stage Bardenpho process are as follows:

1. Pre-anoxic basins: Primary denitrification zone where all RAS and NRCY is recycled to remove most nitrate from the mixed liquor.
2. Aeration basins: Primary COD removal and nitrification zone. NRCY flows are recycled from the end of the aeration basins to the head of the pre-anoxic basins similar to the existing MLE process.
3. Post-anoxic basins: Secondary denitrification zone to remove additional nitrates left in the mixed liquor from the aeration basins. A supplemental carbon source is typically provided, and likely to be required, for this zone as a back-up to ensure there is sufficient readily biodegradable COD (rbCOD) in the ML to support biological growth and create a demand for nitrate as an alternative electron acceptor.
4. Reaeration basins: Small basins required to strip nitrogen gas generated by denitrification from the ML to aid in clarification.

Carollo Engineers previously provided the County with conceptual recommendations and costs for processes to meet AWT requirements at an AADF capacity of 18 MGD. This previous conceptual evaluation was based on the use of the five-stage Bardenpho process, which includes an initial anaerobic zone prior to the pre-anoxic basins to provide biological phosphorus removal. While biological phosphorus removal is not expected to be required for the SWWRF as noted above, the previous conceptual evaluation of AWT treatment processes compared a conventional five-stage Bardnepho process to intensification of the five-stage Bardenpho process using BioMag. Based on the previous engineer's evaluations and the evaluation of the existing clarifier capacity in the previous sections, the conventional Bardenpho process without intensification will not fit within the existing site of the SWWRF due to the additional basin volume and clarifier area required. As a result, expansion of the SWWRF to meet AWT requirements at an AADF capacity of 18 MGD is expected to require the four-stage Bardenpho process with process intensification to reduce its footprint. Multiple intensification processes exist that may be applied to the four-stage Bardepho process, such as ballasted activated sludge, integrated fixed-film activated sludge (IFAS), and membrane bioreactors (MBR), to reduce the footprint of the process.

Of the three process intensification options listed above, ballasted activated sludge using the BioMag process (provided by Evoqua) is the most logical selection based on its benefits and cost, which supports the previous engineer's selection of this process for conceptual evaluation. The BioMag process blends inert magnetite, which has a specific gravity of 4.8 to 5.2, with the MLSS at a typical ratio of 1:1 to significantly increase the MLSS's settling velocity and thus reduce the clarifier area required. The significant increase in settling velocity in turn allows the secondary treatment process to operate at higher MLSS concentrations, which allows for greater treatment capacity out of existing basins and smaller basins for new construction.

The IFAS intensification option is not applicable to the SWWRF since its primary benefit is a reduction in basin volume required due to the addition of attached growth on fixed or moving media. The IFAS process does not reduce loading to the secondary clarifiers, therefore a sixth clarifier would still be required with this intensification option, eliminating any benefit of its space savings for the SWWRF. An MBR intensification process is applicable to the SWWRF because it would eliminate the need for secondary clarifiers and free up significant space within the existing facility's footprint. However, MBR processes require significant additional mechanical equipment and have significantly higher operating costs compared to more conventional processes due to additional pumping equipment, mixing equipment, and maintenance requirements for the membranes.

8.3 Evaluation of the BioMag Process

To begin the evaluation of the BioMag process, M&C coordinated with the treatment technology provider, Evoqua, to determine preliminary process characteristics to enable preliminary basin sizing and the development of a budgetary proposal. The goals of the BioMag process are to meet the AWT and Class I Reliability requirements at the expansion to 18 MGD AADF within the existing footprint of the SWWRF while using only the existing five secondary clarifiers. The design criteria for the BioMag process are summarized in **Table 8.1**, **Table 8.2**, and **Table 8.3** below.

Table 8.1 – BioMag Process Design Flows

Parameter	Unit	Value
Annual Average Daily Flow	MGD	18.0
Maximum Month Average Daily Flow	MGD	25.2
Maximum Daily Flow	MGD	34.2
Peak Hourly Flow	MGD	54.0

Table 8.2 – BioMag Process Design Influent Water Quality

Parameter	Unit	AADF	MMADF
$CBOD_5$	lb/day	19,816	24,968
BOD_5	lb/day	23,569	29,697
COD	lb/day	56,745	76,606
TSS	lb/day	23,719	36,764
VSS	lb/day	20,266	35,871
TKN	lb/day	5,404	6,107
NH_3-N	lb/day	4,804	5,765
Alkalinity	mg/L as $CaCO_3$	225	225
pH	S.U.	7.46	7.46
Maximum Influent Temperature	°C	32	32
Minimum Influent Temperature	°C	22	22

Table 8.3 – BioMag Process Design Monthly Average Final Effluent Performance

Parameter	Unit	Value
$cBOD_5$	mg/L	5.0
TSS	mg/L	5.0
TN	mg/L	3.0

The details of the existing secondary clarifiers as summarized in **Table 2.5** (surface area, SWD, sludge withdrawal mechanism) were shared with Evoqua to determine the maximum MLSS concentration that can be supported by the clarifiers with the implementation of the BioMag process. Based on Evoqua's preliminary evaluation of the existing clarifiers, the maximum MLSS concentration that may be clarified at the design conditions summarized above is 5,200 mg/L (not including magnetite content). As noted above, magnetite is typically blended with the MLSS at a ratio of 1:1, therefore the approximate maximum total MLSS concentration including the inert magnetite would be 10,400 mg/L. This information was utilized to perform preliminary process modeling of the BioMag process using the calibrated BioWin process model to determine preliminary basin sizing. The flow diagram of the BioWin process model for the BioMag alternative is presented in **Figure 8.1** below, and **Table 8.4** below summarizes the results of the preliminary modeling of the BioMag process along with the preliminary basin sizing and operational parameters.

Figure 8.1 – BioWin Process Flow Diagram for the BioMag Alternative

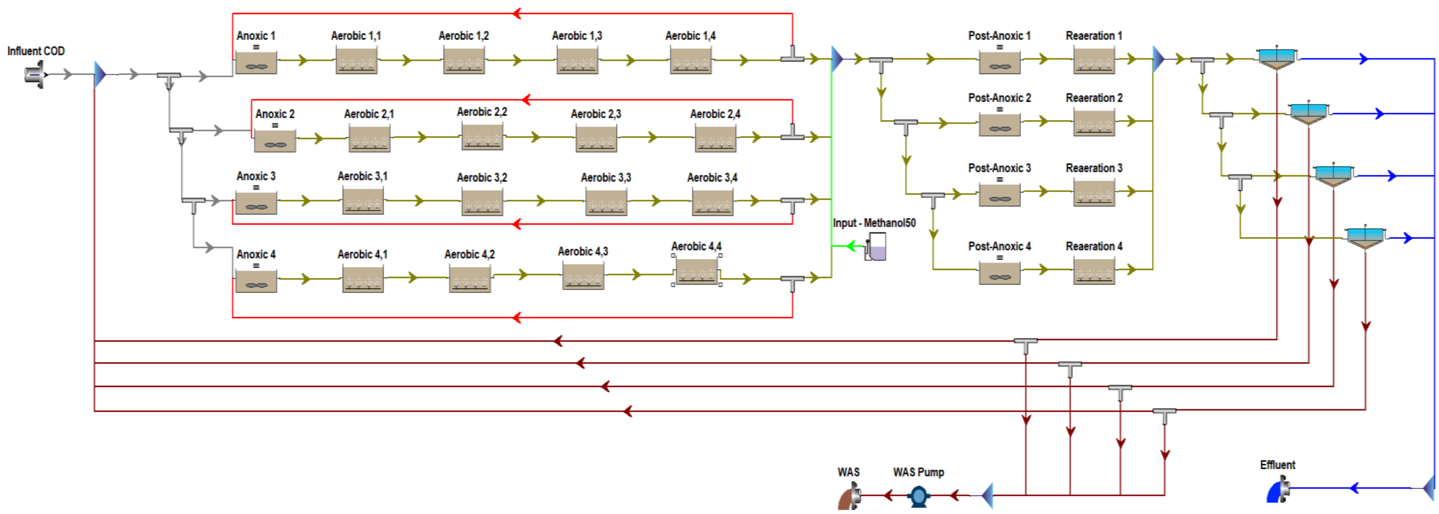


Table 8.4 – Preliminary Design and Process Parameters

Parameter	Value
Pre-Anoxic Basins	Five (5) basins, 2.6875 MG total (four existing, one new) Pre-Anoxic Nos. 1 through 4: 0.5375 MG each (existing) Pre-Anoxic No. 4: 0.5375 MG (new)
Aeration Basins	Five (5) basins, 4.5 MG total (four existing, one new) Aeration Basin Nos. 1 and 2: 0.75 MG each (existing) Aeration Basin Nos. 3 and 4: 1.0 MG each (existing) Aeration Basin No. 5: 1.0 MG (new)
Post-Anoxic Basins	Four (4) basins, 0.5 MG each, 2.0 MG total (all new)
Reaeration Basins	Four (4) basins, 0.08 MG each, 0.32 MG total (all new)
Aerobic SRT	AADF: 7.13 days MMADF: 6.47 days
MLSS (excluding magnetite)	AADF: 3,356 mg/L MMADF: 4,676 mg/L
Air Flow Rate, total	AADF: 17,413 scfm @ 20°C, 1 atm MMADF: 26,995 scfm @ 20°C, 1 atm
Methanol Feed	AADF: 1,487 lb COD/d (150 gpd) MMADF: 0 lb COD/d (0 gpd)
WAS	AADF: 18,044 lb/d @ 7,722 mg/L TSS MMADF: 27,022 lb/d @ 10,793 mg/L TSS
RAS	AADF: 9 to 18 MGD MMADF: 12.6 to 25.2 MGD
NRCY	AADF: Up to 54 MGD (300% of Influent) MMADF: Up to 63 MGD (250% of Influent)

Parameter	Value

Secondary Clarifiers	Quantity: 5 (all existing) Type: Center feed, peripheral weir Sludge Withdrawal: Draft tube (requires replacement) Diameter (Nos. 1 and 2): 105-ft Side Water Depth (Nos. 1 and 2): 12-ft Diameter (Nos. 3 and 4): 125-ft Side Water Depth (Nos. 3 and 4): 14-ft Diameter (No. 5): 105-ft Side Water Depth (No. 5): 14-ft
AADF Secondary Effluent Water Quality	$cBOD_5$: 2.58 mg/L TSS: 6.0 mg/L TN: 2.47 mg/L as N NH_3: 0.08 mg/L as N NO_3: 0.89 mg/L as N NO_2: 0.02 mg/L as N
MMADF Secondary Effluent Water Quality	$cBOD_5$: 4.27 mg/L TSS: 10.0 mg/L TN: 2.08 mg/L as N NH_3: 0.10 mg/L as N NO_3: 0.26 mg/L as N NO_2: 0.02 mg/L as N

As shown in the table above, the preliminary modeling of the BioMag process indicated that approximately 1,500 lb COD/day of methanol addition as a supplemental carbon source would be needed to support denitrification in the post-anoxic basins at AADF conditions. Based on these results, very little rbCOD is carried over from the aeration basins to the post-anoxic basins at AADF conditions to support the level of denitrification needed. Methanol at a concentration of 1,188,000 mg COD/L was used in the model to provide the supplemental carbon source to the post-anoxic reactors, however other carbon sources may be utilized. One alternative to methanol as a supplemental carbon source is MicroC 2000, which is a non-hazardous glycerol based supplement carbon source that is much safer to handle and store than methanol, and has a similar COD concentration of approximately 1,100,000 mg COD/L. It is recommended that glycerol based supplemental carbon sources be used if the County elects to proceed with this alternative due to the safety of glycerol based products, the slightly higher growth rate of facultative heterotrophs using glycerol, and because denitrification using glycerol requires very little to no acclimation period for the mixed liquor.

The modeling for MMADF conditions did not require supplemental carbon addition due to more carryover of rbCOD from the aeration basins to the post-anoxic basins. Supplemental carbon addition may still be necessary at MMADF conditions, and if the County elects to proceed with this alternative, future designs must account for supplemental carbon feed under these conditions. Additional influent sampling data and detailed modeling should be performed during preliminary and detailed design to determine the range of supplemental carbon feed that may be required.

Despite the need for a supplemental carbon source, the process modeling and preliminary basin sizing indicates that the proposed BioMag process can adequately meet the AWT requirements within the existing footprint of the SWWRF.

8.4 Description of Additional Infrastructure and Impacts

Expansion of the SWWRF with a four-stage Bardenpho BioMag process to meet Florida AWT requirements at an AADF capacity of 18 MGD will require significant improvements to the existing facility. A general arrangement diagram showing the proposed facilities required for the BioMag intensification expansion of the SWWRF to 18 MGD AADF to meet AWT requirements is included in **Figure 8.2** below. A breakdown of the necessary improvements by process area is provided in the sections below:

8.4.1 Headworks

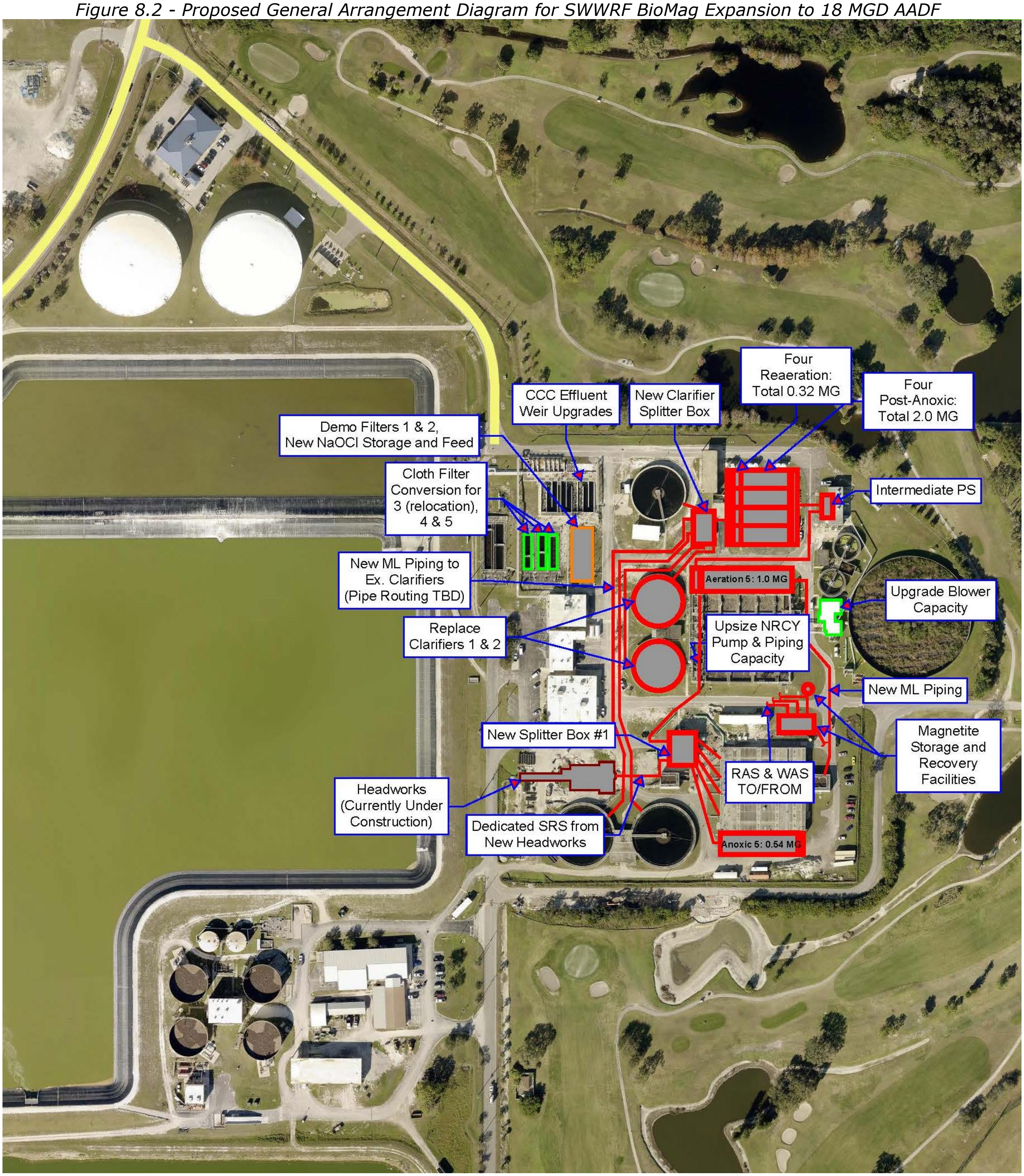
Once the new headworks facility is constructed, it is expected to adequately serve the BioMag expansion alternative. Per Evoqua, the BioMag process requires influent mechanical screening using a minimum of ¼-inch screens. The proposed center-flow mechanical screens for the new headworks will utilize ¼-inch perforated plates, therefore no modifications to the new headworks will be required.

Similar to the MLE expansion, a new Splitter Box No. 1 will be required to alleviate hydraulic limitations with the increased influent SRS, RAS, and NRCY flows. Again, the new Splitter Box No. 1 is recommended to be constructed in place of the existing headworks once it is demolished following the completion of the new headworks. The new Splitter Box No. 1 for the BioMag expansion alternative will differ from the MLE alternative in that it will split flow to only five anoxic basins instead of the six required for the MLE expansion.

8.4.2 Pre-Anoxic Basins

Improvements to the anoxic basins will include the construction of one new 0.5375 MG pre-anoxic basin matching the dimensions of the existing anoxic basins. The common effluent of the existing anoxic basins is recommended to be tied into the effluent channel of the new pre-anoxic basin to allow the use of the existing spare weir in Splitter Box No. 2 to convey flows to the aeration basins. The BioMag system typically requires a mixing energy input of 55 hp per 1.0 MG of basin volume. The existing anoxic basins are each separated into four zones of equal volume, with two 2-hp, 480V, 3-phase mechanical mixers per zone for a total of eight 2-hp mixers per basin. Based on the typical mixing energy requirements noted by Evoqua, each existing basin would require eight new 5-hp, 480V, 3-phase mixers to provide the mixing energy required. The new pre-anoxic basin No. 5 is recommended to be provided with similar equipment to match the existing basins.

Figure 8.2 - Proposed General Arrangement Diagram for SWWRF BioMag Expansion to 18 MGD AADF



8.4.3 Aeration Basins

One new 1.0 MG aeration basin No. 5 must be constructed for the BioMag process to meet AWT requirements at an AADF capacity of 18 MGD. Each existing aeration basin must be modified to include new supplemental mixing equipment and additional diffusers. For the purposes of this CER it is assumed that the existing diffuser grids within the existing aeration basins must be replaced to meet the new design requirements for the BioMag system. Similar to the MLE process expansion, new blowers will be required for the expansion to meet the increased aeration demands. The existing Hoffman multi-stage centrifugal blowers are assumed to be replaced with new high-speed turbo blowers to increase capacity. Similar to the MLE expansion alternative, a combination of new multi-stage centrifugal blowers and high-speed turbo blowers may be provided to accommodate space limitations and potentially reduce cost.

New NRCY pumps must be provided for each aeration basin, including the existing basins, due to the increased NRCY flows required for the expansion. The NRCY pumps for aeration basins Nos. 1 and 2 must be sized for up to 7,300 gpm each, and the NRCY pumps for aeration basins Nos. 3 through 5 must be sized for up to 9,750 gpm each to provide a NRCY capacity of at least 250% of the maximum month average daily influent flow rate. The common RAS/NRCY piping must be upsized similar to the MLE process expansion to convey the increased flows while limiting flow velocity, friction loss, and pump horsepower requirements.

8.4.4 Post-Anoxic and Reaeration Basins

Following the aeration basins, a new intermediate pump station must be constructed prior to the post-anoxic and reaeration basins due to the additional head loss incurred with the addition of new basins before the existing secondary clarifiers. It is assumed that the new intermediate pump station would consist of a wet well structure with submersible, high-flow, low-head, centrifugal wastewater pumps similar to the existing NRCY pumps. Mixed liquor from the aeration basins would be conveyed to the new intermediate pump station via the existing and extended common effluent channel.

Following the new intermediate pump station, flow would be split to four new post-anoxic/reaeration basin trains. Each train would consist of a 0.5 MG post-anoxic zone and a 0.08 MG reaeration zone. Effluent from the post-anoxic/reaeration basins would be conveyed to a new flow splitter structure to split flows to each existing secondary clarifier proportionally based on their capacity.

Glycerol storage and feed facilities would be required to provide supplemental carbon to the head of the post-anoxic basins as needed to support additional denitrification required to meet the TN effluent limit of 3.0 mg/L. At least 30 days of glycerol storage should be provided, which is recommended to consist of 15,000 gallons of storage assuming a maximum usage of 500 gpd. The maximum glycerol usage of 500 gpd is based on the supplemental carbon needed to denitrify 5 mg/L of NO_3 in the post-anoxic zone at the maximum month flow of 25.2 MGD with a COD demand of with 3.0 lbs COD required per lb of NO_3 removed, a glycerol COD content of 1,100,000 mg/L (i.e. MicroC 2000), and a safety factor of approximately 1.5.

8.4.5 Secondary Clarifiers

The five existing secondary clarifiers each utilize draft tube sludge withdrawal mechanisms per the available record drawings for the SWWRF. Per Evoqua, draft tube sludge withdrawal systems are not compatible with the BioMag system due to the magnetite content and increased concentration of the settled sludge. As a result, each existing clarifier mechanism must be replaced for the BioMag alternative to meet AWT requirements. Conventional scraper, spiral, and uni-tube header clarifier mechanisms are compatible with the BioMag process, while the uni-tube header design may be slightly more cost-effective. For the purposes of this CER, it is assumed that each existing clarifier mechanism must be replaced with a Tow-Bro clarifier mechanism.

As noted above, a new clarifier splitter box will be required to proportionally split flows to each clarifier following the post-anoxic and reaeration basins. This will require rerouting all flow to each existing clarifier within the facility, which presents a significant challenge for constructability and maintenance of plant operations. It is anticipated that the greatest challenge associated with this requirement will be redirecting flow to existing clarifiers Nos. 1 and 2. Mixed liquor from the existing aeration basins is currently distributed to clarifiers Nos. 1 and 2 from the common effluent channel via a sump in the channel located between the two clarifiers, with two 30-inch ML pipelines exiting the sump and going directly to each clarifier, respectively. The location of the existing 30-inch ML piping to each clarifier is extremely compact and congested with multiple other conflicts including the existing aeration basin common effluent channel above, the effluent sump to clarifiers Nos. 3 and 4, the RAS/WAS pump station for clarifiers Nos. 1 and 2, the 20-inch RAS pipeline from clarifiers Nos. 1 and 2, and a scum pump station. Based on this, it is assumed that clarifiers Nos. 1 and 2 will require complete replacement for the purpose of this CER. If the County elects to proceed with this alternative, more detailed evaluation of alternatives to maintain use of existing clarifiers Nos. 1 and 2 should be completed, with input from experienced contractors.

In addition to the requirements above, each set of RAS and WAS pumps must be replaced for the expansion due to the increased sludge flows and concentrations that must be accommodated. RAS flows will continue to be directed to the common RAS/NRCY header, while WAS flows must be diverted to new magnetite recovery equipment prior to pumping to the biosolids handling facility. New WAS pumps should be sized to accommodate a continuous 24/7 wasting schedule as required by the BioMag process to ensure a consistent ratio of magnetite to MLSS.

8.4.6 Tertiary Treatment

Tertiary treatment requirements for the expansion to 18 MGD AADF to meet AWT requirements will include the same requirements as the MLE process expansion. At least two existing ABW filters must be retrofitted as AquaDiamond filters to provide a total of three, and the CCC effluent weirs must also be retrofitted with finger weirs to limit head loss. Relocation of the proposed new sodium hypochlorite storage and feed facilities will also be required for this alternative to ensure sufficient space is available for the new post-anoxic and reaeration basins. No other modifications to the tertiary treatment processes will be required.

8.4.7 Effluent Pumping and Reject Capacity

Effluent pumping capacity improvements will include the same requirements as the MLE expansion to increase the capacity to 54 MGD. Reject storage and reject pump station improvements are not required.

8.4.8 Biosolids Handling

The WAS production of the four-stage Bardenpho BioMag process is very similar to the expanded capacity of the MLE process. No additional aerated sludge holding capacity will be required for the expansion to meet AWT requirements with the BioMag process. Per Evoqua, the WAS flow from the BioMag process has very little magnetite after the recovery process, and most of the filamentous bacteria in the WAS is broken down by the magnetite recovery equipment (shear mill). No additional belt filter press dewatering capacity will be required, and in fact dewatering performance may improve due to the break down of filamentous bacteria. This in turn may reduce polymer requirements for dewatering and allow slightly higher BFP loading rates, thus reducing operating costs.

8.4.9 BioMag Equipment

A general process flow diagram of the BioMag process is shown in **Figure 8.3** below. As shown in the flow diagram, the BioMag equipment is generally limited to the magnetite feed and recovery equipment. The magnetite recovery equipment includes shear mills to break up the floc and free the magnetite that is imbedded in the floc, magnetic recovery drums to separates the magnetite from the sheared WAS flow, a magnetite storage silo and feed system for make-up supply, a ballast mix tank to blend the magnetite with a sidestream of RAS, and associated pumps. A new BioMag equipment building must be provided to house the magnetite recovery and equipment, with the exception of the magnetite storage silo. **Table 8.5** below provides a preliminary list of the equipment expected to be provided by Evoqua for the BioMag process.

Figure 8.3 – General BioMag Process Flow Diagram

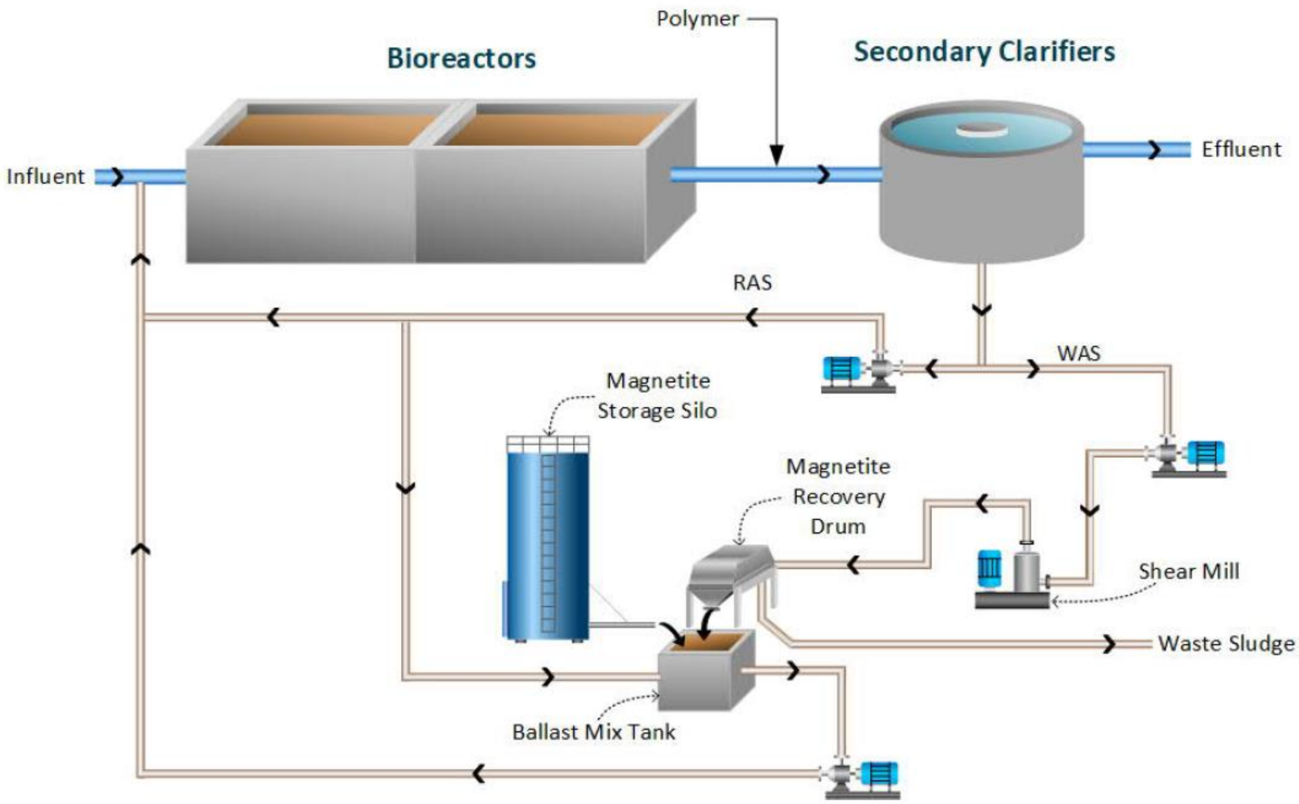


Table 8.5 – BioMag Process Equipment Requirements

Item	Quantity	Description
Ballast Storage and Feed System		
Flow Control Valve – Ballast Mix Tank Feed	1	Motor Operated Plug Valve
Flow Meter – Ballast Mix Tank Feed	1	Electromagnetic flow meter
Level Transmitter – Ballast Mix Tank[1]	2	Radar level transmitter
High Level Switch – Ballast Mix Tank[1]	2	Float style
Pump – Ballast Mix Tank Discharge	2 (1 duty, 1 standby)	Positive Displacement, 450 gpm, 20 hp
Ballast Mix Tank Mixer	4	3 hp, vertical shaft
Magnetite Storage	1	25 ton outdoor silo
Magnetite Dry Feeder	1	Up to 10' long Stringer® feed pipe extending from silo to ballast mix tank
Air Compressor	2 (lead/lag)	10 hp units
Air Dryer	1	Heatless desiccant
Compressed Air System Instrumentation	1 lot	Dew point sensor, pressure switch, pressure gauge
Ballast Recovery System		
Magnetic Drum Separator	9	36" x 72" drum, 7.5 hp each
Shear Pump	5	10 hp each
Pump – WAS Transfer Pump (after magnetite recovery)	2 (1 duty, 1 standby)	Positive displacement, 450 gpm, 20 hp
Flow Control Valve – Mag Drum Feed	9	Motor operated plug valve
Flow Meter – Mag Drum Feed	9	Electromagnetic flow meter
Level Switch – Mag Drum	9	Capacitance style
Speed Switch – Mag Drum	9	Proximity style
Level Transmitter – Post Recovery WAS Sump[2]	1	Radar
High Level Switch – Post Recovery WAS Sump[2]	1	Float style
Control System Hardware		
Control Panel	1	NEMA 12 control panel, HMI, PLC, I/O
Services		
Engineering Support		Engineering submittals and O&M manual
Installation oversight, start-up, commissioning, performance testing, and training		Up to 21 days

[1]*Ballast mix tank not provided by Evoqua*
[2]*Post recovery WAS sump not provided by Evoqua*

8.5 Opinion of Probable Construction Cost

The opinion of probable construction and project costs for the expansion to 18 MGD AADF using the BioMag process to meet AWT requirements is presented in **Table 8.6** below. This cost opinion was developed following the same methodology used for the MLE expansion alternative cost opinion. However, the markup factor for yard piping has been increased for this BioMag cost opinion, from 25% to 30%, due to the extensive degree of process reconfiguration required for this alternative. As noted in **Section 7**, this is estimate of conceptual project costs is based on materials and equipment costs as of June 2022. An estimate of inflation has been included to aid in planning, however this should be re-evaluated annually. This cost estimated has been prepared meeting the classification as an AACE Class 4 cost estimate with an expected range of accuracy of +20% to +50% on the high end, and -15% to -30% on the low end. This range of accuracy equates to an estimated range of total project costs of $202,982,000 to $434,961,000. Various factors may combine to result in cost fluctuations within this range including fluctuations in market conditions, changes in project scope, improved project definition, and value engineering (including the selection of alternative treatment technologies).

Table 8.6 – Cost Opinion for SWWRF BioMag AWT Expansion to 18 MGD AADF

Description	Cost
STRUCTURAL/MECHANICAL	
New Splitter Box No. 1	$2,500,000
Pre-Anoxic Basin No. 5	$3,675,000
New Hyperbolic Mixers (New and Existing Pre-Anoxic Basins)	$1,840,000
Aeration Basin No. 5	$5,125,000
Aeration Basins, Supplemental Mixing	$660,000
New Aeration Blowers	$1,500,000
New NRCY Pumps, Submersible	$1,050,000
Intermediate Pump Station to Post-Anoxic Basins	$2,674,000
Post-Anoxic/Reaeration Basins	$11,578,000
Clarifier Splitter Box	$2,500,000
Clarifiers, New Clarifier Mechanisms, Uni-tube Suction Header	$3,100,000
Replacement of Clarifiers Nos. 1 and 2	$5,535,000
RAS/WAS Pump Replacements	$2,176,000
BioMag Equipment and Building	$8,860,000
Glycerol Storage and Feed Equipment and Facilities	$602,000
AquaDiamond Filters: 1 refurbished, 1,920 ft^2	$4,000,000
CCC Finger Weirs Retrofit	$51,000
New Effluent Pumps	$2,100,000
Structural/Mechanical Subtotal	***$59,526,000***
OTHER DISCIPLINES	
Overall Sitework and Demo (25%)	$14,882,000
Yard Piping (30%)	$17,858,000
Electrical (20%)	$11,906,000
SCADA/I&C (15%)	$8,929,000
Other Disciplines Subtotal	***$53,575,000***
INDIRECT COSTS	
Mobilization/Demobilization (5%)	$5,656,000
General Conditions	$8,400,000
Contractor Overhead & Profit (20%)	$22,621,000
Maintenance of Plant Operations (10%)	$11,311,000
Contractor Bonds/Insurance (4%)	$4,525,000
Indirect Costs Subtotal	***$52,513,000***
Construction Cost Subtotal	***$165,614,000***
Estimating Contingency (30%)	***$49,685,000***
OPINION OF PROBABLE CONSTRUCTION COST (2022 Value)	**$215,299,000**
Project Cost Escalation Due to Inflation (5% Compounded Annually, 4 Years)	***$46,399,000***
OPINION OF PROBABLE CONSTRUCTION COST (INC. EST. INFLATION TO 2026)	**$261,698,000**
OTHER PROJECT COSTS	
Engineering, Administration, and Legal (25% of Direct Costs)	**$28,276,000**
OPINION OF PROBABLE PROJECT COST	**$289,974,000**

9. ALTERNATE AGS PROCESS FOR EXPANSION AND AWT REQUIREMENTS

At the request of the County, an alternative technology was investigated for both expansion to 18 MGD AADF with target effluent at or below TN 10 mg/L and with potential future AWT effluent limits. AquaNereda by Aqua-Aerobic Systems, Inc. is the exclusive provider of this innovative main liquid stream aerobic granular sludge (AGS) process in the US. The key innovation with this process is that the mixed liquor liquid/solids separation by gravity settling happens in a fraction of the time and at much higher MLSS concentrations compared to conventional active sludge (CAS) secondary clarification. AquaNereda is based on the conventional sequencing batch reactor (SBR) process, with several modifications to select for the growth and maintenance of granulated activated sludge particles. The granular activated sludge that is unique to the AquaNereda process settles much faster than conventional activated sludge flocs, and each granule simultaneously consists of aerobic, anoxic, and anaerobic conditions that enables enhanced nutrient removal. AGS is an intensification process that has reduced volume and footprint requirements due to higher MLSS concentrations compared to CAS processes. Intensification processes are sometimes a necessity to increase facility capacity with limited available land or to meet more stringent effluent requirements, which is the case for the SWWRF. For the SWWRF the main benefit is the reduced footprint required, compared to the MLE expansion and BioMag alternatives. Other potential benefits of implementing AGS alongside the existing MLE process are noted later in this section.

The AGS process has proven results in Europe, and there is one operational facility in the US, one demonstration facility, and multiple facilities under construction currently. AGS is a suspended growth activated sludge process that does not require media, membranes, or mineral addition. With the exception of the SRB batch process for AGS, the operation of an AquaNereda system is not much different than a traditional CAS system. Aqua-Aerobic Systems, Inc. has offered SBR treatment systems for over 35 years according to the website, and there are numerous SBRs at municipal wastewater treatment facilities in successful operation throughout the US. Three risks with implementing this process at the SWWRF as described herein are: 1. Loss of or inability to maintain granules; 2. Operating two parallel, separate secondary treatment processes; 3. Inherent unforeseen challenges associated with this innovative technology. On the second point, Manatee County's current WRF administration and operations staff stated that they are willing to operate dual processes. The County has chosen to do this with a current project in design for the SEWRF, which includes estimated capital cost savings compared to CAS expansion. Aqua-Aerobic Systems, Inc. has also stated that there are benefits to the existing CAS process when run in parallel with AquaNereda. Regarding the first and third points the AquaNereda process has been in full scale operation for many years at multiple facilities in Europe, and the technology has built-in controls and process pressures to grow and maintain the granules. It is reasonable that risks of unforeseen challenges with this innovative technology could be avoided with enhanced focus on implementation and operation.

9.1 Secondary Treatment Assessment for Expansion to 18 MGD AADF with AGS

An alternative to expanding SWWRF to 18 MGD AADF with additional process tankage needed to increase the capacity of the existing MLE system is a new AGS system that could be constructed to treat the additional 4.5 MGD, 25% of the flow and loading, in parallel with the existing system. In this case, the SWWRF would be operating dual, parallel secondary treatment processes. Preliminary sizing and design for AGS AquaNereda systems discussed in this report were provided by Aqua-Aerobic Systems, Inc., located in **Appendix F**.

9.1.1 Other Processes Not Impacted by Inclusion of AGS

Recommendations for improvements to preliminary treatment, tertiary treatment, and biosolids handling discussed in section **5 FACILITY ASSESSMENT FOR THE EXPANSION TO 18 MGD AADF** remain the same for this alternative.

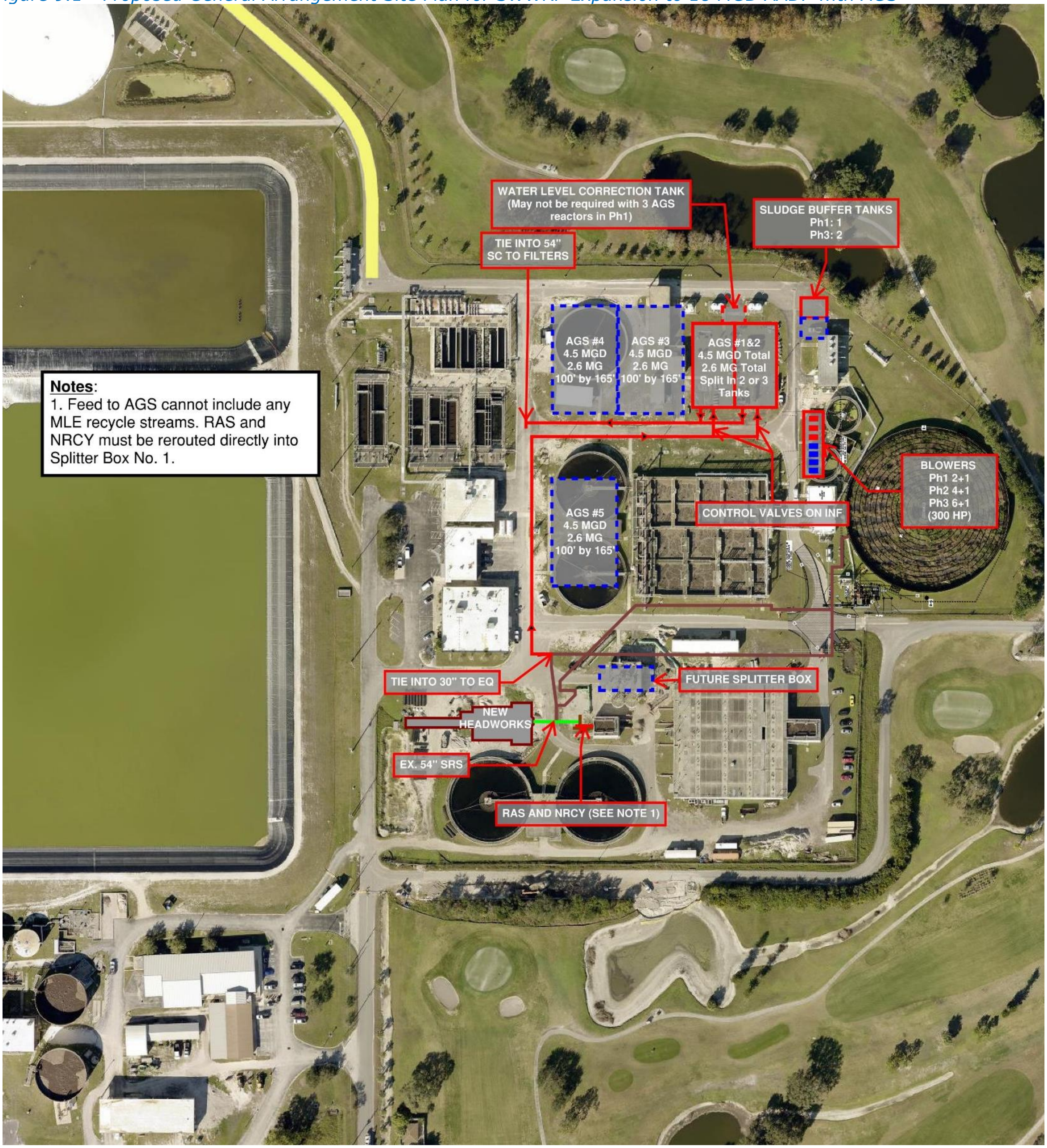
9.1.2 AGS Secondary Treatment System

SRS feed to the new AGS process must be split off prior to any introduction of RAS or NRCY from the MLE process. RAS and NCRY are manifolded in with SRS from the headworks prior to Splitter Box No. 1. One option to split off SRS to AGS is to tee off the 30" line going to the EQ tank. The 48" NCRY must be redirected directly into Splitter Box No. 1 before the current manifold with 54" SRS. The 24" RAS from secondary clarifiers 3 and 4 must also be redirected directly into Splitter Box No. 1. Combining the NRCY and RAS prior to Splitter Box No. 1 could be evaluated during preliminary design. Influent to each AGS reactor must be controlled with a valve and flow meter to regulate the influent flow. The flow into each reactor must be regulated and monitored by the AGS control system according to Aqua-Aerobic Systems, Inc. Aqua-Aerobic Systems, Inc. has stated that a minimum of three reactors are needed if AGS influent does not feed directly from an AGS influent buffer tank or other influent EQ system. However, our understanding is that the regulation and limitation of flow to the AGS reactors is the main concern, and flow to AGS reactors could be controlled or limited as desired to meet Aqua-Aerobics targets with the balance of the flow sent to the existing MLE process. The determination of two or three reactors should be discussed and agreed upon with all parties during preliminary design.

New AGS reactors could be constructed in the NE portion of SWWRF to add additional secondary treatment capacity without impacting the current MLE process and minimize impacts to other processes. Two or three AGS reactors are proposed in common wall, cast-in-place concrete tanks. The estimated 2.6 MG total AGS reactor volume, based on Aqua-Aerobics Preliminary Design Report in Appendix F, would be the same with two or three tanks, refer to the paragraph above. The layout and estimated capital costs are based on two AGS reactors. 21' SWD AGS reactors are standard for AquaNereda systems. This evaluation was based on the standard tank depth. To avoid an AGS feed pump station the AGS reactors would need to be partially buried approximately 6-7’ such that the feed water level for the tanks is compatible with existing plant hydraulics. It is estimated that additional ballast required to prevent flotation for empty reactors is minimal with most of the volume of the tanks above grade. This will require shoring and dewatering during construction compared to above grade tanks. However, the depth of the foundation is not unique for utility construction on the west coast of Florida. New positive displacement (PD) blowers under a canopy structure should be located adjacent to the AGS reactors and potential future AGS reactors. A sludge buffer tank is required for the AGS system with proposed location shown in **Figure 9.1**. The sludge buffer tank allows for a more consistent waste sludge to be pumped to biosolids handling. A new SE line would convey effluent from each AGS reactor and tee into the existing 54” SE line as shown in **Figure 9.1**. The diameter should be sized during design based on the number of AGS reactors it will serve. The layout in **Figure 9.1** is conceptual and used to identify possible locations and associated costs with existing infrastructure.

McKIM&CREED ENGINEERS SURVEYORS PLANNERS

Figure 9.1 - Proposed General Arrangement Site Plan for SWWRF Expansion to 18 MGD AADF with AGS



9.1.3 Hydraulic Considerations

With the NRCY and RAS isolated and routed directly into Splitter Box No. 1, discussed above, additional flow redirected to the AGS system, and no need to add more distribution downstream, Splitter Box No. 1 is sufficient to remain as-in for this alternative.

The AGS reactors should be partially buried to allow gravity flow from the headworks. Effluent from AGS reactors should flow directly to tertiary treatment. With this arrangement the flow from preliminary treatment to tertiary treatment does not require an intermediate pump station. Tertiary treatment hydraulics improvements discussed in **5.6.2 Recommended Actions to Resolve Hydraulic Limitations** would still apply with this alternative for expansion.

9.1.4 Opinion of Probable Construction Cost

To allow for the planning of projected future capital costs associated with the expansion of the SWWRF, **Table 9.1** below presents a summary of the conceptual project costs based on the expansion of the SWWRF to an AADF capacity of 18 MGD with AGS. This cost opinion has been prepared as described in **7 OPINION OF PROBABLE PROJECT COST**.

An estimating contingency is also applied to all facility and disciplines estimates due to the preliminary nature of this evaluation to account for additional costs that will be realized during the detailed stages of design. Project cost escalation between present day and the estimated date of project bid opening in 2026 is included to estimate the rate of future inflation. Estimated inflation has been included to aid in capital improvement planning, however, this should be re-evaluated annually, and capital improvement budgets adjusted accordingly. Finally, engineering, administrative, and legal costs were estimated based on the direct construction costs at present day costs.

Costs were estimated based on past projects of similar size and scope; and McKim & Creed has no control over the costs of labor, materials, and equipment in the future. This is only an estimate of conceptual construction costs based on materials and equipment costs as of October 2022.

Table 9.1 - Cost Opinion for SWWRF Expansion to 18 MGD AADF with AGS

Description	Cost
STRUCTURAL/MECHANICAL	
NCRY and RAS to Splitter Box No. 1	$100,000
AquaNereda Process for 4.5 MGD	$15,813,000
AquaDiamond Filters: 1 refurbished, 1,920 ft^2	$13,500,000
CCC Finger Weirs Retrofit	$51,000
New Effluent Pumps	$2,100,000
Structural/Mechanical Subtotal	***$22,064,000***
OTHER DISCIPLINES	
Overall Sitework and Demo (25%)	$5,516,000
Yard Piping (25%)	$5,600,000
Electrical (25%)	$5,516,000
SCADA/I&C (18%)	$3,972,000
Other Disciplines Subtotal	***$20,604,000***
INDIRECT COSTS	
Mobilization/Demobilization (5%)	$2,134,000
General Conditions	$7,350,000
Contractor Overhead & Profit (20%)	$10,667,000
Maintenance of Plant Operations (10%)	$3,414,000
Contractor Bonds/Insurance (4%)	$1,707,000
Indirect Costs Subtotal	***$25,272,000***
Construction Cost Subtotal	***$67,940,000***
Estimating Contingency (30%)	***$20,382,000***
OPINION OF PROBABLE CONSTRUCTION COST (2022 VALUE)	**$88,322,000**
Project Cost Escalation Due to Inflation (5% Compounded Annually, 4 Years)	***$19,034,000***
OPINION OF PROBABLE COSNTRUCTION COST (INC. EST. INFLATION TO 2026)	**$107,356,000**
OTHER PROJECT COSTS	
Engineering, Administration, and Legal (25% of Direct Costs)	***$10,667,000***
OPINION OF PROBABLE PROJECT COST	**$118,023,000**

9.2 Secondary Treatment Assessment for Expansion to 18 MGD AADF at AWT with AGS

An alternative to expanding SWWRF to 18 MGD AADF and meet AWT effluent limits would be to completely replace the MLE secondary treatment process with a new AGS secondary treatment system. The available open area at the SWWRF is not sufficient to build the AGS system without demolishing a portion of the existing MLE system. **Figure 9.2** shows one potential layout for the process conversion. The layout shown is based on first adding the first AGS in the same location as discussed in **Section 9.1** and additional AGS reactors would be located in close proximity to each other and blower structure. Due to the smaller tankage and footprint requirements, there will be additional areas left over for future use.

The conversion is shown in three phases. SWWRF could operate after the first phase has been completed (expansion with current limits) with dual, parallel secondary treatment processes for many years into the future. Phase one adds 4.5 MGD AADF of treatment capacity with AGS without reducing the existing 13.5 MGD AADF MLE system capacity. Phase two adds another 4.5 MGD AADF of AGS treatment capacity, for a total of 9 MGD AADF AGS treatment capacity, and the existing MLE system capacity is reduced to approximately 10.5 MGD AADF based on the layout shown in **Figure 9.2**. Phase three completes the conversion to AGS with the rest of the MLE system decommissioned. The intent for the second and third phases would be that both would be constructed and commissioned within a couple years of each other. The phasing was identified to spread out construction costs if needed and reduce MOPO to convert the 13.5 MGD MLE system to AGS all at once.

9.2.1 Other Processes Not Impacted by Inclusion of AGS

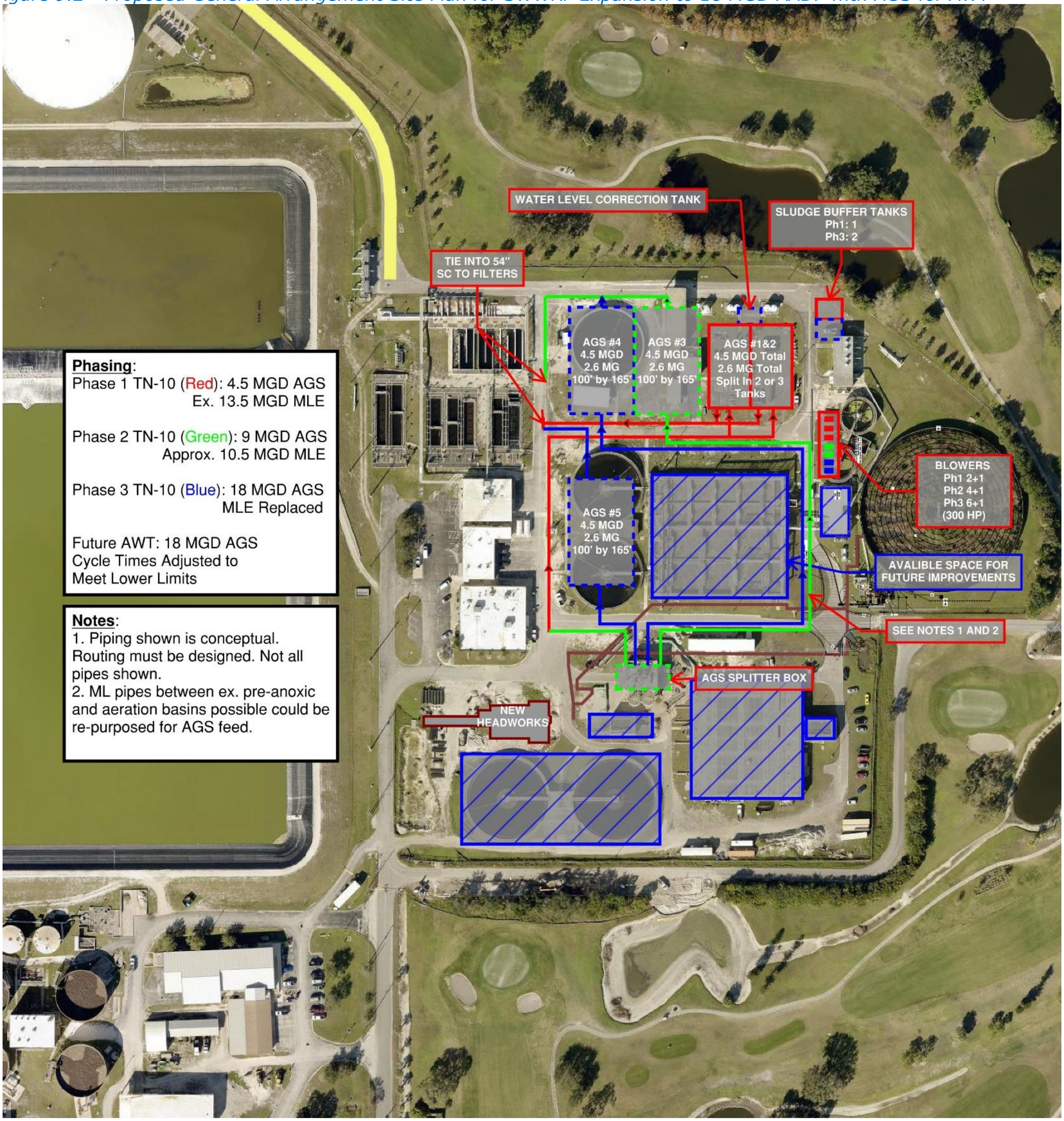
Recommendations for improvements to preliminary treatment, tertiary treatment, effluent pumping and biosolids handling discussed in section **5 FACILITY ASSESSMENT FOR THE EXPANSION TO 18 MGD AADF** remain the same for this alternative.

9.2.2 AGS Secondary Treatment System

A new Splitter Box No. 1 should be constructed to control and split the flow to the AGS reactors. It's recommended that the AGS reactors be partially buried to work with existing plant hydraulics without an intermediate pump station as noted in **Section 9.1.3 Hydraulic Considerations**. It may be feasible for the existing splitter box to be retrofitted for this purpose. However, MOPO would be significant during the retrofit. The flow into each reactor must be regulated and monitored by the AGS control system according to Aqua-Aerobics. Therefore, the design of Splitter Box No. 1 must be coordinated with Aqua-Aerobics.

The layout and estimated capital costs are based on **Figure 9.2**. 21' SWD AGS reactors are standard for AquaNereda systems. This evaluation was based on the standard tank depth. To avoid an AGS feed pump station the AGS reactors would need to be partially buried approximately 6-7' such that the feed water level for the tanks is compatible with existing plant hydraulics. It is estimated that additional ballast required to prevent flotation for empty reactors is minimal with most of the volume of the tanks above grade. This will require shoring and dewatering during construction compared to above grade tanks. However, the depth of the foundation is not uncommon for the area. New PD blowers under a canopy structure should be located adjacent to the AGS reactors and potential future AGS reactors. Two sludge buffer tanks are required for the full buildout AGS system. Sludge buffer tanks allow for a more consistent waste sludge to be pumped to biosolids handling. New SE lines are required to convey effluent from each AGS reactor and tee into the existing 54” SE line.

Figure 9.2 - Proposed General Arrangement Site Plan for SWWRF Expansion to 18 MGD AADF with AGS for AWT



9.2.3 Hydraulic Considerations

The hydraulic limitations noted with the existing Splitter Box No. 1 do not apply with the construction and/or retrofit of a new splitter box to serve the AGS system. The flow going through the splitter box is significantly less without the NRCY and RAS streams associated with the MLE process. If control valves are used on AGS reactor influent connections in conjunction with the splitter box, provisions should be made to ensure Splitter Box No. 1 and the Headworks do not overflow.

The AGS reactors should be partially buried to allow gravity flow from the headworks. Effluent from AGS reactors should flow directly to tertiary treatment. With this arrangement the flow from preliminary treatment to tertiary treatment does not require an intermediate pump station. Tertiary treatment hydraulics improvements discussed in **5.6.2 Recommended Actions to Resolve Hydraulic Limitations** would still apply with this alternative for expansion.

9.2.4 Opinion of Probable Construction Cost

To allow for the planning of projected future capital costs associated with the expansion of the SWWRF, the following tables present a summary of the conceptual project costs based on the expansion and conversion of the SWWRF to an AADF capacity of 18 MGD for AWT with AGS. This has been broken down into phases followed by comparison of costs if conversion to AGS was completed in one phase. **Table 9.2** presents conceptual costs as second phase following the initial phase discussed in **Section 9.1**. **Table 9.3** presents conceptual costs as third phase following phases 1 and 2. **Table 9.4** presents conceptual costs for a complete conversion to AGS in one phase, which can be compared to the BioMag alternative in **Section 8.5**. These cost opinions have been prepared as described in **7 OPINION OF PROBABLE PROJECT COST**.

An estimating contingency is also applied to all facility and disciplines estimates due to the preliminary nature of this evaluation to account for additional costs that will be realized during the detailed stages of design. Project cost escalation between present day and the estimated date of project bid opening in years 2026, 2028, and 2030 as noted in the table, has been included to estimate the rate of future inflation. Estimated inflation has been included to aid in capital improvement planning, however, this should be re-evaluated annually, and capital improvement budgets adjusted accordingly. Finally, engineering, administrative, and legal costs were estimated based on the direct construction costs at present day costs.

Costs were estimated based on past projects of similar size and scope; and McKim & Creed has no control over the costs of labor, materials, and equipment in the future. This is only an estimate of conceptual construction costs based on materials and equipment costs as of October 2022.

Table 9.2 - Phase 2 Cost Opinion for SWWRF Expansion to 18 MGD AADF by Conversion to AGS for AWT

Description	Cost
STRUCTURAL/MECHANICAL	
New Splitter Box No. 1	$2,000,000
AquaNereda Process Phase 2	$11,415,000
Structural/Mechanical Subtotal	***$13,415,000***
OTHER DISCIPLINES	
Overall Sitework and Demo (30%)	$4,025,000
Yard Piping (30%)	$3,400,000
Electrical (20%)	$3,354,000
SCADA/I&C (18%)	$2,415,000
Other Disciplines Subtotal	***$13,194,000***
INDIRECT COSTS	
Mobilization/Demobilization (5%)	$1,331,000
General Conditions	$7,500,000
Contractor Overhead & Profit (20%)	$6,653,000
Maintenance of Plant Operations (10%)	$2,1291,000
Contractor Bonds/Insurance (4%)	$1,065,000
Indirect Costs Subtotal	**$18,678,000**
Construction Cost Subtotal	**$45,287,000**
Estimating Contingency (30%)	**$13,587,000**
OPINION OF PROBABLE CONSTRUCTION COST (2022 VALUE)	**$58,874,000**
Project Cost Escalation Due to Inflation (5% Compounded Annually, 6 Years)	**$20,023,000**
OPINION OF PROBABLE CONSTRUCTION COST (INC. EST. INFLATION TO 2028)	**$78,897,000**

Table 9.3 - Phase 3 Cost Opinion for SWWRF Expansion to 18 MGD AADF by Conversion to AGS for AWT

Description	Cost
STRUCTURAL/MECHANICAL	
AquaNereda Process Phase 3	$25,535,000
Structural/Mechanical Subtotal	***$25,535,000***
OTHER DISCIPLINES	
Overall Sitework and Demo (30%)	$7,661,000
Yard Piping (30%)	$6,400,000
Electrical (20%)	$6,384,000
SCADA/I&C (15%)	$4,597,000
Other Disciplines Subtotal	***$25,042,000***
INDIRECT COSTS	
Mobilization/Demobilization (5%)	$2,529,000
General Conditions	$7,500,000
Contractor Overhead & Profit (20%)	$12,645,000
Maintenance of Plant Operations (10%)	$4,047,000
Contractor Bonds/Insurance (4%)	$2,024,000
Indirect Costs Subtotal	**$28,745,000**
Construction Cost Subtotal	**$79,322,000**
Estimating Contingency (30%)	**$23,797,000**
OPINION OF PROBABLE CONSTRUCTION COST (2022 VALUE)	**$103,119,000**
Project Cost Escalation Due to Inflation (5% Compounded Annually, 8 Years)	**$49,235,000**
OPINION OF PROBABLE CONSTRUCTION COST (INC. EST. INFLATION TO 2030)	**$152,354,000**
TOTALS FOR ALL THREE PHASES	
PHASE 1: OPCC (INC. EST. INFLATION TO 2026)	**$118,023,000**
PHASE 2: OPCC (INC. EST. INFLATION TO 2028)	**$78,897,000**
PHASE 3: OPCC (INC. EST. INFLATION TO 2030)	**$152,354,000**
TOTAL OF ALL THREE PHASES (YEARS NOTED ABOVE)	**$349,274,000**
OTHER PROJECT COSTS	
Phase 2 and 3 Combined Engineering, Administration, and Legal (25% of Direct Costs)	**$19,297,000**

Table 9.4 – Conversion in One Phase Cost Opinion for SWWRF Expansion to 18 MGD AADF by Conversion to AGS for AWT

Description	Cost
STRUCTURAL/MECHANICAL	
New Splitter Box No. 1	$2,000,000
AquaNereda Process for 18 MGD	$53,198,000
AquaDiamond Filters: 1 refurbished, 1,920 ft^2	$4,000,000
CCC Finger Weirs Retrofit	$51,000
New Effluent Pumps	$2,1000
Structural/Mechanical Subtotal	***$59,249,000***
OTHER DISCIPLINES	
Overall Sitework and Demo (30%)	$18,405,000
Yard Piping (30%)	$15,400,000
Electrical (20%)	$15,338,000
SCADA/I&C (15%)	$11,043,000
Other Disciplines Subtotal	***$60,186,000***
INDIRECT COSTS	
Mobilization/Demobilization (5%)	$6,077,000
General Conditions	$8,400,000
Contractor Overhead & Profit (20%)	$30,384,000
Maintenance of Plant Operations (10%)	$9,723,000
Contractor Bonds/Insurance (4%)	$4,862,000
Indirect Costs Subtotal	***$59,446,000***
Construction Cost Subtotal	***$178,881,000***
Estimating Contingency (30%)	***$53,664,500***
OPINION OF PROBABLE CONSTRUCTION COST (2022 VALUE)	**$232,545,500**
Project Cost Escalation Due to Inflation (5% Compounded Annually, 4 Years)	***$50,116,000***
OPINION OF PROBABLE CONSTRUCTION COST (INC. EST. INFLATION TO 2026)	**$282,661,500**
OTHER PROJECT COSTS	
Engineering, Administration, and Legal (25% of Direct Costs)	**$29,859,000**
OPINION OF PROBABLE PROJECT COST	**$312,520,500**

10. FUNDING STRATEGIES

McKim & Creed contracted with Angie Brewer and Associates, LC (ABA) to evaluate potential funding opportunities to support the expansion of the SWWRF as noted in this CER. The Funding Strategy Memorandum prepared by ABA is incorporated as an Appendix to this document, located in **Appendix E**.

11. SUMMARY AND CONCLUSIONS

11.1 Expansion Timing

Influent flows and loadings to Manatee County's SWWRF have increased at an accelerated rate over the past several years and the SWWRF has been at the MLE process design AADF capacity since 2019. Refer to **Section 1 INTRODUCTION** for explanation for MLE design capacity vs. operation capacity for permit compliance. Due to secondary clarifier capacity limitations, it is recommended that Manatee County immediately plan for the expansion of the SWWRF. Based on discussions with the County the soonest the design and construction could begin would be in fiscal years 2024 and 2026 respectively. In the meantime, as the SWWRF loading operates within the design safety factor for the MLE system, a change in facility operation may be required, especially if flows and loads increase before expanded facilities go into operation. Ultimately, the change in operation would be to reduce SRT, which would lower MLSS, reduce solids loading on clarifiers, and alleviate the current process limitation. This change would increase secondary effluent ammonia and greatly increase chlorine demand for disinfection.

It is recommended that the County conduct a study to identify emergency chlorine storage and dosing improvements required for the additional chlorine demand if and when it is needed. The facility could still remain in permit compliance, but operations would be challenging, and operational costs would increase dramatically for disinfection. The first process expected to be overload is the secondary clarifiers, assuming one of the largest clarifiers out of service for Class I Reliability. To prevent spilling solids from the clarifiers and plugging up downstream filters, operators may need to increase wasting, which will reduce the aerobic SRT. Nitrifiers would get washed out at some point as the aerobic SRT is decreased. The washout SRT is dependent on process temperature, pH, DO, ammonia, and other factors. The expected washout aerobic SRT in the winter for this facility would between 2 and 3 days, without any safety factor. Maintaining a stable SRT is challenging with manual control. It is recommended that the County conduct an evaluation and implementation of hydraulic SRT control through SCADA programming.

Manatee County has requested that McKim & Creed prepare this CER to begin planning for the expansion of the SWWRF. The intention of this CER is to identify the necessary improvements and their associated capital costs to expand the SWWRF to an AADF capacity of 18 MGD across all unit processes and identify potential funding strategies to complete the expansion. An additional purpose of this CER was to identify the necessary improvements and their associated capital costs to meet Florida AWT requirements at the expanded facility capacity of 18 MGD AADF.

11.2 MLE Process Expansion

All existing unit processes within the SWWRF were evaluated at a conceptual level to determine their hydraulic and treatment capacities and identify improvements necessary to meet the future capacity requirements at the facility capacity of 18 MGD AADF. As shown in Sections 3 through 5 contained herein, the analyses performed indicate that expansion of the SWWRF to meet an AADF capacity of 18 MGD is feasible within the existing facility footprint. In general, expansion of the existing MLE process will require the following improvements to expand to the 18 MGD AADF capacity.

- Replacement of Splitter Box No. 1
- Construction of two additional 0.5375 MG anoxic basins
- Construction of a new Splitter Box No. 3 at the effluent end of the new anoxic basins
- Construction of two additional 1.0 MG aeration basins
- Expansion of the existing blower capacity
- Upsizing/expansion of the existing process air distribution piping
- Expansion/replacement of the existing diffuser grids in each aeration basin
- Upsizing of the common RAS/NRCY piping to Splitter Box No. 1
- Construction of one additional 125-ft diameter secondary clarifier
- Construction of one additional RAS/WAS pump station to serve new clarifier No. 6
- Replacement of existing WAS pumps serving clarifier Nos. 1 and 2
- Retrofit of existing ABW filters No. 5 with AquaDiamond cloth media filters
- Construction of a new sodium hypochlorite storage and feed facility located in the current footprint of existing filters Nos. 1 and 2
- Retrofit of each CCC with effluent finger weirs
- Replacement of the reuse transfer pumps/effluent pumps

The County requested an evaluation of potential phasing of this recommended alternative, to better match capital spending with projected growth in influent flow rates. Based upon the latest flow projections presented in the 2022 Wastewater Collection System Master Plan Updates Workshop meeting on May 6th 2022 using Methodology 1 conducted by the County and Carollo Engineers, the SWRWRF has already exceeded its 2035 flow projection and will likely exceed the 2040 flow projection of approximately 15 MGD before any facility upgrade may be placed into service. Therefore, there appears to be no benefit in partial construction of any recommended alternative and full expansion to 18 MGD is recommended.

The total opinion of probable construction cost for the expansion of the SWWRF using the current MLE process is $111,394,000 based on materials, equipment, and installation costs as of June 2022. The total opinion of probable construction cost including an estimate of potential cost inflation between present day and 2026, estimated bid opening year, is $135,401,000.

11.3 Expansion with AGS

At the County's request expansion to 18 MGD AADF by adding a new parallel AGS secondary treatment process, AquaNereda, was evaluated. The footprint and total tankage requirement were estimated to be significantly less than expansion of the MLE process. In general, expansion with AGS will require the following improvements to expand to the 18 MGD AADF capacity.

- Separation of RAS and NCRY streams directly into Splitter Box No. 1
- Branch of off existing 30" line to EQ for AGS system influent
- Construction of 2.6 MG total AGS process volume split into two or three reactors
- Construction of new blower canopy area with three 300 HP PD blowers
- Construction of one 0.07 MG Sludge Buffer Tank
- Construction of one 0.09 MG Water Level Correction Tank (if needed for two initial AGS reactors)
- Replacement of existing WAS pumps serving clarifier Nos. 1 and 2
- Retrofit of existing ABW filters No. 5 with AquaDiamond cloth media filters
- Construction of a new sodium hypochlorite storage and feed facility located in the current footprint of existing filters Nos. 1 and 2
- Retrofit of each CCC with effluent finger weirs
- Replacement of the reuse transfer pumps/effluent pumps

The total opinion of probable construction cost for the expansion of the SWWRF with a new parallel AGS process is $88,322,000 based on materials, equipment, and installation costs as of November 2022. The total opinion of probable construction cost including an estimate of potential cost inflation between present day and the date of project bid is $107,356,000.

It is recommended to expand by way of adding a parallel AGS processes solely based on lower capital cost compared to expansion of the MLE process. Manatee County has stated that they are comfortable operating the dual processes.

11.4 Expansion to Meet AWT Requirements

A conceptual alternative for expansion of the SWWRF to meet Florida AWT requirements was also evaluated, as described in Section 8 contained herein. Expansion of the SWWRF to meet AWT requirements is expected to require conversion of the existing MLE process to a four-stage Bardenpho process to achieve an effluent TN concentration of 3.0 mg/L. The inclusion of biological or chemical phosphorus removal is not expected to be required to meet AWT requirements as the SWWRF does not discharge directly to surface waters, and the nutrient limitation of the surrounding coastal water bodies is widely known to be predominantly associated with nitrogen. The possibility of a TP waiver should be discussed with FDEP and verified through additional studies prior to detailed design if the County elects to proceed with the AWT alternative.

As described in Section 8, conversion of the SWWRF to a conventional four-stage Bardenpho process to meet AWT requirements will require additional reactor basins and at least one additional clarifier. This will not be feasible within the existing footprint of the SWWRF. As a result, process intensification will be required to meet AWT requirements if the County desires to stay within the existing facility footprint. Three primary alternatives for process intensification coupled with the four-stage Bardenpho process were discussed in Section 8, including ballasted activated sludge with the BioMag process, integrated fixed-film activated sludge (IFAS), and membrane bioreactors (MBR). The BioMag ballasted activated sludge process was selected for this evaluation based on practical knowledge of each alternative and the site and process characteristics of the SWWRF. Based on the evaluation described in Section 8, and in coordination with Evoqua, it was determined that the expansion of the SWWRF to an AADF capacity of 18 MGD using the BioMag technology coupled with a four-stage Bardenpho process is expected to adequately meet the AWT requirements within the existing facility footprint. Expansion of the SWWRF utilizing the BioMag four-stage Bardenpho process is expected to require the following improvements:

- Replacement of Splitter Box No. 1
- Construction of one additional 0.5375 MG anoxic basin
- Upsizing of the existing anoxic basin mixers
- Construction of one additional 1.0 MG aeration basin
- Expansion of the existing blower capacity
- Upsizing/expansion of the existing process air distribution piping
- Expansion/replacement of the existing diffuser grids in each aeration basin
- Addition of supplemental mixing equipment in each aeration basin
- Upsizing of the existing NRCY pumps

- Upsizing of the common RAS/NRCY piping to Splitter Box No. 1
- Construction of four new post-anoxic basins, with a volume of 0.5 MG each
- Construction of four new reaeration basins, with a volume of 0.08 MG each, and sharing common wall construction with the post-anoxic basins
- Construction of a new intermediate pump station between the aeration basins and the post-anoxic basins
- Construction of a new secondary clarifier splitter box after the reaeration basins
- Replacement of all secondary clarifier draft-tube style clarifier mechanisms with new uni-tube header clarifier mechanisms
- Upsizing of all existing RAS and WAS pumps
- Construction of a new BioMag equipment building and installation of all BioMag equipment
- Construction of a new glycerol storage and feed facility to provide supplemental carbon to the post-anoxic basins
- Retrofit of existing ABW filters No. 5 with AquaDiamond cloth media filters
- Retrofit of each CCC with effluent finger weirs
- Replacement of the reuse transfer pumps/effluent pumps

The total opinion of probable construction cost for the expansion of the SWWRF to meet AWT requirements using the BioMag four-stage Bardenpho process is $215,299,000 based on materials, equipment, and installation costs as of June 2022. The total opinion of probable construction cost including an estimate of potential cost inflation between present day and the date of project bid is $261,698,000.

11.5 Expansion to Meet AWT Requirements with AGS

At the County's request an alternate concept expansion of the SWWRF by converting to an AGS secondary treatment process, AquaNereda, to meet Florida AWT requirements was also evaluated. This is described in **Section 9** contained herein. Expansion of the SWWRF to meet AWT requirements with an AGS system will require a complete conversion and replacement of the existing secondary treatment process to achieve an effluent TN concentration of 3.0 mg/L. The AGS system would also be capable of achieving an effluent TP of 1.0 mg/L if required.

As described in **Section 10**, conversion of the SWWRF to an AGS process to meet AWT requirements will require all new AGS reactors to be constructed. This will not be feasible within the existing available open land in the area near the existing secondary treatment. The first 4.5 MGD AADF of capacity could be constructed without reducing the capacity of the existing MLE process. After that at least two additional phases will be needed to demolish existing secondary treatment structures to make space for the new AGS reactors. Each phase will require significant MOPO during construction and commissioning to maintain treatment. The footprint and total tankage requirement are significantly less than expansion utilizing a BioMag four-stage Bardenpho process, and space for future improvements will be available in the left over decommissioned MLE areas not needed for the AGS system. Expansion of the SWWRF utilizing the AquaNereda AGS process is expected to require the following improvements.

- New Splitter Box No. 1 or Retrofit of Existing Splitter Box No. 1 to Supply the AGS Reactors
- Construction of 10.4 MG total AGS process volume split into five or six reactors
- Construction of new blower canopy area with seven 300 HP PD blowers
- Construction of two 0.07 MG Sludge Buffer Tanks
- Construction of one 0.09 MG Water Level Correction Tank (revisit need in preliminary design)
- Retrofit of existing ABW filters No. 5 with AquaDiamond cloth media filters
- Construction of a new sodium hypochlorite storage and feed facility located in the current footprint of existing filters Nos. 1 and 2
- Retrofit of each CCC with effluent finger weirs
- Replacement of the reuse transfer pumps/effluent pumps

The total opinion of probable construction cost for the expansion of the SWWRF to meet AWT effluent limits with a new AGS process based on materials, equipment, and installation costs as of November 2022 is $88,322,000 for Phase 1, $58,874,000 for Phase 2 and $103,119,000 for Phase 3. The total opinion of probable construction cost including an estimate of potential cost inflation between present day and the date of project bid is $118,023,000 for Phase 1, $78,897,000 for Phase 2 and $152,354,000 for Phase 3. The total opinion of probable construction cost including an estimate of potential cost inflation between present day and at assumed bid years for all three phases is $349,274,000 and in a single phase is $282,661,500. Both totals have higher estimated capital costs than the BioMag alternative.

If SWWRF must be upgraded to meet AWT limits the County could consider a comparison of life cycle costs between the AWT options considered. Solely based on capital costs estimated with this report BioMag is recommended for an AWT upgrade prior to any MLE capacity upgrades. However, if the County first expands to 18 MGD with a parallel AGS process, converting the remaining secondary treatment process to AGS would be less costly than a conversion to any other process at that point.

11.6 Recommendations

Planning, design and construction of expansion of the SWWRF to 18 MGD AADF is recommended as soon as possible to maintain the County's desired effluent 10 mg/L TN as discussed in this report. Expansion to 18 MGD by adding a parallel AGS process is recommended and estimated to have the lowest capital cost. This alternative allows for a future complete conversion to AGS with built-in capabilities to meet AWT limits in the future if required. The County stated they are comfortable with operating dual secondary treatment processes. Until the expansion is online the County may have to operate the SWWRF with reduced nitrogen removal and increased operational cost and complexity as discussed in this report. The operational change would allow SWWRF to stay in permit compliance. Treatment to AWT limits is not a current regulatory or administrative requirement. The evaluation of improvements to meet AWT limits was included in this report for information purposes at the County's request.

11.7 Recommended Monitoring Improvements

Several monitoring improvements are recommended in the immediate term to better assist detailed design of the expansion to the SWWRF. McKim & Creed recommends the addition of the following monitoring parameters and devices:

- Influent COD, $cBOD_5$, TSS, VSS, TKN, NH_3, and TP (flow-weighted composites, minimum five days per week)
- Online TSS sensor in the secondary effluent to assist in evaluating clarifier performance and allow SRT control if desired
- Effluent TKN, NH_3, NO_3, NO_2, and TN (flow-weighted composites, minimum five days per week)
- Online TSS sensors in the aeration basins to better estimate MLSS concentrations and allow SRT control if desired
- Online TSS sensors on the RAS lines to better estimate RAS/WAS concentration and allow SRT control if desired
- Recalibration or replacement of WAS flow meters
- Recalibration or replacement of RAS flow meters

McKim and Creed suggests that operations management focuses on improving the manner operation data from the facility are currently collected and reported, and the frequency of complete process data measured and calculated to facilitate process control. Please note that the model simulations in this report were all run with an internal recycle flow of 250% of the influent wastewater flow. This is especially important for the control of nitrate concentrations in the effluent, as less nitrate or more nitrate recycled to the anoxic basin can be detrimental for process optimization.

Finally, it is important to emphasize that the simulation results should not be perceived as absolute in wastewater operation optimization because of specific limitations associated with any biological model used, the availability (only one set of influent pollutant determination per week) and quality of the data used for input in the simulator, and the scaling from lab-scale data to full-scale operation data.

APPENDIX A:

HISTORICAL INFLUENT FLOW, LOADING, AND OPERATIONAL DATA

Summary Data 2019

	Influent										Influent loading			
	SW_Inf: pH -field	SW_Inf: Total Flow	SW_Inf: Flow Max	SW_Inf: CBOD5	SW_Inf: COD	SW_Inf: TSS	SW_Inf: VSS	SW INF TKN	SW INF NH3	Rolling Average Total Flow	SW_Inf: CBOD5	SW_Inf: TSS	SW INF TKN	SW INF NH3
Units	SU	MGD	MGD	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	MGD	lb/day	lb/day	lb/day	lb/day
Minimum Day	6.8	10.6	15.9	38		28		12	12	10.6	6,211	3,498	1,688	1,325
Max Month ADF	7.5	26.5	35.3	173		240		53	36	27.5	15,025	18,291	3,995	3,531
Average Day	7.2	13.5	21.8	103		100		31	27	13.5	11,219	10,908	3,387	2,924
Max Day	7.5	33.2	50	189		252		58	37	32.4	21,353	28,893	5,134	3,814

Flow Peak Factors		
Min Day	0.79	0.73
Max Month ADF	1.97	1.62
Max Day	2.47	2.30

Rolling Flow		Pollutant Peak factors			
0.79		CBOD5	TSS	TKN	NH3
2.04	Min Day	0.55	0.32	0.50	0.45
1.00	Max Month ADF	1.34	1.68	1.18	1.21
2.40	Max Day	1.90	2.65	1.52	1.30

Summary Data 2019

Primary Clar/Anoxic Basin				Effluent									
Pri Eff Alk	SB 2 Alk	SW SB 2 NH3	SW SB 2 NO3	Eff: pH MAX	Eff: pH MIN	SW_Eff: CBOD	Eff: NH3	Eff: TSS	Eff: TKN	Eff: NO2	Eff: NO3	Eff: Nitrogen, Total	Eff: Turbidity Max
mg/L	mg/L	mg/L	mg/L	SU	SU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU
	154	1.5	0.02	6.9	6.7		0.49		1.0	0.01	3.8	6.1	0.5
	243	8.5	3.2	7.3	7.2		3.8		4.0	0.1	7.8	9.8	2.2
	183	6.4	0.27	7.0	6.9		0.9		2.0	0.10	6.0	8.0	0.91
	250	9.4	3.7	8.0	7.2		4.1		4.4	7.0	9.1	10.4	2.6

Summary Data 2019

Aeration Basins												Misc				
AB: Aeration Basin #1 D.O	AB: Aeration Basin #1 SVI	AB: Aeration Basin #1 MLSS	AB: Aeration Basin #2 D.O	AB: Aeration Basin #2 SVI	AB: Aeration Basin #2 MLSS	AB: Aeration Basin #3 D.O	AB: Aeration Basin #3 SVI	AB: Aeration Basin #3 MLSS	AB: Aeration Basin #4 D.O	AB: Aeration Basin #4 SVI	AB: Aeration Basin #4 MLSS	Anoxic Basin online	Aer Basin online	Sec Clar online	RAS: Flow	Combined WAS Total Flow
mg/l		mg/l	mg/l		mg/l	mg/l		mg/l	mg/l		mg/l	Count	Count	Count	MGD	MGD
2.3	46	2,133	2.4	46	2,035	2.1	48	2,128	2.3	48	2,098	2	4	5	3.7	0.016
3.7	74	4,581	3.6	75	4,466	4.6	75	4,585	4.1	74	4,528	2	4	5	17	0.105
3.0	61	3,262	3.0	62	3,226	3.1	61	3,231	3.2	62	3,239	2	4	5	11	0.063
4.1	88	5,295	4.0	88	5,012	5.2	81	4,777	4.5	83	5,020	4	4	5	17	0.121

February 2019 Special Sampling Data

	Influent									Influent loading			
	SW_Inf: pH -field	SW_Inf: Total Flow	SW_Inf: Flow Max	SW_Inf: CBOD5	SW_Inf: COD	SW_Inf: TSS	SW_Inf: VSS	SW INF TKN	SW INF NH3	SW_Inf: CBOD5	SW_Inf: TSS	SW INF TKN	SW INF NH3
Units	SU	MGD	MGD	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	lb/day	lb/day	lb/day	lb/day
Min Day	6.9	12.9	19	98	225	58	47	33	29	10,745	6,358	3,683	3,298
Average Day	7.3	13.5	24	132	378	158	135	36	32	14,910	17,974	4,013	3,573
Max Month ADF	7.4	13.8	38	168	512	243	244	38	33	19,310	27,857	4,338	3,728
Max Day	7.4	13.8	50	187	567	252	273	41	33	21,359	28,902	4,418	3,807
Flow Peak Factors													
Min Day		0.95			0.60		0.35						
Max Month ADF		1.02			1.36		1.81						
Max Day		1.02			1.50		2.02						

	Pollutant Max Peak factors					
	CBOD5	TSS	TKN	NH3	COD	VSS
Min Day	0.72	0.35	0.92	0.92	0.60	0.35
Max Month ADF	1.30	1.55	1.08	1.04	1.36	1.81
Max Day	1.43	1.61	1.10	1.07	1.50	2.02

February 2019 Special Sampling Data

Primary Clar/Anoxic Basin				Effluent									
Pri Eff Alk	SB 2 Alk	SW SB 2 NH3	SW SB 2 NO3	Eff: pH MAX	Eff: pH MIN	SW_Eff: CBOD	Eff: NH3	Eff: TSS	Eff: TKN	Eff: NO2	Eff: NO3	Eff: Nitrogen, Total	Eff: Turbidity Max
mg/L	mg/L	mg/L	mg/L	SU	SU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU
167	153	7.5	0.03	6.9	6.8	0.78	0.70	1.8	1.2	0.02	6.6	5.9	0.86
167	161	7.9	.06	7.0	6.9	.78	.80	1.8	1.9	.55	7.3	8.7	1.1
167	165	8.1	0.08	7.2	6.9	.78	.87	1.8	2.2	.07	7.8	9.7	1.4
167	166	8.2	0.09	7.4	7.0	.78	.87	1.8	2.3	7.0	9.1	9.8	1.6

February 2019 Special Sampling Data

Aeration Basins												Misc				
AB: Aeration Basin #1 D.O.	AB: Aeration Basin #1 SVI	AB: Aeration Basin #1 MLSS	AB: Aeration Basin #2 D.O.	AB: Aeration Basin #2 SVI	AB: Aeration Basin #2 MLSS	AB: Aeration Basin #3 D.O.	AB: Aeration Basin #3 SVI	AB: Aeration Basin #3 MLSS	AB: Aeration Basin #4 D.O.	AB: Aeration Basin #4 SVI	AB: Aeration Basin #4 MLSS	Anoxic Basin online	Aer Basin online	Sec Clar online	RAS: Flow	Combined WAS Total Flow
mg/l		mg/l	mg/l		mg/l	mg/l		mg/l	mg/l		mg/l	Count	Count	Count	MGD	MGD
2.6	58	3,807	2.5	55	3,668	2.6	58	3,727	2.3	58	3,801	2	4	5	3.7	0.084
3.0	63	4,263	2.8	64	4,173	2.9	63	4,161	2.8	65	4,156	2	4	5	6.1	.091
3.4	68	4,603	3.3	69	4,732	3.3	68	4,647	3.1	70	4,553	2	4	5	8.8	0.098
3.5	71	4,838	3.4	71	5,015	3.6	69	4,680	3.5	71	4,689	4	4	5	9.2	0.099

Summary Data 2020

	Influent								Influent Loadings			
	SW_Inf: pH -field	SW_Inf: Total Flow	SW_Inf: Flow Max	SW_Inf: CBOD5	SW_Inf: TSS	SW INF TKN	SW INF NH3	Rolling Average Total Flow	SW_Inf: CBOD5	SW_Inf: TSS	SW INF TKN	SW INF NH3
Units	SU	MGD	MGD	mg/L	mg/L	mg/L	mg/L	MGD	lb/day	lb/day	lb/day	lb/day
Minimum Day	7.2	10.8	17.7	44	35	18	12	10.8	5,511	3,506	2,154	1,619
Max Month ADF	7.6	16.4	24.8	119	168	32	30	23.9	12172	18132	3514	3228
Average Day	7.5	13.6	21.9	94	94	28	24	13.6	10,205	10,404	3,061	2,632
Max Day	7.8	30.7	46.3	156	262	40	37	29.6	15,439	27,962	4,283	3,949

Flow Peak Factors			
Min Day		0.79	0.47
Max Month ADF		1.21	1.26
Max Day		2.26	1.65

Rolling Flow
0.79
1.75
2.17

	Pollutant Loading Peak Factors			
	CBOD5	TSS	TKN	NH3
Min Day	0.54	0.34	0.70	0.62
Max Month ADF	1.19	1.74	1.15	1.23
Max Day	1.51	2.69	1.40	1.50

Summary Data 2020

Primary Clar/Anoxic Basin				Effluent									
Pri Eff Alk mg/L	SB 2 Alk mg/L	SW SB 2 NH3 mg/L	SW SB 2 NO3 mg/L	Eff: pH MAX SU	Eff: pH MIN SU	SW_Eff: CBOD mg/L	Eff: NH3 mg/L	Eff: TSS mg/L	Eff: TKN mg/L	Eff: NO2 mg/L	Eff: NO3 mg/L	Eff: Nitrogen, Total mg/L	Eff: Turbidity Max NTU
	193	4.1	0.02	7.0	6.8		0.52		1.1	0.02	3.8	5.8	0.40
	268.0	8.0	0.18	7.4	7.3		4.1		2.8	0.14	6.6	8.7	2.7
	235	6.4	0.07	7.2	7.1		0.91		1.9	0.06	5.4	7.4	1.0
	270	8.2	0.19	7.5	7.3		5.2		2.9	0.17	6.7	8.8	3.4

Summary Data 2020

Aeration Basins											
AB: Aeration Basin #1 D.O mg/l	AB: Aeration Basin #1 SVI	AB: Aeration Basin #1 MLSS mg/l	AB: Aeration Basin #2 D.O mg/l	AB: Aeration Basin #2 SVI	AB: Aeration Basin #2 MLSS mg/l	AB: Aeration Basin #3 D.O mg/l	AB: Aeration Basin #3 SVI	AB: Aeration Basin #3 MLSS mg/l	AB: Aeration Basin #4 D.O mg/l	AB: Aeration Basin #4 SVI	AB: Aeration Basin #4 MLSS mg/l
2.1	43	2,330	2.0	43	2,304	2.1	43	2,320	2.2	46	2,368
4.0	86	5773	4.1	90	5,615	4.0	89	5,688	3.8	89	5,792
2.9	65	4,069	2.9	66	4,025	3.0	65	4,039	2.9	66	4,048
5.6	93	6,188	4.7	95	6,157	5.0	97	6,247	4.3	229	6,288

Misc				
Anoxic Basin online Count	Aer Basin online Count	Sec Clar online Count	RAS: Flow MGD	Combined WAS Total Flow MGD
2	4	4	0.50	0.005
2	4	5	15	0.094
2	4	4	4.8	0.041
2	4	5	16	0.101

Summary Data 2021

	Influent								Influent Loadings			
	SW_Inf: pH -field	SW_Inf: Total Flow	SW_Inf: Flow Max	SW_Inf: CBOD5	SW_Inf: TSS	SW INF TKN	SW INF NH3	Rolling Average Total Flow	SW_Inf: CBOD5	SW_Inf: TSS	SW INF TKN	SW INF NH3
Units	SU	MGD	MGD	mg/L	mg/L	mg/L	mg/L	MGD	lb/day	lb/day	lb/day	lb/day
Minimum Day	7.4	11.20	17.74	28	56	4.3	14	11.23	4,231	6,258	2,916	1,992
Max Month ADF	8.0	20.5	30.7	174	286	42	33	20.34	13,992	21264	3764	3205
Average Day	7.6	13.4	21.6	105	160	27	26	13.43	11,272	17,413	3,498	2,785
Max Day	8.0	21.6	41.5	188	297	43	34	21.29	18,704	33,939	4,457	3,585

Flow Peak Factors	Total Flow	Flow Max
Minimum Day	0.83	0.82
Max Month ADF	1.53	1.42
Max Day	1.61	1.93

Average Flow PF: 2019-2021			
	Total Flow	Flow Max	Rolling Flow
Minimum Day	0.81	0.67	0.80
Max Month ADF	1.57	1.43	1.77
Max Day	1.94	1.79	2.05

	Rolling Flow
Minimum Day	0.84
Max Month ADF	1.51
Max Day	1.59

Pollutant Loadings Peak Factors	CBOD5	TSS	TKN	NH3
Minimum Day	0.38	0.36	0.83	0.72
Max Month ADF	1.24	1.22	1.08	1.15
Max Day	1.66	1.95	1.27	1.29

	Recommended Design Flow and Loading Peak Factors							
	Total Flow	Flow Max	CBOD5	TSS	TKN	NH3	COD	VSS
Minimum Day	0.81	0.73	0.49	0.34	0.69	0.60	0.58	0.35
Max Month ADF	1.40	1.25	1.46	2.16	1.29	1.30	1.35	1.77
Max Day	1.90	1.90	1.7	2.45	1.42	1.37	1.41	1.90
Peak hour Flow	3.0	2.0	See Spreadsheet SWWRF Hourly Influent Flows.xls					

	Average Loading PF: 2019-2021				Based on Sampling					
	CBOD5	TSS	TKN	NH3	COD	VSS				
Minimum Day	0.49	0.34	0.68	0.59	0.58	0.35	VSS/TSS =	70%	NH3/TKN =	89.6%
Max Month ADF	1.26	1.55	1.13	1.20	1.35	1.77	VSS/TSS =	66%	NH3/TKN =	85.8%
Max Day	1.69	2.43	1.40	1.36	1.41	1.90				

		Average Design Influent Pollutant Parameters, mg/L									
	Total Flow	Flow Max	CBOD5	BOD5	TSS	TKN	NH3	COD	VSS	Alkalinity	pH
Average	13.5	21.8	132	157	158	36	32	378	135	225	7.47

Summary Data 2021

Primary Clar/Anoxic Basin				Effluent									
Pri Eff Alk mg/L	SB 2 Alk mg/L	SW SB 2 NH3 mg/L	SW SB 2 NO3 mg/L	Eff: pH MAX SU	Eff: pH MIN SU	SW_Eff: CBOD mg/L	Eff: NH3 mg/L	Eff: TSS mg/L	Eff: TKN mg/L	Eff: NO2 mg/L	Eff: NO3 mg/L	Eff: Nitrogen, Total mg/L	Eff: Turbidity Max NTU
	204	3.6	0.03	7.1	7.0	0.0	0.54	0.00	1.5	0.03	3.2	5.4	0.46
	272	7.1	1.0	7.3	7.2	0.0	1.1	0.0	2.7	0.19	6.0	8.2	1.4
	248	6.0	0.16	7.3	7.2	#DIV/0!	0.84	#DIV/0!	2.1	0.10	5.2	7.4	1.0
	285	8.0	3.9	7.6	7.3	0.0	1.3	0.0	2.9	0.35	6.6	9.2	3.0

Summary Data 2021

Aeration Basins												Misc				
AB: Aeration Basin #1 D.O mg/l	AB: Aeration Basin #1 SVI	AB: Aeration Basin #1 MLSS mg/l	AB: Aeration Basin #2 D.O mg/l	AB: Aeration Basin #2 SVI	AB: Aeration Basin #2 MLSS mg/l	AB: Aeration Basin #3 D.O mg/l	AB: Aeration Basin #3 SVI	AB: Aeration Basin #3 MLSS mg/l	AB: Aeration Basin #4 D.O mg/l	AB: Aeration Basin #4 SVI	AB: Aeration Basin #4 MLSS mg/l	Anoxic Basin online Count	Aer Basin online Count	Sec Clar online Count	RAS: Flow MGD	Combined WAS Total Flow MGD
1.8	62	3,313	2.2	63	3,300	2.3	62	3,333	2.0	62	3,293	2	4	4	1.6	0.020
3.3	85	5308.6	3.2	86	5,209	3.3	86	5,234	3.0	83	5,239	3	4	5	10	0.076
2.8	77	4,401	2.8	78	4,352	2.9	78	4,387	2.8	77	4,387	2	4	5	6.3	0.056
4.2	97	6,088	4.2	97	6,012	4.6	97	6,065	4.0	94	6,075	3	4	5	16	0.166

APPENDIX B:
BIOWIN MODEL INFLUENT SPECIFIER

COD Influent Data

Name	Value
Flow	18.00
COD - Total mgCOD/L	378.00
N - Total Kjeldahl Nitrogen mgN/L	36.00
P - Total P mgP/L	7.00
S - Total S mgS/L	10.00
N - Nitrate mgN/L	0.00
pH	7.46
Alkalinity mmol/L	4.50
Influent inorganic suspended solids mgISS/	23.00
Metal soluble - Calcium mg/L	74.70
Metal soluble - Magnesium mg/L	26.30
Gas - Dissolved oxygen mg/L	0.00

Paste values to:

Project > Para. > Stoichi. > Common	Value
Particulate Substrate COD:VSS Ratio	1.65
Particulate Inert COD:VSS Ratio	1.60
Cellulose COD:VSS ratio [mgCOD/mgVSS]	1.40

Paste values to:

Project > Para. > Other	Value
k1 for CODc - Xsc	0.50
k2 for CODp - Xsp	0.50

COD Influent Fractions

Name	Raw Defaults	Value
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.1600	**0.1672**
Fac - Acetate [gCOD/g of readily biodegradable COD]	0.1500	**0.3165**
Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable C	0.7500	**0.7376**
Fus - Unbiodegradable soluble [gCOD/g of total COD]	0.0500	**0.0767**
Fup - Unbiodegradable particulate [gCOD/g of total COD]	0.1300	**0.1400**
Fcel - Cellulose fraction of unbiodegradable particulate [gCOD/gCOD]	0.5000	0.5000
Fna - Ammonia [gNH3-N/gTKN]	0.6600	**0.8889**
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.5000	0.5000
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.0200	0.0200
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.0700	0.0700
Fpo4 - Phosphate [gPO4-P/gTP]	0.5000	**0.6500**
FupP - P:COD ratio for unbiodegradable part. COD [gP/gCOD]	0.0220	0.0220
Fsr - Reduced sulfur [H2S] [gS/gS]	0.1500	0.1500
FZbh - Ordinary heterotrophic COD fraction [gCOD/g of total COD]	0.0200	0.0200
FZbm - Methylotrophic COD fraction [gCOD/g of total COD]	1.00E-04	1.000E-04
FZao - Ammonia oxidizing COD fraction [gCOD/g of total COD]	1.00E-04	1.000E-04
FZno - Nitrite oxidizing COD fraction [gCOD/g of total COD]	1.00E-04	1.000E-04
FZaao - Anaerobic ammonia oxidizing COD fraction [gCOD/g of total COD	1.00E-04	1.000E-04
FZppa - Phosphorus accumulating COD fraction [gCOD/g of total COD]	1.00E-04	1.000E-04
FZpa - Propionic acetogenic COD fraction [gCOD/g of total COD]	1.00E-04	1.000E-04
FZam - Acetoclastic methanogenic COD fraction [gCOD/g of total COD]	1.00E-04	1.000E-04
FZhm - Hydrogenotrophic methanogenic COD fraction [gCOD/g of total CO	1.00E-04	1.000E-04
FZso - Sulfur oxidizing COD fraction [gCOD/g of total COD]	1.00E-04	1.000E-04
FZsrpa - Sulfur reducing propionic acetogenic COD fraction [gCOD/g of total	1.00E-04	1.000E-04
FZsra - Sulfur reducing acetotrophic COD fraction [gCOD/g of total COD]	1.00E-04	1.000E-04
FZsrh - Sulfur reducing hydrogenotrophic COD fraction [gCOD/g of total C	1.00E-04	1.000E-04
FZe - Endogenous products COD fraction [gCOD/g of total COD]	0.0000	0.0000

APPENDIX C:
VISUAL HYDRAULICS MODEL REPORT OUTPUT

Visual Hydraulics Summary Report - Hydraulic Analysis

Project: **Manatee County SWWRF Expansion to 18 MGD_12.vhf**
Company: **McKim & Creed, Inc.**
Date: **May 23, 2022**

Current flow conditions

Forward Flow =	54 mgd
Return I Flow =	18.9 mgd
Return II Flow =	63 mgd
Return III Flow =	-----

Section Description	Water Surface Elevation
Starting water surface elevation	**15.33**
Orifices to Effluent Wet Well	**15.35**
Opening type = rectangular orifice Opening diameter/width = 48 in Opening height = 48 in Invert = 8.33 Number of openings = 7 Flow through opening(s) = 54 mgd Total area of opening(s) = 112 ft^2 Velocity through opening(s) = 0.75 ft/s	
CCC 2 Eff Weir	**18.31**
Weir invert (top of weir) = 17.33 Number of contracted sides = 2 Weir length = 9 ft Flow over weir = 18 mgd Submergence = unsubmerged Head over weir = 0.98 ft	
CCC 1 Eff Weir	**18.31**
Weir invert (top of weir) = 17.33 Number of contracted sides = 2 Weir length = 9 ft Flow over weir = 18 mgd Submergence = unsubmerged Head over weir = 0.98 ft	

Section Description	Water Surface Elevation
CCC 3 Eff Weir	**18.31**

Weir invert (top of weir) = 17.33
Number of contracted sides = 2
Weir length = 9 ft
Flow over weir = 18 mgd
Submergence = unsubmerged
Head over weir = 0.98 ft

CCC 3 Pass 3 **18.31**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 61.33 ft
Channel width/diameter = 10 ft
Flow = 18 mgd
Downstream channel invert = 7.33
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 109.8 ft^2
Hydraulic radius = 3.436
Normal depth = infinite
Critical depth = 0.62 ft
Depth downstream = 10.98 ft
Bend loss = 0 ft
Depth upstream = 10.98 ft
Velocity = 0.25 ft/s
Flow profile = Horizontal

CCC 3 Pass 2 **18.32**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 61.33 ft
Channel width/diameter = 10 ft
Flow = 18 mgd
Downstream channel invert = 7.33
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 109.83 ft^2
Hydraulic radius = 3.436
Normal depth = infinite
Critical depth = 0.62 ft
Depth downstream = 10.98 ft
Bend loss = 0 ft
Depth upstream = 10.99 ft
Velocity = 0.25 ft/s
Flow profile = Horizontal

Section Description	Water Surface Elevation
CCC 3 Pass 1	**18.32**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 61.33 ft
Channel width/diameter = 10 ft
Flow = 18 mgd
Downstream channel invert = 7.33
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 109.86 ft^2
Hydraulic radius = 3.436
Normal depth = infinite
Critical depth = 0.62 ft
Depth downstream = 10.99 ft
Bend loss = 0 ft
Depth upstream = 10.99 ft
Velocity = 0.25 ft/s
Flow profile = Horizontal

CCC 3 Influent Gate **18.36**

Opening type = rectangular gate
Opening diameter/width = 66 in
Gate height = 60 in
Invert = 8.33
Number of gates = 1
Flow through gate(s) = 18 mgd
Total area of opening(s) = 27.5 ft^2
Velocity through gate(s) = 1.01 ft/s

CCC 2 Pass 3 **18.31**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 61.33 ft
Channel width/diameter = 10 ft
Flow = 18 mgd
Downstream channel invert = 7.33
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 109.8 ft^2
Hydraulic radius = 3.436
Normal depth = infinite
Critical depth = 0.62 ft
Depth downstream = 10.98 ft
Bend loss = 0 ft
Depth upstream = 10.98 ft
Velocity = 0.25 ft/s
Flow profile = Horizontal

Section Description	Water Surface Elevation

CCC 1 Pass 3 **18.31**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 61.33 ft
Channel width/diameter = 10 ft
Flow = 18 mgd
Downstream channel invert = 7.33
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 109.8 ft^2
Hydraulic radius = 3.436
Normal depth = infinite
Critical depth = 0.62 ft
Depth downstream = 10.98 ft
Bend loss = 0 ft
Depth upstream = 10.98 ft
Velocity = 0.25 ft/s
Flow profile = Horizontal

CCC 1 Pass 2 **18.32**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 61.33 ft
Channel width/diameter = 10 ft
Flow = 18 mgd
Downstream channel invert = 7.33
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 109.83 ft^2
Hydraulic radius = 3.436
Normal depth = infinite
Critical depth = 0.62 ft
Depth downstream = 10.98 ft
Bend loss = 0 ft
Depth upstream = 10.99 ft
Velocity = 0.25 ft/s
Flow profile = Horizontal

CCC 1 Pass 1 **18.32**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 61.33 ft
Channel width/diameter = 10 ft
Flow = 18 mgd
Downstream channel invert = 7.33
Channel slope = 0 ft/ft

Section Description	Water Surface Elevation
Channel side slope = not applicable Area of flow = 109.86 ft^2 Hydraulic radius = 3.436 Normal depth = infinite Critical depth = 0.62 ft Depth downstream = 10.99 ft Bend loss = 0 ft Depth upstream = 10.99 ft Velocity = 0.25 ft/s Flow profile = Horizontal	
CCC 1 Influent Gate	**18.36**
Opening type = rectangular gate Opening diameter/width = 66 in Gate height = 60 in Invert = 8.33 Number of gates = 1 Flow through gate(s) = 18 mgd Total area of opening(s) = 27.5 ft^2 Velocity through gate(s) = 1.01 ft/s	
CCC 2 Pass 2	**18.32**
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 61.33 ft Channel width/diameter = 10 ft Flow = 18 mgd Downstream channel invert = 7.33 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 109.83 ft^2 Hydraulic radius = 3.436 Normal depth = infinite Critical depth = 0.62 ft Depth downstream = 10.98 ft Bend loss = 0 ft Depth upstream = 10.99 ft Velocity = 0.25 ft/s Flow profile = Horizontal	
CCC 2 Pass 1	**18.32**
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 61.33 ft Channel width/diameter = 10 ft Flow = 18 mgd Downstream channel invert = 7.33	

Section Description	**Water Surface Elevation**
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 109.86 ft^2	
Hydraulic radius = 3.436	
Normal depth = infinite	
Critical depth = 0.62 ft	
Depth downstream = 10.99 ft	
Bend loss = 0 ft	
Depth upstream = 10.99 ft	
Velocity = 0.25 ft/s	
Flow profile = Horizontal	
CCC 2 Influent Gate	**18.36**
Opening type = rectangular gate	
Opening diameter/width = 66 in	
Gate height = 60 in	
Invert = 8.33	
Number of gates = 1	
Flow through gate(s) = 18 mgd	
Total area of opening(s) = 27.5 ft^2	
Velocity through gate(s) = 1.01 ft/s	
CCC Influent Channel	**18.36**
User defined loss for flow split = 0 ft	
Total flow through flow split = 54 mgd	
CCC Common Inf Channel	**18.37**
Channel shape = Rectangular	
Manning's 'n' = 0.013	
Channel length = 82.5 ft	
Channel width/diameter = 5.5 ft	
Flow = 54 mgd	
Downstream channel invert = 7.33	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 60.68 ft^2	
Hydraulic radius = 2.201	
Normal depth = infinite	
Critical depth = 1.93 ft	
Depth downstream = 11.03 ft	
Bend loss = 0 ft	
Depth upstream = 11.04 ft	
Velocity = 1.38 ft/s	
Flow profile = Horizontal	
54'' CCC connection	**18.42**

Section Description | **Water Surface Elevation**

Pipe shape = Circular
Diameter = 54 in
Length = 12 ft
Flow = 18.602 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 1
Pipe area = 15.9 ft²
Pipe hydraulic radius = 1.125
Age factor = 1
Solids factor = 1
Velocity = 1.81 ft/s
Friction loss = 0 ft
Fitting loss = 0.05 ft
Total loss = 0.05 ft

36" ABW 1,2 FE **18.52**

Pipe shape = Circular
Diameter = 36 in
Length = 23 ft
Flow = 35.398 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 0
Pipe area = 7.07 ft²
Pipe hydraulic radius = 0.75
Age factor = 1
Solids factor = 1
Velocity = 7.75 ft/s
Friction loss = 0.15 ft
Fitting loss = 0 ft
Total loss = 0.15 ft

54x36 Tee **18.42**

Main line diameter = 54 in
Branch diameter = 36 in
Main line flow = 14.96 mgd
Branch flow = 3.64 mgd
Tee head loss = 0 ft

36" to ABW filters 6 & 7 **18.44**

Pipe shape = Circular
Diameter = 36 in
Length = 90 ft
Flow = 3.288 mgd
Friction method = Manning's Equation

Section Description	Water Surface Elevation
Friction factor = 0.013	
Total fitting K value = 1.53	
Pipe area = 7.07 ft²	
Pipe hydraulic radius = 0.75	
Age factor = 1	
Solids factor = 1	
Velocity = 0.72 ft/s	
Friction loss = 0.01 ft	
Fitting loss = 0.01 ft	
Total loss = 0.02 ft	
ABW 6,7 54" effluent	**18.44**
Pipe shape = Circular	
Diameter = 54 in	
Length = 8 ft	
Flow = 3.288 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 1.1	
Pipe area = 15.9 ft²	
Pipe hydraulic radius = 1.125	
Age factor = 1	
Solids factor = 1	
Velocity = 0.32 ft/s	
Friction loss = 0 ft	
Fitting loss = 0 ft	
Total loss = 0 ft	
ABW 7 Eff Weir	**18.71**
Weir invert (top of weir) = 18.58	
Number of contracted sides = 2	
Weir length = 20 ft	
Flow over weir = 1.644 mgd	
Submergence = unsubmerged	
Head over weir = 0.13 ft	
ABW 7 Inf Weir	**19.95**
Weir invert (top of weir) = 19.8	
Number of contracted sides = 2	
Weir length = 15 ft	
Flow over weir = 1.644 mgd	
Submergence = unsubmerged	
Head over weir = 0.15 ft	
ABW 6 Eff Weir	**18.71**
Weir invert (top of weir) = 18.58	

Section Description	Water Surface Elevation
Number of contracted sides = 2 Weir length = 20 ft Flow over weir = 1.644 mgd Submergence = unsubmerged Head over weir = 0.13 ft	
ABW 6 Inf Weir	**19.95**
Weir invert (top of weir) = 19.8 Number of contracted sides = 2 Weir length = 15 ft Flow over weir = 1.644 mgd Submergence = unsubmerged Head over weir = 0.15 ft	
ABW 6,7 Common Inf Channel	**19.95**
User defined loss for flow split = 0 ft Total flow through flow split = 3.288 mgd	
ABW 6,7 54" Inf	**19.95**
Pipe shape = Circular Diameter = 54 in Length = 33 ft Flow = 3.288 mgd Friction method = Manning's Equation Friction factor = 0.013 Total fitting K value = 1.3 Pipe area = 15.9 ft² Pipe hydraulic radius = 1.125 Age factor = 1 Solids factor = 1 Velocity = 0.32 ft/s Friction loss = 0 ft Fitting loss = 0 ft Total loss = 0 ft	
54" to 54x54 Tee	**18.49**
Pipe shape = Circular Diameter = 54 in Length = 15 ft Flow = 15.314 mgd Friction method = Manning's Equation Friction factor = 0.013 Total fitting K value = 1.8 Pipe area = 15.9 ft² Pipe hydraulic radius = 1.125 Age factor = 1 Solids factor = 1	

Section Description	Water Surface Elevation
Velocity = 1.49 ft/s Friction loss = 0 ft Fitting loss = 0.06 ft Total loss = 0.06 ft	
ABW 1,2 Common Eff. Channel	**18.53**
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 49 ft Channel width/diameter = 5.5 ft Flow = 35.398 mgd Downstream channel invert = 14 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 24.89 ft^2 Hydraulic radius = 1.71 Normal depth = infinite Critical depth = 1.45 ft Depth downstream = 4.52 ft Bend loss = 0 ft Depth upstream = 4.53 ft Velocity = 2.2 ft/s Flow profile = Horizontal	
ABW 2 Eff Weir	**19.15**
Weir invert (top of weir) = 18.58 Number of contracted sides = 2 Weir length = 20 ft Flow over weir = 17.699 mgd Submergence = unsubmerged Head over weir = 0.57 ft	
ABW 1 Eff Weir	**19.15**
Weir invert (top of weir) = 18.58 Number of contracted sides = 2 Weir length = 20 ft Flow over weir = 17.699 mgd Submergence = unsubmerged Head over weir = 0.57 ft	
ABW 1 Inf Weir	**20.05**
Weir invert (top of weir) = 19.36 Number of contracted sides = 2 Weir length = 15 ft Flow over weir = 17.699 mgd Submergence = unsubmerged	

Section Description	Water Surface Elevation
Head over weir = 0.69 ft	
ABW 2 Inf Weir	**20.05**
Weir invert (top of weir) = 19.36	
Number of contracted sides = 2	
Weir length = 15 ft	
Flow over weir = 17.699 mgd	
Submergence = unsubmerged	
Head over weir = 0.69 ft	
54" to ABW filters 3,4,5	**18.52**
Pipe shape = Circular	
Diameter = 54 in	
Length = 10 ft	
Flow = 15.314 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 0.8	
Pipe area = 15.9 ft^2	
Pipe hydraulic radius = 1.125	
Age factor = 1	
Solids factor = 1	
Velocity = 1.49 ft/s	
Friction loss = 0 ft	
Fitting loss = 0.03 ft	
Total loss = 0.03 ft	
ABW 5 Eff Weir	**18.71**
Weir invert (top of weir) = 18.58	
Number of contracted sides = 2	
Weir length = 20 ft	
Flow over weir = 1.583 mgd	
Submergence = unsubmerged	
Head over weir = 0.13 ft	
ABW 5 Inf Weir	**19.95**
Weir invert (top of weir) = 19.8	
Number of contracted sides = 2	
Weir length = 15 ft	
Flow over weir = 1.583 mgd	
Submergence = unsubmerged	
Head over weir = 0.15 ft	
ABW 4 Eff Weir	**18.71**
Weir invert (top of weir) = 18.58	
Number of contracted sides = 2	

Section Description	Water Surface Elevation
Weir length = 20 ft	
Flow over weir = 1.583 mgd	
Submergence = unsubmerged	
Head over weir = 0.13 ft	
ABW 4 Inf Weir	**19.95**
Weir invert (top of weir) = 19.8	
Number of contracted sides = 2	
Weir length = 15 ft	
Flow over weir = 1.583 mgd	
Submergence = unsubmerged	
Head over weir = 0.15 ft	
ABW 3 Eff Weir	**19.03**
Weir invert (top of weir) = 18.58	
Number of contracted sides = 2	
Weir length = 20 ft	
Flow over weir = 12.149 mgd	
Submergence = unsubmerged	
Head over weir = 0.45 ft	
ABW 3 Inf Weir	**19.9**
Weir invert (top of weir) = 19.36	
Number of contracted sides = 2	
Weir length = 15 ft	
Flow over weir = 12.149 mgd	
Submergence = unsubmerged	
Head over weir = 0.54 ft	
ABW 3,4,5 Common Inf Channel	**19.95**
User defined loss for flow split = 0 ft	
Total flow through flow split = 18.602 mgd	
ABW 3,4,5 54" Inf Pipe	**20.05**
Pipe shape = Circular	
Diameter = 54 in	
Length = 16 ft	
Flow = 18.602 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 1.8	
Pipe area = 15.9 ft²	
Pipe hydraulic radius = 1.125	
Age factor = 1	
Solids factor = 1	
Velocity = 1.81 ft/s	
Friction loss = 0 ft	

Section Description	Water Surface Elevation
Fitting loss = 0.09 ft	
Total loss = 0.09 ft	
ABW flow split to 3,4,5,6,7	**20.05**
User defined loss for flow split = 0 ft	
Total flow through flow split = 54 mgd	
ABW 1,2 Common Inf Channel	**20.06**
Channel shape = Rectangular	
Manning's 'n' = 0.013	
Channel length = 49 ft	
Channel width/diameter = 5.5 ft	
Flow = 54.06 mgd	
Downstream channel invert = 14	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 33.31 ft^2	
Hydraulic radius = 1.891	
Normal depth = infinite	
Critical depth = 1.93 ft	
Depth downstream = 6.05 ft	
Bend loss = 0 ft	
Depth upstream = 6.06 ft	
Velocity = 2.51 ft/s	
Flow profile = Horizontal	
54" ABW Influent	**21.53**
Pipe shape = Circular	
Diameter = 54 in	
Length = 50 ft	
Flow = 54.06 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 3.2	
Pipe area = 15.9 ft²	
Pipe hydraulic radius = 1.125	
Age factor = 1	
Solids factor = 1	
Velocity = 5.26 ft/s	
Friction loss = 0.09 ft	
Fitting loss = 1.37 ft	
Total loss = 1.46 ft	
CE Junction 1,2,3,4 with 5,6	
54" PCCP CE	**21.69**
Pipe shape = Circular	

Section Description	Water Surface Elevation

Diameter = 54 in
Length = 80 ft
Flow = 36.624 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 0.5
Pipe area = 15.9 ft²
Pipe hydraulic radius = 1.125
Age factor = 1
Solids factor = 1
Velocity = 3.56 ft/s
Friction loss = 0.07 ft
Fitting loss = 0.1 ft
Total loss = 0.16 ft

54" CE from Clarifiers 5,6 **21.54**

Pipe shape = Circular
Diameter = 54 in
Length = 85 ft
Flow = 17.436 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 0
Pipe area = 15.9 ft²
Pipe hydraulic radius = 1.125
Age factor = 1
Solids factor = 1
Velocity = 1.7 ft/s
Friction loss = 0.02 ft
Fitting loss = 0 ft
Total loss = 0.02 ft

54" from Clarifier 5 **21.55**

Pipe shape = Circular
Diameter = 54 in
Length = 40 ft
Flow = 6.791 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 0.6
Pipe area = 15.9 ft²
Pipe hydraulic radius = 1.125
Age factor = 1
Solids factor = 1
Velocity = 0.66 ft/s
Friction loss = 0 ft

Section Description	Water Surface Elevation
Fitting loss = 0 ft	
Total loss = 0.01 ft	
30" from Clarifier 5	**21.83**
Pipe shape = Circular	
Diameter = 30 in	
Length = 70 ft	
Flow = 6.791 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 3.27	
Pipe area = 4.91 ft^2	
Pipe hydraulic radius = 0.625	
Age factor = 1	
Solids factor = 1	
Velocity = 2.14 ft/s	
Friction loss = 0.05 ft	
Fitting loss = 0.23 ft	
Total loss = 0.28 ft	
Clarifier 5 Eff. Weir	**22.95**
Invert of V notch = 22.82	
Angle of V notch = 90 degrees	
Number of notches = 629	
Total flow over weir = 6.791 mgd	
Weir submergence = unsubmerged	
Head over weir = 0.13 ft	
30" ML to Clar. 5	**23.42**
Pipe shape = Circular	
Diameter = 30 in	
Length = 160 ft	
Flow = 9.17 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 2.1	
Pipe area = 4.91 ft^2	
Pipe hydraulic radius = 0.625	
Age factor = 1	
Solids factor = 1	
Velocity = 2.89 ft/s	
Friction loss = 0.19 ft	
Fitting loss = 0.27 ft	
Total loss = 0.46 ft	
30" Sluice Gate to Clar. 5	**23.88**
Opening type = circular gate	

Section Description	Water Surface Elevation
Opening diameter/width = 30 in	
Gate height = 27.2 in	
Invert = 11	
Number of gates = 1	
Flow through gate(s) = 9.169 mgd	
Total area of opening(s) = 4.68 ft^2	
Velocity through gate(s) = 3.03 ft/s	
36" from Clarifier 6	**22.06**
Pipe shape = Circular	
Diameter = 36 in	
Length = 350 ft	
Flow = 10.645 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 3.67	
Pipe area = 7.07 ft²	
Pipe hydraulic radius = 0.75	
Age factor = 1	
Solids factor = 1	
Velocity = 2.33 ft/s	
Friction loss = 0.21 ft	
Fitting loss = 0.31 ft	
Total loss = 0.52 ft	
Clarifier 6 Eff. Weirs	**22.93**
Invert of V notch = 22.82	
Angle of V notch = 90 degrees	
Number of notches = 1471	
Total flow over weir = 10.645 mgd	
Weir submergence = unsubmerged	
Head over weir = 0.11 ft	
36" ML to Clar. 6	**23.45**
Pipe shape = Circular	
Diameter = 36 in	
Length = 200 ft	
Flow = 14.371 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 1.9	
Pipe area = 7.07 ft²	
Pipe hydraulic radius = 0.75	
Age factor = 1	
Solids factor = 1	
Velocity = 3.15 ft/s	
Friction loss = 0.22 ft	

Section Description	Water Surface Elevation
Fitting loss = 0.29 ft Total loss = 0.51 ft	
36" Sluice Gate to Clar. 6	**23.88**
Opening type = circular gate Opening diameter/width = 36 in Gate height = 36 in Invert = 11 Number of gates = 1 Flow through gate(s) = 14.371 mgd Total area of opening(s) = 7.07 ft^2 Velocity through gate(s) = 3.15 ft/s	
Aeration Basin Eff Sump to Clar. 5&6	**23.88**
User defined loss for flow split = 0 ft Total flow through flow split = 23.541 mgd	
Aeration Basin 5&6 Effluent Channel	**23.91**
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 36 ft Channel width/diameter = 4 ft Flow = 23.56 mgd Downstream channel invert = 21 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 11.59 ft^2 Hydraulic radius = 1.183 Normal depth = infinite Critical depth = 1.37 ft Depth downstream = 2.88 ft Bend loss = 0 ft Depth upstream = 2.91 ft Velocity = 3.16 ft/s Flow profile = Horizontal	
Aer. Basin #5 Eff Weir	**25.34**
Weir invert (top of weir) = 25 Number of contracted sides = 2 Weir length = 34 ft Flow over weir = 13.347 mgd Submergence = unsubmerged Head over weir = 0.34 ft	
48" Aer. Basin #5 Influent	**26.49**
Pipe shape = Circular	

Section Description	**Water Surface Elevation**

Diameter = 48 in
Length = 650 ft
Flow = 24.847 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 4.72
Pipe area = 12.57 ft²
Pipe hydraulic radius = 1
Age factor = 1
Solids factor = 1
Velocity = 3.06 ft/s
Friction loss = 0.46 ft
Fitting loss = 0.69 ft
Total loss = 1.15 ft

Splitter Box 3 (new) Gate 1 — **27.86**

Weir invert (top of weir) = 27
Number of contracted sides = 2
Weir length = 15 ft
Flow over weir = 24.847 mgd
Submergence = unsubmerged
Head over weir = 0.86 ft

Aer. Basin #6 Eff Channel — **23.92**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 36 ft
Channel width/diameter = 4 ft
Flow = 10.218 mgd
Downstream channel invert = 21
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 11.65 ft^2
Hydraulic radius = 1.186
Normal depth = infinite
Critical depth = 0.79 ft
Depth downstream = 2.91 ft
Bend loss = 0 ft
Depth upstream = 2.92 ft
Velocity = 1.36 ft/s
Flow profile = Horizontal

42" CE from Wye — **21.79**

Pipe shape = Circular
Diameter = 42 in
Length = 7 ft

Section Description	**Water Surface Elevation**

Flow = 15.278 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 1
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 1
Solids factor = 1
Velocity = 2.46 ft/s
Friction loss = 0 ft
Fitting loss = 0.09 ft
Total loss = 0.1 ft

48" from Clarifiers 3,4	**22.1**

Pipe shape = Circular
Diameter = 48 in
Length = 420 ft
Flow = 21.346 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 1.75
Pipe area = 12.57 ft²
Pipe hydraulic radius = 1
Age factor = 1
Solids factor = 1
Velocity = 2.63 ft/s
Friction loss = 0.22 ft
Fitting loss = 0.19 ft
Total loss = 0.41 ft

42" from Clarifier 3	**22.17**

Pipe shape = Circular
Diameter = 42 in
Length = 20 ft
Flow = 10.673 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 1.5
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 1
Solids factor = 1
Velocity = 1.72 ft/s
Friction loss = 0.01 ft
Fitting loss = 0.07 ft
Total loss = 0.07 ft

Section Description	**Water Surface Elevation**
Clarifier 3 Eff. Weirs	**22.94**

Invert of V notch = 22.82
Angle of V notch = 90 degrees
Number of notches = 1471
Total flow over weir = 10.673 mgd
Weir submergence = unsubmerged
Head over weir = 0.12 ft

42" ML to Clar. 3 — **23.18**

Pipe shape = Circular
Diameter = 42 in
Length = 116 ft
Flow = 14.4 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 2.25
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 1
Solids factor = 1
Velocity = 2.32 ft/s
Friction loss = 0.06 ft
Fitting loss = 0.19 ft
Total loss = 0.24 ft

42" weir gate to Clar. 3 — **23.42**

Opening type = circular gate
Opening diameter/width = 42 in
Gate height = 42 in
Invert = 19.58
Number of gates = 1
Flow through gate(s) = 14.4 mgd
Total area of opening(s) = 9.62 ft^2
Velocity through gate(s) = 2.32 ft/s

42" from Clarifier 4 — **22.17**

Pipe shape = Circular
Diameter = 42 in
Length = 20 ft
Flow = 10.673 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 1.5
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 1

Section Description	Water Surface Elevation
Solids factor = 1	
Velocity = 1.72 ft/s	
Friction loss = 0.01 ft	
Fitting loss = 0.07 ft	
Total loss = 0.07 ft	
Clarifier 4 Eff. Weirs	**22.94**
Invert of V notch = 22.82	
Angle of V notch = 90 degrees	
Number of notches = 1471	
Total flow over weir = 10.673 mgd	
Weir submergence = unsubmerged	
Head over weir = 0.12 ft	
42" ML to Clar. 4	**23.18**
Pipe shape = Circular	
Diameter = 42 in	
Length = 116 ft	
Flow = 14.4 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 2.25	
Pipe area = 9.62 ft^2	
Pipe hydraulic radius = 0.875	
Age factor = 1	
Solids factor = 1	
Velocity = 2.32 ft/s	
Friction loss = 0.06 ft	
Fitting loss = 0.19 ft	
Total loss = 0.24 ft	
42" weir gate to Clar. 4	**23.42**
Opening type = circular gate	
Opening diameter/width = 42 in	
Gate height = 42 in	
Invert = 19.58	
Number of gates = 1	
Flow through gate(s) = 14.4 mgd	
Total area of opening(s) = 9.62 ft^2	
Velocity through gate(s) = 2.32 ft/s	
3&4 Influent Box	**23.42**
User defined loss for flow split = 0 ft	
Total flow through flow split = 28.801 mgd	
54" ML to Clar. 3&4	**23.86**
Pipe shape = Circular	

Section Description	Water Surface Elevation

Diameter = 54 in
Length = 390 ft
Flow = 28.801 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 2.03
Pipe area = 15.9 ft²
Pipe hydraulic radius = 1.125
Age factor = 1
Solids factor = 1
Velocity = 2.8 ft/s
Friction loss = 0.2 ft
Fitting loss = 0.25 ft
Total loss = 0.45 ft

Eff Channel to 3&4 Eff Pit — **23.86**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 18 ft
Channel width/diameter = 4 ft
Flow = 2.257 mgd
Downstream channel invert = 21
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 11.45 ft^2
Hydraulic radius = 1.177
Normal depth = infinite
Critical depth = 0.29 ft
Depth downstream = 2.86 ft
Bend loss = 0 ft
Depth upstream = 2.86 ft
Velocity = 0.3 ft/s
Flow profile = Horizontal

Aer. Basin 3&4 Eff Channel — **23.89**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 30 ft
Channel width/diameter = 4 ft
Flow = 26.539 mgd
Downstream channel invert = 21
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 11.5 ft^2
Hydraulic radius = 1.18
Normal depth = infinite

Section Description	**Water Surface Elevation**

Critical depth = 1.48 ft
Depth downstream = 2.86 ft
Bend loss = 0 ft
Depth upstream = 2.89 ft
Velocity = 3.59 ft/s
Flow profile = Horizontal

Aer. Basin #3 Eff Weir 1 — **25.43**

Weir invert (top of weir) = 25
Number of contracted sides = 2
Weir length = 11.5 ft
Flow over weir = 6.635 mgd
Submergence = unsubmerged
Head over weir = 0.43 ft

Aer. Basin #3 Eff Weir 2 — **25.43**

Weir invert (top of weir) = 25
Number of contracted sides = 2
Weir length = 11.5 ft
Flow over weir = 6.635 mgd
Submergence = unsubmerged
Head over weir = 0.43 ft

Aer. Basin #3 Effluent — **25.43**

User defined loss for flow split = 0 ft
Total flow through flow split = 13.269 mgd

42" Aer. Basin #3 Influent — **26.6**

Pipe shape = Circular
Diameter = 42 in
Length = 350 ft
Flow = 24.737 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 2.73
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 1
Solids factor = 1
Velocity = 3.98 ft/s
Friction loss = 0.5 ft
Fitting loss = 0.67 ft
Total loss = 1.17 ft

Splitter Box 2 Gate 3 — **27.86**

Weir invert (top of weir) = 27

Section Description	Water Surface Elevation
Number of contracted sides = 2 Weir length = 15 ft Flow over weir = 24.737 mgd Submergence = unsubmerged Head over weir = 0.86 ft	
Aer. Basin #4 Eff Weir 1	**25.43**
Weir invert (top of weir) = 25 Number of contracted sides = 2 Weir length = 11.5 ft Flow over weir = 6.635 mgd Submergence = unsubmerged Head over weir = 0.43 ft	
Aer. Basin #4 Eff Weir 2	**25.43**
Weir invert (top of weir) = 25 Number of contracted sides = 2 Weir length = 11.5 ft Flow over weir = 6.635 mgd Submergence = unsubmerged Head over weir = 0.43 ft	
Aer. Basin #4 Effluent	**25.43**
User defined loss for flow split = 0 ft Total flow through flow split = 13.269 mgd	
42" Aer. Basin #4 Influent	**26.48**
Pipe shape = Circular Diameter = 42 in Length = 275 ft Flow = 24.737 mgd Friction method = Manning's Equation Friction factor = 0.013 Total fitting K value = 2.66 Pipe area = 9.62 ft² Pipe hydraulic radius = 0.875 Age factor = 1 Solids factor = 1 Velocity = 3.98 ft/s Friction loss = 0.4 ft Fitting loss = 0.65 ft Total loss = 1.05 ft	
Splitter Box 2 Gate 1	**27.86**
Weir invert (top of weir) = 27 Number of contracted sides = 2 Weir length = 15 ft	

Section Description	Water Surface Elevation
Flow over weir = 24.737 mgd	
Submergence = unsubmerged	
Head over weir = 0.86 ft	
36" CE from Wye	**21.84**
Pipe shape = Circular	
Diameter = 36 in	
Length = 4 ft	
Flow = 15.278 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 0.25	
Pipe area = 7.07 ft²	
Pipe hydraulic radius = 0.75	
Age factor = 1	
Solids factor = 1	
Velocity = 3.34 ft/s	
Friction loss = 0 ft	
Fitting loss = 0.04 ft	
Total loss = 0.05 ft	
36" Wye from Clarifiers 1,2	**22.16**
Main line diameter = 36 in	
Branch diameter = 30 in	
Main line flow = 7.64 mgd	
Branch flow = 7.64 mgd	
Tee head loss = 0.33 ft	
30" from Clarifier 1	**22.3**
Pipe shape = Circular	
Diameter = 30 in	
Length = 50 ft	
Flow = 7.64 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 1	
Pipe area = 4.91 ft²	
Pipe hydraulic radius = 0.625	
Age factor = 1	
Solids factor = 1	
Velocity = 2.41 ft/s	
Friction loss = 0.04 ft	
Fitting loss = 0.09 ft	
Total loss = 0.13 ft	
Clarifier 1 Eff Weir	**22.96**

Section Description	Water Surface Elevation
Invert of V notch = 22.82	
Angle of V notch = 90 degrees	
Number of notches = 660	
Total flow over weir = 7.64 mgd	
Weir submergence = unsubmerged	
Head over weir = 0.14 ft	
30" ML to Clar. 1	**23.37**
Pipe shape = Circular	
Diameter = 30 in	
Length = 120 ft	
Flow = 10.28 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 1.45	
Pipe area = 4.91 ft^2	
Pipe hydraulic radius = 0.625	
Age factor = 1	
Solids factor = 1	
Velocity = 3.24 ft/s	
Friction loss = 0.18 ft	
Fitting loss = 0.24 ft	
Total loss = 0.42 ft	
30" Sluice Gate to Clar. 1	**23.86**
Opening type = circular gate	
Opening diameter/width = 30 in	
Gate height = 29.2 in	
Invert = 11.08	
Number of gates = 1	
Flow through gate(s) = 10.28 mgd	
Total area of opening(s) = 4.87 ft^2	
Velocity through gate(s) = 3.26 ft/s	
30" from Clarifier 2	**22.3**
Pipe shape = Circular	
Diameter = 30 in	
Length = 50 ft	
Flow = 7.638 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 1	
Pipe area = 4.91 ft^2	
Pipe hydraulic radius = 0.625	
Age factor = 1	
Solids factor = 1	
Velocity = 2.41 ft/s	

Section Description	Water Surface Elevation
Friction loss = 0.04 ft	
Fitting loss = 0.09 ft	
Total loss = 0.13 ft	
Clarifier 2 Eff Weir	**22.96**
Invert of V notch = 22.82	
Angle of V notch = 90 degrees	
Number of notches = 660	
Total flow over weir = 7.638 mgd	
Weir submergence = unsubmerged	
Head over weir = 0.14 ft	
30" ML to Clar. 2	**23.4**
Pipe shape = Circular	
Diameter = 30 in	
Length = 100 ft	
Flow = 10.278 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 1.8	
Pipe area = 4.91 ft^2	
Pipe hydraulic radius = 0.625	
Age factor = 1	
Solids factor = 1	
Velocity = 3.24 ft/s	
Friction loss = 0.15 ft	
Fitting loss = 0.29 ft	
Total loss = 0.44 ft	
30" Sluice Gate to Clar. 2	**23.86**
Opening type = circular gate	
Opening diameter/width = 30 in	
Gate height = 30 in	
Invert = 11.08	
Number of gates = 1	
Flow through gate(s) = 10.278 mgd	
Total area of opening(s) = 4.91 ft^2	
Velocity through gate(s) = 3.24 ft/s	
Aer. Basin 1&2 Eff Pit	**23.86**
User defined loss for flow split = 0 ft	
Total flow through flow split = 22.815 mgd	
Aer. Basin #2 Eff. Channel	**23.9**
Channel shape = Rectangular	
Manning's 'n' = 0.013	
Channel length = 60 ft	

Section Description	Water Surface Elevation
Channel width/diameter = 4 ft	
Flow = 22.843 mgd	
Downstream channel invert = 21	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 11.54 ft^2	
Hydraulic radius = 1.181	
Normal depth = infinite	
Critical depth = 1.34 ft	
Depth downstream = 2.86 ft	
Bend loss = 0 ft	
Depth upstream = 2.9 ft	
Velocity = 3.08 ft/s	
Flow profile = Horizontal	
Aeration Eff Channel Mixing 1,2,&6	
Aer. Basin #1 Eff. Channel	**23.91**
Channel shape = Rectangular	
Manning's 'n' = 0.013	
Channel length = 37 ft	
Channel width/diameter = 4 ft	
Flow = 12.982 mgd	
Downstream channel invert = 21	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 11.63 ft^2	
Hydraulic radius = 1.185	
Normal depth = infinite	
Critical depth = 0.92 ft	
Depth downstream = 2.9 ft	
Bend loss = 0 ft	
Depth upstream = 2.91 ft	
Velocity = 1.73 ft/s	
Flow profile = Horizontal	
Aer. Basin #1 Eff Weir	**25.28**
Weir invert (top of weir) = 25	
Number of contracted sides = 2	
Weir length = 34 ft	
Flow over weir = 9.866 mgd	
Submergence = unsubmerged	
Head over weir = 0.28 ft	
Aer. Basin #1 Inf Port	**25.3**
Opening type = rectangular orifice	

Section Description	Water Surface Elevation
Opening diameter/width = 120 in	
Opening height = 48 in	
Invert = 10.5	
Number of openings = 1	
Flow through opening(s) = 18.366 mgd	
Total area of opening(s) = 40 ft^2	
Velocity through opening(s) = 0.71 ft/s	
Aer. Basin #1 Inf Gate	**25.35**
Opening type = rectangular gate	
Opening diameter/width = 48 in	
Gate height = 78 in	
Invert = 20	
Number of gates = 1	
Flow through gate(s) = 18.366 mgd	
Total area of opening(s) = 26 ft^2	
Velocity through gate(s) = 1.09 ft/s	
Aer. #6 Eff Channel to Aer. #1	**23.91**
Channel shape = Rectangular	
Manning's 'n' = 0.013	
Channel length = 4 ft	
Channel width/diameter = 4 ft	
Flow = 3.111 mgd	
Downstream channel invert = 21	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 11.65 ft^2	
Hydraulic radius = 1.186	
Normal depth = infinite	
Critical depth = 0.36 ft	
Depth downstream = 2.91 ft	
Bend loss = 0 ft	
Depth upstream = 2.91 ft	
Velocity = 0.41 ft/s	
Flow profile = Horizontal	
Aer. Basin #6 Eff Channel Split	**23.92**
User defined loss for flow split = 0 ft	
Total flow through flow split = 13.328 mgd	
Aer. Basin #6 Eff Weir	**25.34**
Weir invert (top of weir) = 25	
Number of contracted sides = 2	
Weir length = 34 ft	
Flow over weir = 13.347 mgd	
Submergence = unsubmerged	

Section Description	Water Surface Elevation
Head over weir = 0.34 ft	

48" Aer. Basin #6 Influent — **26.58**

Pipe shape = Circular
Diameter = 48 in
Length = 725 ft
Flow = 24.847 mgd
Friction method = Manning's Equation
Friction factor = 0.013
Total fitting K value = 4.97
Pipe area = 12.57 ft^2
Pipe hydraulic radius = 1
Age factor = 1
Solids factor = 1
Velocity = 3.06 ft/s
Friction loss = 0.52 ft
Fitting loss = 0.72 ft
Total loss = 1.24 ft

Splitter Box 3 (new) Gate 2 — **27.86**

Weir invert (top of weir) = 27
Number of contracted sides = 2
Weir length = 15 ft
Flow over weir = 24.847 mgd
Submergence = unsubmerged
Head over weir = 0.86 ft

Splitter Box No. 3 (new) — **27.86**

User defined loss for flow split = 0 ft
Total flow through flow split = 49.694 mgd

Splitter Box No. 3 Submerged Ports — **28.22**

Opening type = rectangular orifice
Opening diameter/width = 30 in
Opening height = 41 in
Invert = 15.35
Number of openings = 3
Flow through opening(s) = 49.694 mgd
Total area of opening(s) = 25.62 ft^2
Velocity through opening(s) = 3 ft/s

Anx Basin 6 Eff. Channel — **28.23**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 40 ft
Channel width/diameter = 5.5 ft

Section Description	Water Surface Elevation
Flow = 22.65 mgd Downstream channel invert = 24.67 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 19.56 ft^2 Hydraulic radius = 1.551 Normal depth = infinite Critical depth = 1.08 ft Depth downstream = 3.55 ft Bend loss = 0 ft Depth upstream = 3.56 ft Velocity = 1.79 ft/s Flow profile = Horizontal	
Anx Basin 6 Eff. Weir	**29.15**
Weir invert (top of weir) = 28.66 Number of contracted sides = 2 Weir length = 32 ft Flow over weir = 22.65 mgd Submergence = unsubmerged Head over weir = 0.49 ft	
36" ML to Anx Basin 6	**31.2**
Pipe shape = Circular Diameter = 36 in Length = 275 ft Flow = 22.65 mgd Friction method = Manning's Equation Friction factor = 0.013 Total fitting K value = 3.4 Pipe area = 7.07 ft² Pipe hydraulic radius = 0.75 Age factor = 1 Solids factor = 1 Velocity = 4.96 ft/s Friction loss = 0.76 ft Fitting loss = 1.3 ft Total loss = 2.05 ft	
Anx Basin 5 Eff. Channel	**28.23**
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 40 ft Channel width/diameter = 5.5 ft Flow = 27.044 mgd Downstream channel invert = 24.67 Channel slope = 0 ft/ft	

Section Description	Water Surface Elevation
Channel side slope = not applicable	
Area of flow = 19.57 ft^2	
Hydraulic radius = 1.551	
Normal depth = infinite	
Critical depth = 1.22 ft	
Depth downstream = 3.55 ft	
Bend loss = 0 ft	
Depth upstream = 3.56 ft	
Velocity = 2.14 ft/s	
Flow profile = Horizontal	
Anx Basin 5 Eff. Weir	**29.15**
Weir invert (top of weir) = 28.66	
Number of contracted sides = 2	
Weir length = 32 ft	
Flow over weir = 22.65 mgd	
Submergence = unsubmerged	
Head over weir = 0.49 ft	
36" ML to Anx Basin 5	**30.85**
Pipe shape = Circular	
Diameter = 36 in	
Length = 190 ft	
Flow = 22.65 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 3.1	
Pipe area = 7.07 ft²	
Pipe hydraulic radius = 0.75	
Age factor = 1	
Solids factor = 1	
Velocity = 4.96 ft/s	
Friction loss = 0.52 ft	
Fitting loss = 1.18 ft	
Total loss = 1.7 ft	
Anx Basin 4 Eff. Channel to SB3	**28.24**
Channel shape = Rectangular	
Manning's 'n' = 0.013	
Channel length = 10 ft	
Channel width/diameter = 5.5 ft	
Flow = 4.394 mgd	
Downstream channel invert = 24.67	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 19.6 ft^2	

Section Description	Water Surface Elevation
Hydraulic radius = 1.552 Normal depth = infinite Critical depth = 0.36 ft Depth downstream = 3.56 ft Bend loss = 0 ft Depth upstream = 3.57 ft Velocity = 0.35 ft/s Flow profile = Horizontal	
Aer. Basin #2 Eff Weir Weir invert (top of weir) = 25 Number of contracted sides = 2 Weir length = 34 ft Flow over weir = 9.866 mgd Submergence = unsubmerged Head over weir = 0.28 ft	**25.28**
Aer. Basin #2 Inf Port Opening type = rectangular orifice Opening diameter/width = 120 in Opening height = 48 in Invert = 10.5 Number of openings = 1 Flow through opening(s) = 18.366 mgd Total area of opening(s) = 40 ft^2 Velocity through opening(s) = 0.71 ft/s	**25.3**
Aer. Basin #2 Inf Gate Opening type = rectangular gate Opening diameter/width = 48 in Gate height = 78 in Invert = 20 Number of gates = 1 Flow through gate(s) = 18.366 mgd Total area of opening(s) = 26 ft^2 Velocity through gate(s) = 1.09 ft/s	**25.35**
Aer. Basin 1&2 Inf Box User defined loss for flow split = 0 ft Total flow through flow split = 36.732 mgd	**25.35**
54" Aer. Basin 1&2 Influent Pipe shape = Circular Diameter = 54 in Length = 325 ft Flow = 36.732 mgd Friction method = Manning's Equation	**26.06**

Section Description	Water Surface Elevation
Friction factor = 0.013 Total fitting K value = 2.2 Pipe area = 15.9 ft² Pipe hydraulic radius = 1.125 Age factor = 1 Solids factor = 1 Velocity = 3.57 ft/s Friction loss = 0.27 ft Fitting loss = 0.44 ft Total loss = 0.71 ft	
54"x48" reducer	**26.14**
Pipe shape = Circular Diameter = 48 in Length = 1.5 ft Flow = 36.732 mgd Friction method = Manning's Equation Friction factor = 0.013 Total fitting K value = 0.25 Pipe area = 12.57 ft² Pipe hydraulic radius = 1 Age factor = 1 Solids factor = 1 Velocity = 4.52 ft/s Friction loss = 0 ft Fitting loss = 0.08 ft Total loss = 0.08 ft	
48"x36" wye run	**26.19**
Tee type = run of tee Diameter of pipe run past tee = 48 in Flow through tee = 18.366 mgd Velocity through tee = 2.26 ft/s Total tee K value = 0.6 Overall head loss = 0.05 ft	
36" ML from Splitter Box 2 Gate 2	**26.57**
Pipe shape = Circular Diameter = 36 in Length = 55 ft Flow = 18.366 mgd Friction method = Manning's Equation Friction factor = 0.013 Total fitting K value = 1.15 Pipe area = 7.07 ft² Pipe hydraulic radius = 0.75	

Section Description	Water Surface Elevation
Age factor = 1 Solids factor = 1 Velocity = 4.02 ft/s Friction loss = 0.1 ft Fitting loss = 0.29 ft Total loss = 0.39 ft	
Splitter Box 2 Gate 2	**27.86**
Weir invert (top of weir) = 27 Number of contracted sides = 2 Weir length = 11.25 ft Flow over weir = 18.366 mgd Submergence = unsubmerged Head over weir = 0.86 ft	
48"x36" wye branch	**26.53**
Tee type = branch to line Diameter of pipe line = 48 in Diameter of pipe branch = 36 in Flow through tee = 18.366 mgd Velocity through tee = 4.02 ft/s Total tee K value = 1.57 Overall head loss = 0.39 ft	
36" ML from Splitter Box 2 Gate 4	**26.91**
Pipe shape = Circular Diameter = 36 in Length = 80 ft Flow = 18.366 mgd Friction method = Manning's Equation Friction factor = 0.013 Total fitting K value = 0.95 Pipe area = 7.07 ft^2 Pipe hydraulic radius = 0.75 Age factor = 1 Solids factor = 1 Velocity = 4.02 ft/s Friction loss = 0.14 ft Fitting loss = 0.24 ft Total loss = 0.38 ft	
Splitter Box 2 Gate 4	**27.86**
Weir invert (top of weir) = 27 Number of contracted sides = 2 Weir length = 11.25 ft Flow over weir = 18.366 mgd Submergence = unsubmerged	

Section Description	Water Surface Elevation
Head over weir = 0.86 ft	
Splitter Box No. 2	**27.86**
User defined loss for flow split = 0 ft	
Total flow through flow split = 86.206 mgd	
Splitter Box No. 2 Submerged Ports	**28.24**
Opening type = rectangular orifice	
Opening diameter/width = 30 in	
Opening height = 42 in	
Invert = 15.35	
Number of openings = 5	
Flow through opening(s) = 86.206 mgd	
Total area of opening(s) = 43.75 ft^2	
Velocity through opening(s) = 3.05 ft/s	
Anx Basin 1&2 Eff. Channel	**28.26**
Channel shape = Rectangular	
Manning's 'n' = 0.013	
Channel length = 40 ft	
Channel width/diameter = 5.5 ft	
Flow = 45.3 mgd	
Downstream channel invert = 24.67	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 19.68 ft^2	
Hydraulic radius = 1.555	
Normal depth = infinite	
Critical depth = 1.71 ft	
Depth downstream = 3.57 ft	
Bend loss = 0 ft	
Depth upstream = 3.59 ft	
Velocity = 3.57 ft/s	
Flow profile = Horizontal	
Anx Basin 1 Eff Weirs	**29.15**
Weir invert (top of weir) = 28.66	
Number of contracted sides = 2	
Weir length = 32 ft	
Flow over weir = 22.65 mgd	
Submergence = unsubmerged	
Head over weir = 0.49 ft	
36" ML to Anx Basin 1	**30.72**
Pipe shape = Circular	

Section Description	Water Surface Elevation
Diameter = 36 in	
Length = 135 ft	
Flow = 22.65 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 3.15	
Pipe area = 7.07 ft²	
Pipe hydraulic radius = 0.75	
Age factor = 1	
Solids factor = 1	
Velocity = 4.96 ft/s	
Friction loss = 0.37 ft	
Fitting loss = 1.2 ft	
Total loss = 1.57 ft	
Anx Basin 2 Eff Weirs	**29.15**
Weir invert (top of weir) = 28.66	
Number of contracted sides = 2	
Weir length = 32 ft	
Flow over weir = 22.65 mgd	
Submergence = unsubmerged	
Head over weir = 0.49 ft	
36" ML to Anx Basin 2	**30.48**
Pipe shape = Circular	
Diameter = 36 in	
Length = 100 ft	
Flow = 22.65 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 2.76	
Pipe area = 7.07 ft²	
Pipe hydraulic radius = 0.75	
Age factor = 1	
Solids factor = 1	
Velocity = 4.96 ft/s	
Friction loss = 0.27 ft	
Fitting loss = 1.05 ft	
Total loss = 1.33 ft	
Anx Basin 3 Eff. Weir 1	**29.15**
Weir invert (top of weir) = 28.66	
Number of contracted sides = 2	
Weir length = 8.25 ft	
Flow over weir = 5.663 mgd	
Submergence = unsubmerged	
Head over weir = 0.49 ft	

Section Description	Water Surface Elevation
Anx Basin 3 Eff. Weir 2	**29.15**
Weir invert (top of weir) = 28.66	
Number of contracted sides = 2	
Weir length = 8.25 ft	
Flow over weir = 5.663 mgd	
Submergence = unsubmerged	
Head over weir = 0.49 ft	
Anx Basin 3 Eff. Weir 3	**29.15**
Weir invert (top of weir) = 28.66	
Number of contracted sides = 2	
Weir length = 8.25 ft	
Flow over weir = 5.663 mgd	
Submergence = unsubmerged	
Head over weir = 0.49 ft	
Anx Basin 3 Eff. Weir 4	**29.15**
Weir invert (top of weir) = 28.66	
Number of contracted sides = 2	
Weir length = 8.25 ft	
Flow over weir = 5.663 mgd	
Submergence = unsubmerged	
Head over weir = 0.49 ft	
Anx Basin 3	**29.15**
User defined loss for flow split = 0 ft	
Total flow through flow split = 22.65 mgd	
36'' ML to Anx Basin 3	**30.56**
Pipe shape = Circular	
Diameter = 36 in	
Length = 110 ft	
Flow = 22.65 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 2.9	
Pipe area = 7.07 ft²	
Pipe hydraulic radius = 0.75	
Age factor = 1	
Solids factor = 1	
Velocity = 4.96 ft/s	
Friction loss = 0.3 ft	
Fitting loss = 1.11 ft	
Total loss = 1.41 ft	
Anx Basin 4 Eff. Channel to SB2	**28.24**

Section Description	Water Surface Elevation
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 30 ft Channel width/diameter = 5.5 ft Flow = 18.256 mgd Downstream channel invert = 24.67 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 19.62 ft^2 Hydraulic radius = 1.553 Normal depth = infinite Critical depth = 0.94 ft Depth downstream = 3.57 ft Bend loss = 0 ft Depth upstream = 3.57 ft Velocity = 1.44 ft/s Flow profile = Horizontal	
Anx Basin 4 Eff Weir 1	**29.15**
Weir invert (top of weir) = 28.66 Number of contracted sides = 2 Weir length = 8.25 ft Flow over weir = 5.663 mgd Submergence = unsubmerged Head over weir = 0.49 ft	
Anx. Basin 4 Eff. Weir 2	**29.15**
Weir invert (top of weir) = 28.66 Number of contracted sides = 2 Weir length = 8.25 ft Flow over weir = 5.663 mgd Submergence = unsubmerged Head over weir = 0.49 ft	
Anx Basin 4 Eff. Weir 3	**29.15**
Weir invert (top of weir) = 28.66 Number of contracted sides = 2 Weir length = 8.25 ft Flow over weir = 5.663 mgd Submergence = unsubmerged Head over weir = 0.49 ft	
Anx. Basin 4 Eff. Weir 4 to SB2	**28.24**
Channel shape = Rectangular Manning's 'n' = 0.013 Channel length = 10 ft	

Section Description	Water Surface Elevation
Channel width/diameter = 5.5 ft	
Flow = 1.269 mgd	
Downstream channel invert = 24.67	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 19.63 ft^2	
Hydraulic radius = 1.553	
Normal depth = infinite	
Critical depth = 0.16 ft	
Depth downstream = 3.57 ft	
Bend loss = 0 ft	
Depth upstream = 3.57 ft	
Velocity = 0.1 ft/s	
Flow profile = Horizontal	
Anx Basin 4 Eff. Channel Split	**28.24**
User defined loss for flow split = 0 ft	
Total flow through flow split = 5.663 mgd	
Anx Basin 4 Eff. Weir 4	**29.15**
Weir invert (top of weir) = 28.66	
Number of contracted sides = 2	
Weir length = 8.25 ft	
Flow over weir = 5.663 mgd	
Submergence = unsubmerged	
Head over weir = 0.49 ft	
Anx Basin 4	**29.15**
User defined loss for flow split = 0 ft	
Total flow through flow split = 22.65 mgd	
36" ML to Anx Basin 4	**30.44**
Pipe shape = Circular	
Diameter = 36 in	
Length = 130 ft	
Flow = 22.65 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 2.45	
Pipe area = 7.07 ft^2	
Pipe hydraulic radius = 0.75	
Age factor = 1	
Solids factor = 1	
Velocity = 4.96 ft/s	
Friction loss = 0.36 ft	
Fitting loss = 0.93 ft	
Total loss = 1.29 ft	

Section Description	Water Surface Elevation
Splitter Box No. 1	**32.38**
Weir invert (top of weir) = 31.4	
Weir length = 72 ft	
Weir 'C' coefficient = 3	
Total flow through flow split = 135.9 mgd	
Weir submergence = unsubmerged	
Head over weir = 0.98 ft	
64" ML to Splitter Box No. 1	**34.31**
Pipe shape = Circular	
Diameter = 64 in	
Length = 45 ft	
Flow = 135.9 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 1.25	
Pipe area = 22.34 ft²	
Pipe hydraulic radius = 1.333	
Age factor = 1	
Solids factor = 1	
Velocity = 9.41 ft/s	
Friction loss = 0.21 ft	
Fitting loss = 1.72 ft	
Total loss = 1.93 ft	
64"x64" tee	**35.82**
Main line diameter = 64 in	
Branch diameter = 64 in	
Main line flow = 7.48 mgd	
Branch flow = 128.42 mgd	
Tee head loss = 1.51 ft	
64" ML to 64" Tee	**35.84**
Pipe shape = Circular	
Diameter = 64 in	
Length = 5 ft	
Flow = 128.42 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 0	
Pipe area = 22.34 ft²	
Pipe hydraulic radius = 1.333	
Age factor = 1	
Solids factor = 1	
Velocity = 8.89 ft/s	
Friction loss = 0.02 ft	

Section Description	Water Surface Elevation
Fitting loss = 0 ft	
Total loss = 0.02 ft	
64"x54" Tapping sleeve	**38.06**
Main line diameter = 64 in	
Branch diameter = 54 in	
Main line flow = 54 mgd	
Branch flow = 74.42 mgd	
Tee head loss = 2.22 ft	
54" RS from Headworks	**39.13**
Pipe shape = Circular	
Diameter = 54 in	
Length = 105 ft	
Flow = 54 mgd	
Friction method = Manning's Equation	
Friction factor = 0.013	
Total fitting K value = 2.06	
Pipe area = 15.9 ft^2	
Pipe hydraulic radius = 1.125	
Age factor = 1	
Solids factor = 1	
Velocity = 5.25 ft/s	
Friction loss = 0.19 ft	
Fitting loss = 0.88 ft	
Total loss = 1.07 ft	
HeadCell No. 1 Weir	**39.15**
Weir invert (top of weir) = 35	
Number of contracted sides = 2	
Weir length = 14 ft	
Flow over weir = 18 mgd	
Submergence = submerged	
Head over weir = 4.15 ft	
HeadCell No. 2 Weir	**39.15**
Weir invert (top of weir) = 35	
Number of contracted sides = 2	
Weir length = 14 ft	
Flow over weir = 18 mgd	
Submergence = submerged	
Head over weir = 4.15 ft	
HeadCell No. 3 Weir	**39.15**
Weir invert (top of weir) = 35	
Number of contracted sides = 2	

Section Description | **Water Surface Elevation**

Weir length = 14 ft
Flow over weir = 18 mgd
Submergence = submerged
Head over weir = 4.15 ft

APPENDIX D:

SUPPORTING INFORMATION FOR COST ESTIMATES

MANATEE COUNT SOUTHWEST WRF

BRADENTON, FL

BIOMAG™ CONCEPTUAL PROPOSAL

MCKIM & CREED

May 2022

Evoqua Sales Contact:

Brett Woods
brett.woods@evoqua.com

N19 W23993 Ridgeview Pkwy, Suite 200, Waukesha WI 53188

+1 (262) 547-0141 (toll) +1 (800) 524-6324 (toll-free) www.evoqua.com

CONTENTS

1. Introduction

Evoqua Water Technologies is pleased to present a preliminary BioMag system proposal. The BioMag system is a treatment intensification process using magnetite to ballast the biological flocs in an activated sludge process. This high-density ballast material increases the settling rate of the flocs allowing the plant to operate at elevated mixed liquor concentrations, treating more within a smaller footprint, while still achieving excellent effluent quality.

The treatment goals for this facility, in applying the BioMag system, are to:

- increase the flow rate.
- reduce overall bioreactor footprint.
- handle peak flows and storm flows more reliably.

Figure 1 below is a process flow diagram showing how the components of a BioMag system are typically integrated into the RAS and WAS lines of the main secondary treatment process of a plant.

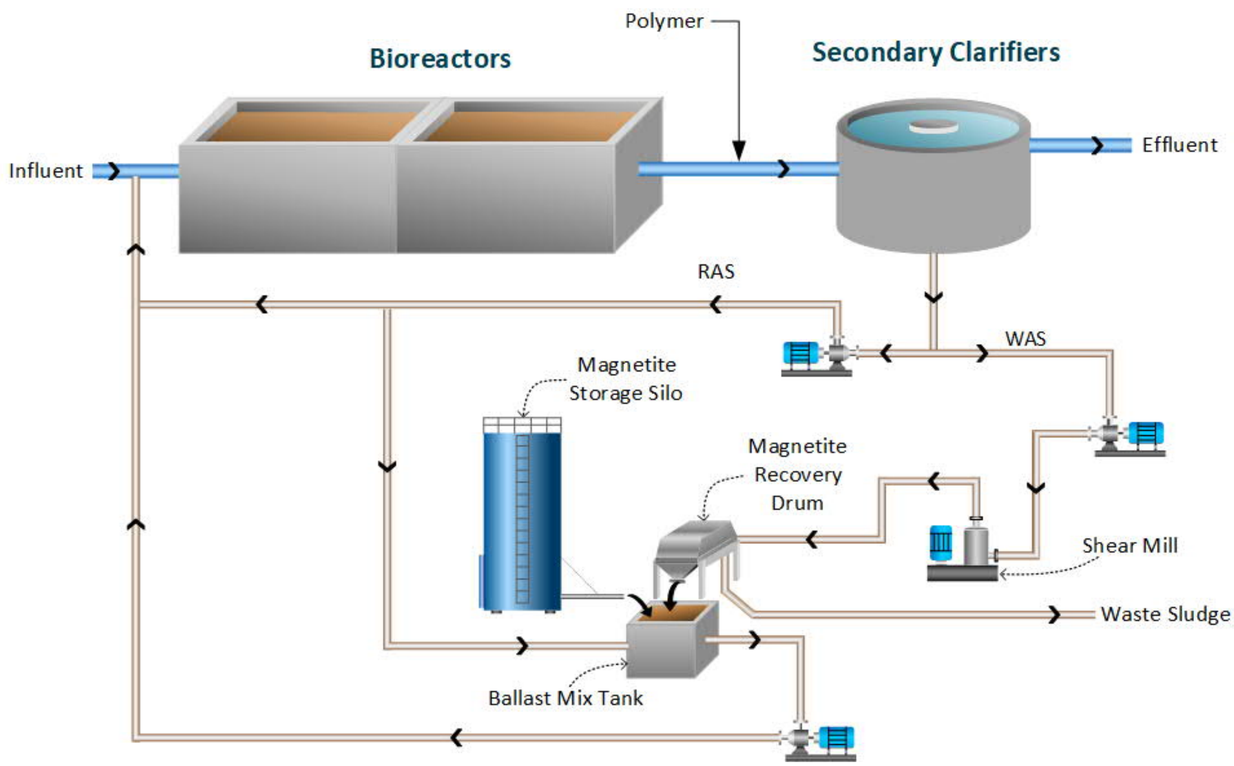


Figure 1: Typical BioMag process flow diagram.

2. Magnetite

Magnetite is a ferrimagnetic, iron oxide with chemical formula Fe_3O_4. It has a dark gray to black color and is chemically inert. Magnetite is a high-density material with a specific gravity ranging from 4.8 to 5.2 and is strongly attracted to magnets. The magnetite material used as part of the BioMag system is graded for a specific particle size range, optimized for embedment into the biological flocs of the activated sludge process. The high density and magnetic properties are key to the BioMag system. The high density leads to increased settling rates and the attraction to magnets allows the material to be recovered and reused.

Figure 2: Sample of magnetite material used with the BioMag system.

3. Design Criteria

Table 1 summarizes the design flows used as the basis for the proposed BioMag system.

Table 1: Design flows.

Parameter	Unit	Value
Average Daily Flow	MGD	18
Max Month Flow	MGD	25.2
Peak Daily Flow	MGD	34.2
Peak Hourly Flow	MGD	54

Table 2 summarizes the design influent water quality used as the basis for the proposed BioMag system.

Table 2: Design influent water quality.

Parameter	Unit	ADF	MMF
COD	lb/d	56,745	76,606
BOD_5	lb/d	23,569	29,697
TSS	lb/d	23,719	37,002

Parameter	Unit	ADF	MMF
VSS	lb/d	20,266	35,871
NH_3-N	lb/d	4,804	5,765
TKN	lb/d	5,404	6,269
TP	lb/d	NA	NA
Alkalinity	mg/L as $CaCO_3$	225	225
Maximum Influent Temperature	°C	25	25
Minimum Influent Temperature	°C	22	22

Table 3 summarizes the effluent performance requirements used as the basis for the proposed BioMag system. Evoqua can provide effluent performance guarantees upon request depending on the scope of supply from Evoqua. An effluent guarantee for biologically treated parameters such as BOD, ammonia, and TN can be provided if the biological treatment system design, equipment, and controls are provided by Evoqua. If the scope of supply by Evoqua is limited to the BioMag feed and recovery system, as outlined in this proposal, Evoqua can offer a performance guarantee for solids separation parameters such as effluent TSS and/or TP.

Table 3: Monthly average effluent performance.

Parameter	Unit	Value
$cBOD_5$	mg/L	5
TSS	mg/L	5
TN	mg/L	3

NOTE: Effluent values are final effluent.

4. BioMag Design Summary

Table 4 summarizes Evoqua's preliminary process parameters for the proposed BioMag system. The proposed BioMag system is based on preliminary biological sizing calculations performed by McKim an Creed.

Table 4: Design and process parameters.

Parameter	Value
Number of treatment trains	4 existing
Anoxic basins	Five (5) basins, 0.5375 MG each, 2.6875 MG total (four existing, one new)

Parameter	Value
Aerobic basins	Five (5) basins, 4.5 MG total (four existing, one new) Basins 1 and 2: 0.75 MG each (existing) Basins 3 and 4: 1.0 MG each (existing) Basin 5: 1.0 MG (new)
Post anoxic basins	Four (4) basins, 0.5 MG each, 2.0 MG total (all new)
Reaeration basins	Four (4) basins, 0.1 MG each, 0.4 MG total (all new)
Aerobic SRT	ADF: ~7 days MMF: ~6.5 days
MLSS	ADF: 3,320 mg/L MMF: 4,655 mg/L
Aeration/Mixing System	To be determined Typically, 0.2-0.3 scfm/ft^2 at ADF for diffused air and 50 HP/MG for floating mixers
WAS	ADF: 17,845 lb/d @ 7,637 mg/L TSS MMF: 26,894 lb/d @ 10,742 mg/L TSS
RAS requirements	Up to 18 MGD at ADF Up to 27 MGD at peak flow
Secondary clarifiers	Quantity: 5 Type: Center feed, peripheral weir Sludge Withdrawal: Draft tube (will need to replace) Diameter (Nos. 1&2): 105 ft Side Water Depth (Nos. 1&2): 12 ft Diameter (Nos. 3&4): 125 ft Side Water Depth (Nos. 3&4): 14 ft Diameter (No. 5): 105 ft Side Water Depth (No. 5): 14 ft
Number of new clarifiers required	0

5. Operating Costs

As a guidance and reference, Table 5 lists the main consumables associated with the BioMag system recommended for this project.

Table 5: Estimated BioMag consumables.

Item	Guidance
Magnetite consumption	1,639 – 1,862 lb/day at avg. day (≈ $0.30/lb.)
Magnetite feed/recovery equipment power	2,387 kWh/d
Polymer – as dry active	0.5 to 1.5 mg/L
Coagulant	none

6. Additional Design Considerations

In the event that BioMag is the selected technology for this project, the following items will need to be evaluated and discussed in more detail for a finalized design:

- Secondary clarifier mechanism replacement.
- Supplemental mixing requirements.
- Headworks screening. BioMag system may require pre-screening of the WAS flow before the recovery system if influent headworks screening is insufficient. Evoqua recommends at least 1/4” headworks screens.
- BioMag building layout and location.
- Biosolids wasting strategy (BioMag design assumes 24×7 wasting).
- Polymer feed system, chemical preference.

7. System Design Responsibilities

Table 6 below helps outline which parties have primary responsibility for design of the various systems involved in the upgrade of the plant with BioMag.

Table 6: Design responsibilities

Item	Primary	Guidance
Biological system sizing, design, and equipment. This includes calculation of oxygen requirements, sludge yield, sludge age and waste sludge generation.	Others	Evoqua
Clarifier equipment design and supply.	Others	Evoqua
BioMag feed and recovery system sizing, design, and equipment.	Evoqua	
BioMag equipment building layout and design	Others	Evoqua
Plant hydraulics, pipe sizing and pump headloss calculations.	Others	Evoqua

Evoqua has also conducted a preliminary sizing of the secondary clarifiers to determine the minimum required surface area and RAS pumping capacity associated with the enhanced settling rates of the BioMag system. The final design of the clarifier mechanism would need to be finalized by others unless Evoqua has been selected to provide the equipment for the clarifiers.

8. Equipment Scope of Supply

Table 7 below outlines the scope of supply from Evoqua for the proposed BioMag system. All equipment or services not specified in Table 7 are to be supplied by others.

Table 7: Evoqua scope of supply.

Item	Qty	**Description**
Ballast Storage & Feed System		
Flow control valve – ballast mix tank feed	1	Motor operated plug valve
Flow meter – ballast mix tank feed	1	Mag meter
Level transmitter – ballast mix tank (tank by others)	2	Radar
High level switch – ballast mix tank (tank by others)	2	Float style

Item	Qty	Description
Pump – ballast mix tank discharge	1D, 1S	Positive displacement, 450 gpm, 20 HP
Ballast mix tank mixer	4	3 HP, vertical shaft
Magnetite storage	1	25 ton outdoor silo
Magnetite dry feeder	1	Up to 10’ long Stinger® feed pipe extending from silo to ballast mix tank
Air compressor	2 (lead/lag)	10 HP units
Air dryer	1	Heatless desiccant
Compressed air system instrumentation	1 lot	Dew point sensor, pressure switch, pressure gauge
Ballast Recovery System		
Magnetic drum separator	9	36” x 72” drum, 7.5 HP each
Shear pump	5	10 HP each
Pump – recovery system feed	0	Use existing or provided by others
Pump – WAS transfer pump (after magnetite recovery)	1D, 1S	Positive displacement, 450 gpm, 20 HP
Flow control valve – mag drum feed	9	Motor operated plug valve
Flow meter – mag drum feed	9	Mag meter
Level switch – mag drum	9	Capacitance style
Speed switch – mag drum	9	Proximity style
Level transmitter – post recovery WAS sump (sump by others)	0	Radar
High level switch – post recovery WAS sump (sump by others)	0	Float style
Control System Hardware		
Control panel	1	NEMA 12 control panel, HMI, PLC, I/O
Services		
Engineering support		Engineering submittals and O&M manual

Item	Qty	Description
Installation oversight, start-up, commissioning, performance testing and training		Up to 21 days

9. Budgetary Pricing

The budgetary price for the Evoqua BioMag system, as defined herein, including engineering, field services, and equipment supply is $4,500,000.

This price makes no provision for taxes, tariffs, duties, permitting fees and other fees and charges that are not made explicit above.

All pricing is quoted at FCA, Factory (full freight allowed). No taxes, regulatory fees or other costs related to the procurement and installation of the system are included.

The initial magnetite charge for the proposed system will require approximately 250-300 ton(s) of virgin magnetite at design conditions. Evoqua can provide magnetite at a cost of $650 per ton plus freight.

The scope of supply and pricing are based on Evoqua standard equipment selection, standard terms of sale and warranty terms. Any variations from these standards may affect this budgetary quotation. Additionally, please note this budgetary quotation is for review and informational purposes only and does not constitute an offer for acceptance.

Should you have any questions regarding this quotation, or would like to request a firm proposal and order form, please contact the following Evoqua Regional Representative:

Jason Hopp
Heyward Florida Inc.
863-701-3082 (cell)
jhopp@heywardfl.com

Budgetary Proposal
Circular Clarifier Mechanisms

SW WRF Expansion
Manatee County, FL

For questions, please contact:
Jason Hopp
Heyward Florida Incorporated
Winter Park, FL 32789
Cell: (863) 701-3082
Email: jhopp@heywardfl.com

Version: 1
Date: 5/19/2022
Prepared By: Liz Bruggink

N19W23993 Ridgeview Pkwy, Suite 200
Waukesha, WI 53188
www.evoqua.com

SUMMARY:

Evoqua Water Technologies (Evoqua) is pleased to present our proposal for the following:

- Two (2) Tow-Bro circular clarifier mechanisms for installation in two (2) existing 105' diameter x 12' side water depth concrete tanks.
- Two (2) Tow-Bro circular clarifier mechanisms for installation in two (2) existing 125' diameter x 14' side water depth concrete tanks.
- One (1) Tow-Bro circular clarifier mechanism for installation in one (1) existing 105' diameter x 14' side water depth concrete tank.

The scope of supply and pricing are based on Evoqua's standard equipment selection, standard terms of sale and warranty terms as described herein. Any variations from these standards may affect this budgetary quotation. Additionally, please note that this budgetary quotation is for review and informational purposes only and does not constitute an offer for acceptance.

EQUIPMENT DESCRIPTION	**BUDGETARY PRICE**
Five (5) Tow-Bro mechanisms	$1,589,700

Equipment for each mechanism will consist of the following:

- Pony truss type access bridge with 1 1/4-inch aluminum grating walkway, 2-rail mechanically fastened aluminum handrail, center service platform and toe plate
- Drive mechanism with micro-switch overload device and shear pin
- Center influent column
- Center drive cage
- Influent flocculation well with supports
- FEDWA influent energy dissipating baffles
- One (1) skimmer assembly
- One (1) scum trough with flushing device
- One (1) truss arm
- Sludge collection manifold
- One (1) 1/4 inch thick unitube suction header
- Counterweights
- Associated anchor bolts and attachment bolts
- Freight – FOB Factory

MATERIALS OF CONSTRUCTION

Tow-Bro unitube header: A36 carbon steel.

Submerged and Non-submerged material: A36 carbon steel

Handrail: 2-rail Aluminum

Walkway and platform flooring: 1 1/4-inch aluminum grating

SURFACE PROTECTION

The Tow-Bro unitube header will be hot-dip galvanized after fabrication per ASTM-A123.

Submerged and Non-submerged components will be prepared by blasting to SSPC-SP10 and prime painted with one (1) shop coat. Finish coats are to be applied in the field by the Contractor.

Ferrous chain: One (1) coat of slush oil.

Shafting and exposed machined surfaces: Solvent wiping, followed by one (1) coat of Evoqua's standard shop preservative.

Wood, nonferrous materials, stainless steel and galvanized surfaces: Unpainted.

Drive unit and controls: Evoqua's standard.

Touch-up and all additional coats shall be furnished and applied by others at the site.

Prices are based on paints and surface preparations as outline in this quotation. In the event an alternative paint system is selected, purchaser's order must advise of its selection. Evoqua will, at its sole discretion, either adjust its price as necessary to comply or ship the material unpainted if compliance is not possible due to price considerations, application problems, or environmental controls.

Evoqua does not guarantee primer's compatibility with purchaser's coating system unless approved by the coating system manufacturer. Primers will only protect for a minimal amount of time, usually thirty (30) days. Specific information should be obtained from coating system manufacturer.

FIELD SERVICES

Manufacturer to provide four (4) trips and six (6) days total of on-site field service.

One day shall be dedicated to a pre-grout inspection. After installation, a post-grout inspection shall be conducted followed by a general training seminar.

An additional one (1) not less than one-half day shall be provided for operation assistance of the equipment supplied.

ELECTRICAL/CONTROLS

Drive mechanism motor will conform to NEMA standards and be suitable for operation on 230/460 volt, 3 phase, 60 Hertz current.

Electrical controls will consist of the two (2) micro-switches (one N.O. and one N.C.) in the drive mechanism overload device housing for high torque alarm and motor shut-down.

WEIRS AND BAFFLES

Effluent overflow weirs and scum baffles are not included.

SPARE PARTS

No spare parts are included.

No special tools are required for the installation or maintenance of this equipment.

EXCLUDED ITEMS *(including but not limited to):*

- Scum spray system
- Pumps
- Misc. access bridges, walkways, stairs, etc.
- Controls or control equipment
- Unloading of equipment and storage
- Concrete work of any sort, grout, mastic, sealing compounds, shims
- Lubricants
- Pipe supports
- Conduit or wiring in the field
- Cable trays, fittings, and supports

- Instrumentation
- Motor control centers
- Variable frequency drives
- Effluent weirs and baffles

xylem

Xylem Water Solutions USA, Inc.
Flygt Products

455 Harvest Time Drive
Sanford, FL 32771
Tel (407) 880-2900
Fax (407) 880-2962

May 25, 2022

BUDGET ESTIMATE PURPOSES ONLY

Re: Budget: MC Manatee SWWRF IR Pumps

Budget Estimation

Qty	Description
6	Flygt Model NP-3315.185 14" volute Submersible pump equipped with a 460 Volt / 3 phase / 60 Hz 70 HP 870 RPM motor, 817 imp. 50 Ft. length of submersible cable, FLS leakage detector, volute is prepared for Flush Valve
6	MINI-CASII LEAKAGE DETECTORS W/SOCKETS
6	20'X5/8" LIFT CHAIN 316SS
6	CONNECTION, DISCHARGE 14X14" CI
24	3/4"X10" J TYPE ANCHOR BOLT 316SS
12	20’ X 3" GUIDE RAIL 316SS
6	3" UPPER GUIDE BRACKET 316SS
2	CABLE HOLDER 316SS

*INCLUDES ONE DAY FACTORY START-UP AND FREIGHT CHARGES

Total Estimated Budget Price $ 762,500.00

APPENDIX E:
FUNDING STRATEGY MEMORANDUM

Funding Strategy Memorandum

Table of Contents

Section 1 - Funding Strategy

Angie Brewer and Associates, LC (ABA) has been engaged by McKim & Creed in support of the Manatee County (County) Southwest Water Reclamation Facility (SWWRF) Conceptual Engineering Report (CER), to provide a preliminary analysis of potential funding opportunities for expansion and improvements at the SWWRF. As part of this effort, ABA has reviewed the proposed improvements, conducted significant funding research, and prepared recommendations to fund wastewater improvements.

The Funding Strategy includes a detailed breakdown of the potential funding sources for the projects proposed as part of the CER. This strategy includes information such as funding cycles, match requirements, administrative burden, and special considerations.

It is important to note that this document is a snapshot in time at its completion. The current economic climate is under constant change. Pressure from the top levels of the federal and state governments to reduce budgets and eliminate programs is a constant concern. The COVID-19 pandemic has caused many of the governmental funding agencies to switch gears, close programs, create new funding opportunities and revise funding policies. There have been many recent effects on the standards of awarding public funds as well as on funding eligibility factors. With increasingly higher demand for infrastructure improvements, there may be new funding opportunities and initiatives coming to light.

Section 2 includes a discussion on leveraging funds and viability versus costs. ABA utilizes these techniques to ensure that the County pursues the best opportunities while delivering the project at the lowest total cost of delivery.

Section 3 explores the various funding sources and how the County can take full advantage of them to reduce costs. Key details about the funding sources and an identification of types of projects that appear to be good candidates is included as well.

Section 4 contains the conclusions that were arrived at based on the evaluation of funding opportunities.

Section 2 - Leveraging and Viability versus Costs

This section contains general information on important aspects of project funding. They are leveraging and viability versus costs. Having an understanding of these concepts will support the decision-making process when pursuing funding sources for critical projects.

Leveraging

Leveraging is simply using funds from one source, internal or external, as match for another funding source thereby increasing the available funding for a project. Our view on leveraging is based on the belief that evaluation of all aspects of a program, without restriction to a project level approach, greatly improves chances of success. If everything is viewed from only a project level approach, this will create gaps and the County may miss out on an opportunity to leverage funds from one source by matching another. ABA maintains a focus at a program level first to define the overall needs. Then it is possible to assist the County in identifying the specific project elements that align with specific funding sources. With that perspective in mind, ABA seeks funding sources that will accept another source as its match rather than using County funds as the only source of match.

Viability versus Costs

There are many programs available to fund a multitude of projects and project elements and while it would seem appropriate to apply for all opportunities that are identified, this is not always the case. There are times when the cost of an application and the required funding administration, either by a consultant or County staff, is too onerous for the amount of money that is being awarded. This does not mean that smaller funding opportunities should be ignored, but that an evaluation of the application process and the administration requirements should be performed before moving forward. The Funding Strategy has an evaluation of these factors included in the recommendations. This will help to ensure that the associated costs of applying and administering the funding do not outweigh the financial benefit.

Other considerations relating to viability versus cost include review of internal policies, procedures and requirements. It is critical to ensure the County's procurement, legal, financial, and operating requirements are evaluated for alignment with Federal, State and specific funding program requirements. It is also important to evaluate and assess whether there would be any anticipated impact on current and future debt obligations, rates/revenue and any other institutional requirements.

Section 3 Funding Strategy

This section contains recommendations and information on the State Revolving Fund (SRF) loan program and other potential funding sources that the County could utilize to fund the improvements that are identified for the SWWRF.

Recommended Strategy

Based on the proposed improvements, the primary recommended sources of funding for this collection of wastewater projects are the State of Florida Local Funding Initiative Request (Legislative Process/LP Grant), State of Florida Department of Environmental Protection Clean Water State Revolving Fund (SRF) Loan Program and United States Environmental Protection Agency Water Infrastructure Finance and Innovation Act (WIFIA) Funding. Secondary sources recommended for consideration are the Protecting Florida Together Grant Program. Tertiary sources are included for informational purposes but are not recommended for pursuit unless additional information becomes available. A funding resource summary for each program that provides expanded information has been included in this section.

Primary Funding Source Discussion

The LP Grant process has funded elements of projects similar to those proposed for the SWWRF in cycles. The Florida State Legislature accepts applications on an annual basis. Typically, an LP Grant would fund only a portion of the project but is a viable option for requests in the low millions of dollars. This process does require submission of an application and support from legislators in order to be considered for inclusion in the State budget.

SRF and WIFIA generally have similar administration requirements and are typically used in conjunction with each other when the total project costs exceed the SRF's capacity to fully fund the project within a reasonable number of years. WIFIA can fund up to 49% of the total eligible costs and SRF can finance some or all of the remaining eligible project costs. The main advantages of WIFIA include no maximum project size (based on credit worthiness), up to 35 year repayment term, up to 5 year payment deferral after substantial completion.

There are many benefits associated with the use of the SRF programs. The first, and quite likely the most important, is reduced interest rates compared to the bond market. Interest rates in the SRF programs range from 20-50% less than what a community can obtain on their own. The savings from these reduced interest rates adds up very quickly on even an average size project and can equal tens of millions of dollars on a larger project. Additional benefits include no pre-payment penalty, no arbitrage, no payments until 6 months after construction completion and others. Administrative and other considerations include a loan service fee, fiscal sustainability plan, capitalized interest, Davis-Bacon compliance, MBE/WBE compliance and American Iron and Steel (AIS)/Buy America/Build America (BABA) compliance.

The CER provides a technical foundation of information needed for the NEPA process and SRF Facilities Plan which is an early step in securing SRF and WIFIA funding. To provide a cost savings, ABA can structure the "Facilities Plan" to meet both program requirements to minimize duplication of effort.

The following is a summary of the process to meet WIFIA and SRF Clean Water (Wastewater) program requirements. Five phases are associated with the implementation and use of these funding mechanisms. These phases include planning, design, pre-construction, construction and close out. The general tasks are included on the following page to explain the phases.

Planning

- Project Identification
- Request for Inclusion
- Studies/Evaluations in Support of Facilities Plan
- NEPA/SRF Facilities Plan
- Environmental Clearance (FONSI/FFONSI/CEN)

Design

- Request for Inclusion
- Design
- Biddable Plans and Specifications
- Permits
- Site Certification
- Readiness to Proceed
- Update RFI for Construction Funding

Pre-Construction

- Pre-Award Compliance
- Bidding Process
- Authority to Award Approval Process
- Pre-Construction Meeting

Construction

- Payment Processes
- Change Orders/Eligibility Determinations
- Reimbursement Processes
- Compliance with Davis Bacon, American Iron & Steel, Buy America/Build America as well as other federal cross-cutter provisions

Close Out

- Final Pay Estimate, Change Order and Disbursement Request
- Final Contract Close Out Documentation
- FDEP Close Out Inspection
- Single Project and Annual Audit

Legend

Below is an example of the **Key Facts** section included for each funding source identified in the strategy. In the second column is an explanation of the potential values in each cell.

Key Facts	
Grant and/or Loan:	Identifies the funding source as a grant and/or a loan.
Terms:	N/A for a grant. If a loan, this will include an estimate of the interest rate and the maximum length of the loan repayment.
Maximum Funding per Cycle:	Identifies the maximum funding available per funding cycle.
Match Requirement:	Identifies the required match percentage and any special match conditions or exclusions.
Application Burden:	Low – Can be completed in-house or with minimal outside support Moderate – Typically completed by an in-house trained grant writer or outside consultant. High – Typically completed by a consultant and may include special technical reports or studies and planning documents.
Special Application Considerations:	Identifies important factors related to schedule and effort such as partnerships, public involvement, and special timetables.
Administrative Burden:	Low – Can be completed in-house or with minimal outside support Moderate – Typically completed by an in-house trained grant administrator or outside consultant. High – Typically completed by a consultant and may include special reports or compliance requirements such as Davis Bacon and Equal Employment Opportunity (EEO).
Special Administrative Considerations:	Identifies important factors related to schedule and effort such as Davis Bacon, EEO monitoring, and others.

State of Florida Local Funding Initiative Request (Legislative Process/LP Grant)

State Legislature (Senate and House)

Primary Funding Source

The State of Florida Senate and House accept Local Funding Initiative Requests through a process that begins with the Legislative Delegation. This opportunity provides funding for projects that enhance, preserve or improve environmental or fish and wildlife quality as well as improve wastewater management, stormwater management, groundwater quality, drinking water quality and surface water quality. Other activities can be funded through this mechanism however, they relate to other types of community projects.

It is imperative that Legislative support be garnered throughout this process. There are multiple steps in the process culminating in the project being listed in the State Budget. Other factors are considered during evaluation such as Local Public Involvement efforts, other funding sought, financially disadvantaged status and local match.

Funding Cycle

Cycle Frequency:	Annually
Begin Application Planning:	Late Summer 2022 - TBD
Funding Cycle Open:	Fall 2022 - TBD
Applications Due:	TBD

Key Facts	
Grant and/or Loan:	Grant
Terms:	N/A
Maximum Funding per Cycle:	No definitive maximum
Match Requirement:	No minimum required
Application Burden:	Low
Special Application Considerations:	Legislator Support Required
Administrative Burden:	Moderate
Special Administrative Considerations:	Quarterly and ROI Reporting

Water Infrastructure Finance and Innovation Act (WIFIA) Funding

Environmental Protection Agency

Primary Funding Source

The Water Infrastructure Finance and Innovation Act program was established in 2014 and annually provides federal credit for eligible water and wastewater infrastructure projects. The eligible projects may include development phase activities, construction, acquisition of real property and equipment, capitalized interest, and other related development and implementation activities. A dedicated source of revenue is required and the project must be creditworthy. This program is aimed toward larger construction projects as the minimum funding per project is $20 million for communities with populations of more than 25,000 and has a substantial non-refundable $100,000 application fee.

Funding Cycle

Cycle Frequency:	Annual
Begin Application Planning:	Ongoing
Funding Cycle Open:	September 6, 2022
Letter of Interest Due:	TBD 2020 (2019 due in July)
Applications Due:	Within 365 days of the invitation to apply

Key Facts	
Grant and/or Loan:	Loan
Terms:	35 years – US Treasury rates or greater, up to 5 year payment deferment
Maximum Funding per Cycle:	Minimum of $20 million per project
Match Requirement:	51%
Application Burden:	High
Special Application Considerations:	Non-refundable application fee of $100,000
Administrative Burden:	High
Special Administrative Considerations:	NEPA, Davis-Bacon, American Iron and Steel, BABA, other federal cross-cutter provisions.

State Revolving Fund Loan Program (SRF) – Clean Water

Florida Department of Environmental Protection

Primary Funding Source

The aim of the Clean Water State Revolving Fund (SRF) Loan Program is to provide low-interest loans to eligible entities for planning, designing, and constructing public wastewater, reclaimed water and storm water facilities.

Funding Cycle

Cycle Frequency:	Quarterly (Aug, Nov, Feb, May)
Begin Application Planning:	Ongoing
Funding Cycle Open:	Ongoing
Applications Due:	45 Days Prior to Quarterly Public Hearings

Key Facts	
Grant and/or Loan:	Loan
Terms:	20 years/Low interest, Loan Fee and Capitalized Interest, Payments begin after Construction Completion
Maximum Funding per Cycle:	Subject to Annual Segment Cap
Match Requirement:	None
Application Burden:	Moderate
Special Application Considerations:	Planning/Environmental Documents
Administrative Burden:	High
Special Administrative Considerations:	Davis Bacon, American Iron and Steel, BABA other federal cross-cutter provisions.

Other Funding Sources

This section focuses on funding programs other than the Primary Sources listed above and provides available details for each funding source. The funding source summaries are listed in alphabetical order.

In addition to the potential funding sources outlined below, the Infrastructure Investment and Jobs Act (IIJA) provides funding in support of projects of this type. The overall list of funding categories in the IIJA are included below:

- roads, bridges, and major projects;
- passenger and freight rail;
- highway and pedestrian safety;
- public transit;
- broadband;
- ports and waterways;
- airports;
- water infrastructure;
- power and grid reliability and resiliency;
- resiliency, including funding for coastal resiliency, ecosystem restoration, and weatherization;
- clean school buses and ferries;
- electric vehicle charging;
- addressing legacy pollution by cleaning up Brownfield and Superfund sites and reclaiming abandoned mines; and
- Western Water Infrastructure.

As it pertains to the proposed improvements, the IIJA effectively adds additional funding to the existing "financial infrastructure" of the SRF Programs over the next 5 years, beginning late 2022 to early 2023. This additional funding is essential to increasing the annual SRF cap by community. The significance of this development is that it will take fewer years for large projects to be fully funded and ease cash flow impacts.

Protecting Florida Together – Wastewater Grants

Florida Department of Environmental Protection

Secondary Funding Source

The aim of the Wastewater Grants Program is to provide grant to eligible governmental entities for constructing wastewater projects that reduce excess nutrient pollution within a Basin Management Action Plan (BMAP), alternative resolution plan or rural area of opportunity (RAO). AWT and Septic to Sewer projects are eligible under this program.

Funding Cycle

Cycle Frequency:	Annually
Begin Application Planning:	Ongoing
Funding Cycle Open:	June 2022 (expected in 2023 also)
Applications Due:	Aug 15, 2022 (expected in 2023 also)

Key Facts	
Grant and/or Loan:	Grant
Terms:	N/A
Maximum Funding per Cycle:	No definitive maximum
Match Requirement:	50% Match
Application Burden:	Moderate
Special Application Considerations:	Project identification in BMAP, Alternative Restoration Plan or RAO
Administrative Burden:	Moderate
Special Administrative Considerations:	Reporting and Financial Oversight

Florida Job Growth Grant Fund – Public Infrastructure

Florida Department of Economic Opportunity

Tertiary Funding Source

This program is centered around economic development and is focused on meeting the demand for infrastructure needs in the community. Infrastructure initiatives are based on attracting businesses, creating jobs, and promoting economic growth.

Funding Cycle

Cycle Frequency:	Ongoing
Begin Application Planning:	Ongoing
Funding Cycle Open:	Ongoing
Applications Due:	TBD

Key Facts	
Grant and/or Loan:	Grant
Terms:	N/A
Maximum Funding per Cycle:	No definitive maximum
Match Requirement:	No definitive match requirement
Application Burden:	Moderate
Special Application Considerations:	Highly focused on Economic Development
Administrative Burden:	Moderate
Special Administrative Considerations:	None

Florida Rural Water Association Loan Programs

Florida Rural Water Association

Tertiary Funding Source

The objective of this program is to assist communities in acquiring interim financing for construction projects. The program allows communities to have access to competitive fixed rate loan funds at a low cost of borrowing. The salient requirement for this program is that the recipient community must have received either a permanent loan commitment from the US Department of Agriculture-Rural Development (USDA-RD) or from the Department of Environmental Protection State Revolving Fund (DEP-SRF) for construction funding. The loans are used during the construction period and are paid off with the USDA-RD/DEP-SRF funds once the project is complete. An additional consideration is that it may require close coordination with FRWA depending on the timing of projects and the ability of FRWA to assemble the Governing Board of this program.

Funding Cycle

Cycle Frequency:	Ongoing
Begin Application Planning:	Ongoing
Funding Cycle Open:	Ongoing
Applications Due:	Ongoing

Key Facts	
Grant and/or Loan:	Loan
Terms:	Up to 5 years/Anticipated interest rate 2-5%
Maximum Funding per Cycle:	Varies depending on market conditions
Match Requirement:	None
Application Burden:	Moderate
Special Application Considerations:	Letter of Commitment from FDEP or USDA-RD
Administrative Burden:	Low
Special Administrative Considerations:	None

Section 4 - Conclusions

The County has an opportunity to bring grant and low-cost funding dollars back into the community. The funding sources presented offer the County potential savings versus conventional project funding sources such as traditional bond financing. The following list of actions are the recommended path forward to provide valuable resources/services to the community at the lowest possible cost of delivery.

1. Start preparing for the Local Funding Initiative Request legislative process
2. Begin the processes to secure WIFIA and SRF funding
3. Continue to monitor the Protecting Florida Together Wastewater Grant for application in 2023
4. Continue to seek other grant funding as the project elements become more defined

It is recommended to plan on using WIFIA/SRF as an “umbrella funding mechanism” for the project and any grants awarded would be used to reduce the amount to be repaid through WIFIA/SRF. This reduces the total cost to the County and to the users of the system.

APPENDIX F:

AQUANEREDA PRELIMINARY DESIGN REPORTS

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Process Design Report

MANATEE COUNTY SWWRF FL

Design# 169364
Option: Preliminary Design Phase 1 half flow

AquaNereda®

Aerobic Granular Sludge Technology

October 20, 2022
Designed By: Xu Ye

6306 N. Alpine Rd Loves Park, IL 61111
(815) 654-2501 www.aqua-aerobic.com

Upstream Recommendations

- 1/4 inch (6 mm) screening (perforated plate-style preferred) and grit removal (95% removal at 140 mesh) is required (by others) ahead of the AquaNereda system.

- Neutralization is required ahead of the biological system if the pH is expected to fall outside of 6.5-8.5 for significant durations.

- Elevated concentration of hydrogen sulfide can be detrimental to both civil and mechanical structures. If anaerobic conditions exist in the collection system, steps should be taken to eliminate hydrogen sulfide prior to the treatment system.

Flow Considerations

- The maximum flow, as shown on the design, has been assumed as an organic maximum that represents an increased organic load. An oxygen peaking factor of 1.17 has been included to accommodate this additional load while maintaining a residual DO concentration of 2 mg/l.

- When flows are in excess of the maximum daily flow of 8.55 MGD, the biological system has been designed to modify cycles in order to process a peak hydraulic flow of 13.5 MGD.

- Depending upon the magnitude and duration of the peak flow, effluent quality may be degraded.

Aeration

- The aeration system has been designed to provide 1.25 lbs. O2/lb. BOD5 applied and 4.6 lbs. O2/lb. TKN applied at the design average loading conditions, while maintaining a residual DO concentration of 2 mg/l.

- Depending on the actual yard piping from the blowers to the diffuser system and the heat losses associated with the yard piping, additional provisions for cooling of the air (i.e. incorporating heat exchangers) and/or modification of in-basin piping and/or diffuser sleeve material may be required. Aqua-Aerobic Systems, Inc. may need to modify the following equipment offering to ensure compatibility of all in-basin components with actual air temperatures.

Process/Site

- The anticipated effluent nitrogen requirement is predicated upon an influent waste temperature of 15 °C or greater. While lower temperatures may be acceptable for a short-term duration, nitrification and (if required) denitrification below 10 °C can be unpredictable, requiring special operator attention.

- Sufficient alkalinity is required for nitrification, as approximately 7.1 mg alkalinity (as CaCO3) is required for every mg of NH3-N nitrified. If the raw water alkalinity cannot support this consumption, while maintaining a residual concentration of 50 mg/l, supplemental alkalinity shall be provided (by others).

- The average, maximum and peak design flow and loading conditions, shown within the report, are based on maximum month average, maximum day and peak hour conditions, respectively.

Post-Secondary Treatment

-Tertiary filtration is required to meet the desired effluent limits.

Equipment

- Changes in basin geometry may require alterations in the equipment recommendation.

- The basins are not included and shall be provided by others.

- The influent enters the basin near the reactor floor. Adequate hydraulic capacity shall be made in the headworks to prevent backflow from one reactor to the other during transition of influent.

- Equipment selection is based upon the use of Aqua-Aerobic Systems' standard materials of construction and electrical components, suitable for non-classified electrical environments.

Design Notes

Design#: 169364

Project: ***MANATEE COUNTY SWWRF FL***

Option: ***Preliminary Design Phase 1 half flow***

Designed by Xu Ye on Thursday, October 20, 2022

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

- The basin dimensions reported on the design have been assumed based upon the required volumes and assumed basin geometry. Actual basin geometry may be circular, square or rectangular with construction materials including concrete or steel.

- The control panel does not include motor starters or VFDs, which should be provided in a separate MCC (by others).

- Provisions should be made, by others, for overflows in each of the recommended basins.

- Aqua-Aerobic Systems, Inc. is familiar with various “Buy American” Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project’s “Buy American” provisions.

Influent Buffer - Design Summary

Design#: 169364

Project: ***MANATEE COUNTY SWWRF FL***

Option: **Preliminary Design Phase 1 half flow**

Designed by Xu Ye on Thursday, October 20, 2022

INFLUENT BUFFER DESIGN PARAMETERS

Avg. Daily Flow:	= 6.30 MGD	= 23,848 m3/day
Max. Daily Flow:	= 8.55 MGD	= 32,365 m3/day
No. of AGS Reactors:		= 2

INFLUENT BUFFER VOLUME DETERMINATION

The volumes determined in this summary reflect the minimum volumes necessary to achieve the desired results based upon the input provided to Aqua. If other hydraulic conditions exist that are not mentioned in this design summary or associated design notes, additional volume may be warranted.

INFLUENT BUFFER BASIN DESIGN VALUES

No./Basin Geometry:	= 1 Rectangular Basin(s)				
Diameter of Basin:	= 129.0 ft	= (39.3 m)			
Width of Basin:	= 129.0 ft	= (39.3 m)			
Min. Water Depth:	= 0.0 ft	= (0.0 m)	**Min. Basin Vol. Basin:**	= 0 gallons	= (0.0 m^3)
Max. Water Depth:	= 14.4 ft	= (4.4 m)	**Max. Basin Vol. Basin:**	= 1,796,370.0 gallons	= (6,800.0 m^3)

INFLUENT BUFFER EQUIPMENT CRITERIA

Max. Flow Rate Required Basin:	= 12,444 GPM	= (2,826 m^3/hr)
Avg. Power Required:	= 893 kWhr/day	

AquaNereda® - Aerobic Granular Sludge Reactor - Design Summary

Project: MANATEE COUNTY SWWRF FL

Option: Preliminary Design Phase 1 half flow

Designed by Xu Ye on Thursday, October 20, 2022

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

DESIGN INFLUENT CONDITIONS

Avg. Design Flow	= 6.30 MGD	= 23,848 m3/day
Max Design Flow	= 8.55 MGD	= 32,365 m3/day
Peak Hyd. Flow	= 13.5 MGD	= 51,103 m3/day

DESIGN PARAMETERS

			Effluent (After Filtration)			
	Influent	**mg/l**	**Required**	**<= mg/l**	**Anticipated**	**<= mg/l**
Bio/Chem Oxygen Demand:	BOD5	141	BOD5	20	BOD5	20
Total Suspended Solids:	TSS	175	TSSa	5	TSSa	5
Total Kjeldahl Nitrogen:	TKN	29	TKN	--	TKN	--
Total Nitrogen:	--	--	TN	10.0	TN	10.0
Phosphorus:	Total P	8	--	--	--	--

SITE CONDITIONS

	Maximum		Minimum		Elevation (MSL)
Ambient Air Temperatures:	105 F	41.0 C	50 F	10.0 C	66 ft
Influent Waste Temperatures:	77 F	25.0 C	59 F	15.0 C	20.0 m

AGS BASIN DESIGN VALUES

				Water Depth		Basin Vol./Basin	
No./Basin Geometry:	2 Rectangular Basin(s)		**Process Level (PWL):**	21.0 ft	(6.4 m)	1.30 MG	(4,910 m³)
Freeboard (from PWL):	2.5 ft	(0.7 m)	**Discharge Level (DWL):**	21.9 ft	(6.7 m)		
Length of Basin:	129.0 ft	(39.3 m)					
Width of Basin:	64.0 ft	(19.5 m)					

Cycle Duration:	= 3.7 Hours/Cycle	
Food/Mass (F/M) ratio:	= 0.043 lbs. BOD5/lb. MLSS-Day	
MLSS Concentration:	= 8000 mg/l	
Hydraulic Retention Time:	= 0.41 Days	
Solids Retention Time:	= 24.35 Days	
Est. Net Sludge Yield:	= 0.92 Lbs. WAS/lb. BOD5	
Est. Dry Solids Produced:	= 6847.0 lbs. WAS/Day	= (3105.8 kg/Day)
Lbs. O2/lb. BOD5	= 1.25	
Lbs. O2/lb. TKN	= 4.60	
Peak O2 Factor:	= 1.17	
Actual Oxygen Required:	= 19058 lbs./Day	= (8644.7 kg/Day)
Air Flowrate/Basin:	= 4097 SCFM	= (116.0 Sm3/min)
Max. Discharge Pressure:	= 10.88 PSIG	= (75 KPA)
Average Aeration Power Consumption:	= 1980 kWh/day (at 83% design load)	

Project: ***MANATEE COUNTY SWWRF FL***

Option: ***Preliminary Design Phase 1 half flow***

Designed by Xu Ye on Thursday, October 20, 2022

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

SLUDGE BUFFER DESIGN VALUES

No./Basins Geometry:	= 1 Rectangular Basin(s)	
Minimum Level:	= 1.0 ft	= (0.3 m)
Max. Level:	= 15.4 ft	= (4.7 m)
Max. Basin Volume:	= 68,294 gallons	= (259.0 m³)
Length of Basin:	= 15.0 ft	= (4.6 m)
Width of Basin:	= 39.5 ft	= (12.0 m)

SLUDGE BUFFER VOLUME DETERMINATION

The sludge buffer volume has been determined based on the sludge production and the concentration of sludge from the AquaNereda reactors. The Sludge from this basin will be pumped to the sludge handling system, and the supernatant back to the head of the plant.

SLUDGE BUFFER EQUIPMENT CRITERIA

Max. Sludge Flow Rate Required:	= 189 gpm	= (43 m³/hr)
Max. Supernatant Flow Rate Required:	= 859 gpm	= (195 m³/hr)
Average Power Consumption:	= 56 kWh/day (at 83% design load)	

AquaNereda: Influent Buffer

Level Sensor Assemblies

1 Sensor installation(s) consisting of:

- Pressure transducer(s).
- Stainless steel sensor guide rail weldment(s).
- PVC sensor mounting pipe(s).
- Top support(s).

1 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

AquaNereda

Influent Distribution System

2 Influent Distribution Assembly(ies) consisting of:

- Influent distribution system consisting of HDPE and PVC pipe with supports.

Effluent Weir Assembly

2 Effluent Weir Assembly(ies) consisting of:

- Concrete main effluent channel(s) provided by others.
- Stainless steel weir assembliy(ies) with supports.
- Stainless steel main channel(s).

Sludge Removal System

2 Solids Waste System(s) consisting of:

- HDPE or Stainless steel solids waste system(s).
- Pressure transmitter(s).

2 Sludge Decant/WLC Valve Set(s) consisting of:

- Each reactor includes two (2) of the following automatic control valves and two (2) of the following manual throttling valves:
- 20 inch electrically operated butterfly valve(s).
- 20 inch diameter manual plug valve(s).

2 Air Valve Set(s) consisting of:

- Each reactor includes two (2) of the following automatic valves and one (1) of the following manual valves:
- 4 inch manual butterfly valve(s).
- 4 inch electrically operated butterfly valve(s) with actuator.

Fixed Fine Bubble Diffusers

2 Fixed Fine Bubble Diffuser Assembly(ies) consisting of:

- 304 SS, 12 Ga. drop pipe(s).
- PVC, Sch 40 Manifold(s) with connection to drop pipe.
- PVC, Air distributor(s) with connection to the manifold and required PVC pipe joint connections.
- 304 Stainless steel piping supports with vertical supports, clamps, adjusting mechanism and anchor bolts.
- Fine bubble diffuser assemblies.

Positive Displacement Blowers

3 Positive Displacement Blower Package(s), with each package consisting of:

- Aerzen 300HP Rotary Positive Displacement Blower(s).
- 12" manual butterfly valve(s).

Level Sensor Assemblies

2 Pressure Transducer Assembly(ies) each consisting of:

- Pressure transducer(s).
- Mounting bracket weldment(s).
- Transducer mounting pipe weldment(s).

2 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

Instrumentation

1 Process Control System will be provided as follows:

Instrumentation including sensors and/or analyzers along with mounting assemblies shall be provided to measure the following for the AquaNereda basin(s):

- Dissolved Oxygen
- pH
- ORP
- TSS
- Nitrate
- Ammonium

Instrumentation including sensors and/or analyzers along with mounting assemblies shall be provided to measure the following for the Sludge Buffer basin(s):

- TSS
- Hach Filtrax sampling system. Sampler includes stainless steel brackets and guiderail system.

AquaNereda: Sludge Buffer

Transfer Pumps/Valves

1 External Pump Assembly(ies) consisting of the following items:

- 15HP Pump assembly(ies).
- 6" Manual plug valve(s).

1 Sludge Valve(s) consisting of the following items:

- 6 inch electrically operated plug valve(s).

1 Supernatant Valve(s) consisting of the following items:

- 8 inch diameter Milliken 601 electrically operated eccentric plug valve(s) with 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, EPDM coated ductile iron plug, assembled and tested with an Auma, 115 VAC, 60 hertz, single phase open/close service electric actuator. Valve actuator includes compartment heater.

Sludge Removal System

1 Solids Removal Assembly(ies) consisting of:

- Solids removal assembly(ies) consisting of PVC and/or HDPE pipe with supports.

Level Sensor Assemblies

1 Pressure Transducer Assembly(ies) each consisting of:

- Pressure transducer(s).
- Mounting bracket weldment(s).
- Transducer mounting pipe weldment(s).

1 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

AquaNereda: PLC Controls

Controls wo/Starters

1 Controls Package(s) will be provided as follows:

- NEMA 12 panel enclosure suitable for indoor installation and constructed of painted steel.
- Fuse(s) and fuse block(s).
- Compactlogix Processor.
- Operator interface(s).
- Remote access Ethernet modem(s).

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Process Design Report

MANATEE COUNTY SWWRF FL

Design# 169143
Option: Preliminary Design Phase 1

AquaNereda®

Aerobic Granular Sludge Technology

October 06, 2022
Designed By: Thea Davis

6306 N. Alpine Rd Loves Park, IL 61111
(815) 654-2501 www.aqua-aerobic.com

Upstream Recommendations

- 1/4 inch (6 mm) screening (perforated plate-style preferred) and grit removal (95% removal at 140 mesh) is required (by others) ahead of the AquaNereda system.

- Neutralization is required ahead of the biological system if the pH is expected to fall outside of 6.5-8.5 for significant durations.

- Elevated concentration of hydrogen sulfide can be detrimental to both civil and mechanical structures. If anaerobic conditions exist in the collection system, steps should be taken to eliminate hydrogen sulfide prior to the treatment system.

Flow Considerations

- The maximum flow, as shown on the design, has been assumed as an organic maximum that represents an increased organic load. An oxygen peaking factor of 1.17 has been included to accommodate this additional load while maintaining a residual DO concentration of 2 mg/l.

- When flows are in excess of the maximum daily flow of 17.1 MGD, the biological system has been designed to modify cycles in order to process a peak hydraulic flow of 27 MGD.

- Depending upon the magnitude and duration of the peak flow, effluent quality may be degraded.

Aeration

- The aeration system has been designed to provide 1.25 lbs. O_2/lb. BOD_5 applied and 4.6 lbs. O_2/lb. TKN applied at the design average loading conditions, while maintaining a residual DO concentration of 2 mg/l.

- Depending on the actual yard piping from the blowers to the diffuser system and the heat losses associated with the yard piping, additional provisions for cooling of the air (i.e. incorporating heat exchangers) and/or modification of in-basin piping and/or diffuser sleeve material may be required. Aqua-Aerobic Systems, Inc. may need to modify the following equipment offering to ensure compatibility of all in-basin components with actual air temperatures.

Process/Site

- The anticipated effluent nitrogen requirement is predicated upon an influent waste temperature of 15 °C or greater. While lower temperatures may be acceptable for a short-term duration, nitrification and (if required) denitrification below 10 °C can be unpredictable, requiring special operator attention.

- Sufficient alkalinity is required for nitrification, as approximately 7.1 mg alkalinity (as $CaCO_3$) is required for every mg of NH_3-N nitrified. If the raw water alkalinity cannot support this consumption, while maintaining a residual concentration of 50 mg/l, supplemental alkalinity shall be provided (by others).

- The average, maximum and peak design flow and loading conditions, shown within the report, are based on maximum month average, maximum day and peak hour conditions, respectively.

Post-Secondary Treatment

-Tertiary filtration is required to meet the desired effluent limits.

Equipment

- Changes in basin geometry may require alterations in the equipment recommendation.

- The basins are not included and shall be provided by others.

- The influent enters the basin near the reactor floor. Adequate hydraulic capacity shall be made in the headworks to prevent backflow from one reactor to the other during transition of influent.

- Equipment selection is based upon the use of Aqua-Aerobic Systems' standard materials of construction and electrical components, suitable for non-classified electrical environments.

- The basin dimensions reported on the design have been assumed based upon the required volumes and assumed basin geometry. Actual basin geometry may be circular, square or rectangular with construction materials including concrete or steel.

- The control panel does not include motor starters or VFDs, which should be provided in a separate MCC (by others).

- Provisions should be made, by others, for overflows in each of the recommended basins.

- Aqua-Aerobic Systems, Inc. is familiar with various “Buy American” Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project’s “Buy American” provisions.

Influent Buffer - Design Summary **Design#: 169143**

Project: ***MANATEE COUNTY SWWRF FL***

Option: **Preliminary Design Phase 1**

Designed by Thea Davis on Thursday, October 6, 2022

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

INFLUENT BUFFER DESIGN PARAMETERS

Avg. Daily Flow:	= 12.60 MGD	= 47,696 m3/day
Max. Daily Flow:	= 17.10 MGD	= 64,731 m3/day
No. of AGS Reactors:		= 2

INFLUENT BUFFER VOLUME DETERMINATION

The volumes determined in this summary reflect the minimum volumes necessary to achieve the desired results based upon the input provided to Aqua. If other hydraulic conditions exist that are not mentioned in this design summary or associated design notes, additional volume may be warranted.

INFLUENT BUFFER BASIN DESIGN VALUES

No./Basin Geometry:	= 1 Rectangular Basin(s)				
Diameter of Basin:	= 129.0 ft	= (39.3 m)			
Width of Basin:	= 129.0 ft	= (39.3 m)			
Min. Water Depth:	= 0.0 ft	= (0.0 m)	**Min. Basin Vol. Basin:**	= 0 gallons	= (0.0 m³)
Max. Water Depth:	= 14.4 ft	= (4.4 m)	**Max. Basin Vol. Basin:**	= 1,796,370.0 gallons	= (6,800.0 m³)

INFLUENT BUFFER EQUIPMENT CRITERIA

Max. Flow Rate Required Basin:	= 24,889 GPM	= (5,653 m³/hr)
Avg. Power Required:	= 1,528 kWhr/day	

AquaNereda® - Aerobic Granular Sludge Reactor - Design Summary

Design#: 169143

Project: MANATEE COUNTY SWWRF FL

Option: Preliminary Design Phase 1

Designed by Thea Davis on Thursday, October 6, 2022

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

DESIGN INFLUENT CONDITIONS

Avg. Design Flow	= 12.60 MGD	= 47,696 m3/day
Max Design Flow	= 17.10 MGD	= 64,731 m3/day
Peak Hyd. Flow	= 27 MGD	= 102206 m3/day (modifying cycles)

DESIGN PARAMETERS

			Effluent (After Filtration)			
	Influent	**mg/l**	**Required**	**<= mg/l**	**Anticipated**	**<= mg/l**
Bio/Chem Oxygen Demand:	BOD5	141	BOD5	20	BOD5	20
Total Suspended Solids:	TSS	175	TSSa	5	TSSa	5
Total Kjeldahl Nitrogen:	TKN	29	TKN	--	TKN	--
Total Nitrogen:	--	--	TN	10.0	TN	10.0
Phosphorus:	Total P	8	--	--	--	--

SITE CONDITIONS

	Maximum		Minimum		Elevation (MSL)
Ambient Air Temperatures:	105 F	41.0 C	50 F	10.0 C	66 ft
Influent Waste Temperatures:	77 F	25.0 C	59 F	15.0 C	20.0 m

AGS BASIN DESIGN VALUES

				Water Depth		Basin Vol./Basin	
No./Basin Geometry:	2 Rectangular Basin(s)		**Process Level (PWL):**	21.0 ft	(6.4 m)	2.61 MG	(9,895 m³)
Freeboard (from PWL):	2.4 ft	(0.7 m)	**Discharge Level (DWL):**	21.9 ft	(6.7 m)		
Length of Basin:	129.0 ft	(39.3 m)					
Width of Basin:	129.0 ft	(39.3 m)					

Cycle Duration:	= 3.7 Hours/Cycle	
Food/Mass (F/M) ratio:	= 0.043 lbs. BOD5/lb. MLSS-Day	
MLSS Concentration:	= 8000 mg/l	
Hydraulic Retention Time:	= 0.41 Days	
Solids Retention Time:	= 24.60 Days	
Est. Net Sludge Yield:	= 0.92 Lbs. WAS/lb. BOD5	
Est. Dry Solids Produced:	= 13694.0 lbs. WAS/Day	= (6211.6 kg/Day)
Lbs. O2/lb. BOD5	= 1.25	
Lbs. O2/lb. TKN	= 4.60	
Peak O2 Factor:	= 1.17	
Actual Oxygen Required:	= 38115 lbs./Day	= (17288.9 kg/Day)
Air Flowrate/Basin:	= 6915 SCFM	= (195.8 Sm3/min)
Max. Discharge Pressure:	= 10.88 PSIG	= (75 KPA)
Average Aeration Power Consumption:	= 5988 kWh/day (at 166% design load)	

Sludge Buffer - Design Summary **Design#: 169143**

Project: ***MANATEE COUNTY SWWRF FL***

Option: ***Preliminary Design Phase 1***

Designed by Thea Davis on Thursday, October 6, 2022

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

SLUDGE BUFFER DESIGN VALUES

No./Basins Geometry:	= 1 Rectangular Basin(s)	
Minimum Level:	= 1.0 ft	= (0.3 m)
Max. Level:	= 15.4 ft	= (4.7 m)
Max. Basin Volume:	= 141,386 gallons	= (535.0 m³)
Length of Basin:	= 31.0 ft	= (9.5 m)
Width of Basin:	= 39.5 ft	= (12.0 m)

SLUDGE BUFFER VOLUME DETERMINATION

The sludge buffer volume has been determined based on the sludge production and the concentration of sludge from the AquaNereda reactors. The Sludge from this basin will be pumped to the sludge handling system, and the supernatant back to the head of the plant.

SLUDGE BUFFER EQUIPMENT CRITERIA

Max. Sludge Flow Rate Required:	= 401 gpm	= (91 m³/hr)
Max. Supernatant Flow Rate Required:	= 1,603 gpm	= (364 m³/hr)
Average Power Consumption:	= 243 kWh/day (at 166% design load)	

AquaNereda: Influent Buffer

Level Sensor Assemblies

1 Sensor installation(s) consisting of:

- Pressure transducer(s).
- Stainless steel sensor guide rail weldment(s).
- PVC sensor mounting pipe(s).
- Top support(s).

1 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

AquaNereda

Influent Distribution System

2 Influent Distribution Assembly(ies) consisting of:

- Influent distribution system consisting of HDPE and PVC pipe with supports.

Effluent Weir Assembly

2 Effluent Weir Assembly(ies) consisting of:

- Concrete main effluent channel(s) provided by others.
- Stainless steel weir assembliy(ies) with supports.
- Stainless steel main channel(s).

Sludge Removal System

2 Solids Waste System(s) consisting of:

- HDPE or Stainless steel solids waste system(s).
- Pressure transmitter(s).

2 Sludge Decant/WLC Valve Set(s) consisting of:

- Each reactor includes two (2) of the following automatic control valves and two (2) of the following manual throttling valves:
- 30 inch electrically operated butterfly valve(s).
- 30 inch diameter Miliken manual plug valve(s).

2 Air Valve Set(s) consisting of:

- Each reactor includes two (2) of the following automatic valves and one (1) of the following manual valves:
- 4 inch manual butterfly valve(s).
- 4 inch electrically operated butterfly valve(s) with actuator.

Fixed Fine Bubble Diffusers

2 Fixed Fine Bubble Diffuser Assembly(ies) consisting of:

- 304 SS, 12 Ga. drop pipe(s).
- PVC, Sch 40 Manifold(s) with connection to drop pipe.
- PVC, Air distributor(s) with connection to the manifold and required PVC pipe joint connections.
- 304 Stainless steel piping supports with vertical supports, clamps, adjusting mechanism and anchor bolts.
- Fine bubble diffuser assemblies.

Positive Displacement Blowers

5 Positive Displacement Blower Package(s), with each package consisting of:

- Aerzen 300HP Rotary Positive Displacement Blower(s).
- 12" manual butterfly valve(s).

Level Sensor Assemblies

2 Pressure Transducer Assembly(ies) each consisting of:

- Pressure transducer(s).
- Mounting bracket weldment(s).
- Transducer mounting pipe weldment(s).

2 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

Instrumentation

1 Process Control System will be provided as follows:

Instrumentation including sensors and/or analyzers along with mounting assemblies shall be provided to measure the following for the AquaNereda basin(s):
- Dissolved Oxygen
- pH
- ORP
- TSS
- Nitrate
- Ammonium

Instrumentation including sensors and/or analyzers along with mounting assemblies shall be provided to measure the following for the Sludge Buffer basin(s):
- TSS

- Hach Filtrax sampling system. Sampler includes stainless steel brackets and guiderail system.

AquaNereda: Sludge Buffer

Transfer Pumps/Valves

1 External Pump Assembly(ies) consisting of the following items:

- 25HP Pump assembly(ies).
- 6" Manual plug valve(s).

1 Sludge Valve(s) consisting of the following items:

- 8 inch diameter Milliken 601 electrically operated eccentric plug valve(s) with 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, EPDM coated ductile iron plug, assembled and tested with an Auma, 115 VAC, 60 hertz, single phase open/close service electric actuator. Valve actuator includes compartment heater.

1 Supernatant Valve(s) consisting of the following items:

- 12 inch diameter Milliken 601 electrically operated eccentric plug valve(s) with 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, EPDM coated ductile iron plug, assembled and tested with an Auma, 115 VAC, 60 hertz, single phase open/close service electric actuator. Valve actuator includes compartment heater.

Sludge Removal System

1 Solids Removal Assembly(ies) consisting of:

- Solids removal assembly(ies) consisting of PVC and/or HDPE pipe with supports.

Level Sensor Assemblies

1 Pressure Transducer Assembly(ies) each consisting of:

- Pressure transducer(s).
- Mounting bracket weldment(s).
- Transducer mounting pipe weldment(s).

1 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

AquaNereda: PLC Controls

Controls wo/Starters

1 Controls Package(s) will be provided as follows:

- NEMA 12 panel enclosure suitable for indoor installation and constructed of painted steel.
- Fuse(s) and fuse block(s).
- Compactlogix Processor.
- Operator interface(s).
- Remote access Ethernet modem(s).

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Process Design Report

MANATEE COUNTY SWWRF FL

Design# 169144
Option: Preliminary Design Phase 2

AquaNereda®
Aerobic Granular Sludge Technology

October 06, 2022
Designed By: Thea Davis

6306 N. Alpine Rd Loves Park, IL 61111
(815) 654-2501 www.aqua-aerobic.com

Upstream Recommendations

- 1/4 inch (6 mm) screening (perforated plate-style preferred) and grit removal (95% removal at 140 mesh) is required (by others) ahead of the AquaNereda system.

- Neutralization is required ahead of the biological system if the pH is expected to fall outside of 6.5-8.5 for significant durations.

- Elevated concentration of hydrogen sulfide can be detrimental to both civil and mechanical structures. If anaerobic conditions exist in the collection system, steps should be taken to eliminate hydrogen sulfide prior to the treatment system.

Flow Considerations

- The maximum flow, as shown on the design, has been assumed as an organic maximum that represents an increased organic load. An oxygen peaking factor of 1.17 has been included to accommodate this additional load while maintaining a residual DO concentration of 2 mg/l.

- When flows are in excess of the maximum daily flow of 34.2 MGD, the biological system has been designed to modify cycles in order to process a peak hydraulic flow of 54 MGD.

- Depending upon the magnitude and duration of the peak flow, effluent quality may be degraded.

Aeration

- The aeration system has been designed to provide 1.25 lbs. O2/lb. BOD5 applied and 4.6 lbs. O2/lb. TKN applied at the design average loading conditions, while maintaining a residual DO concentration of 2 mg/l.

- Depending on the actual yard piping from the blowers to the diffuser system and the heat losses associated with the yard piping, additional provisions for cooling of the air (i.e. incorporating heat exchangers) and/or modification of in-basin piping and/or diffuser sleeve material may be required. Aqua-Aerobic Systems, Inc. may need to modify the following equipment offering to ensure compatibility of all in-basin components with actual air temperatures.

Process/Site

- The anticipated effluent nitrogen requirement is predicated upon an influent waste temperature of 15 °C or greater. While lower temperatures may be acceptable for a short-term duration, nitrification and (if required) denitrification below 10 °C can be unpredictable, requiring special operator attention.

- Sufficient alkalinity is required for nitrification, as approximately 7.1 mg alkalinity (as CaCO3) is required for every mg of NH3-N nitrified. If the raw water alkalinity cannot support this consumption, while maintaining a residual concentration of 50 mg/l, supplemental alkalinity shall be provided (by others).

- The average, maximum and peak design flow and loading conditions, shown within the report, are based on maximum month average, maximum day and peak hour conditions, respectively.

Post-Secondary Treatment

-Tertiary filtration is required to meet the desired effluent limits.

Equipment

- Changes in basin geometry may require alterations in the equipment recommendation.

- The basins are not included and shall be provided by others.

- The influent enters the basin near the reactor floor. Adequate hydraulic capacity shall be made in the headworks to prevent backflow from one reactor to the other during transition of influent.

- Equipment selection is based upon the use of Aqua-Aerobic Systems' standard materials of construction and electrical components, suitable for non-classified electrical environments.

- The basin dimensions reported on the design have been assumed based upon the required volumes and assumed basin geometry. Actual basin geometry may be circular, square or rectangular with construction materials including concrete or steel.

- The control panel does not include motor starters or VFDs, which should be provided in a separate MCC (by others).

- Provisions should be made, by others, for overflows in each of the recommended basins.

- Aqua-Aerobic Systems, Inc. is familiar with various “Buy American” Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project’s “Buy American” provisions.

AquaNereda® - Aerobic Granular Sludge Reactor - Design Summary

Design#: 169144

Project: MANATEE COUNTY SWWRF FL

Option: Preliminary Design Phase 2

Designed by Thea Davis on Thursday, October 6, 2022

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

DESIGN INFLUENT CONDITIONS

Avg. Design Flow	= 25.20 MGD	= 95,392 m3/day
Max Design Flow	= 34.20 MGD	= 129,461 m3/day
Peak Hyd. Flow	= 54 MGD	= 204412 m3/day (modifying cycles)

DESIGN PARAMETERS

			Effluent (After Filtration)			
	Influent	**mg/l**	**Required**	**<= mg/l**	**Anticipated**	**<= mg/l**
Bio/Chem Oxygen Demand:	BOD5	141	BOD5	20	BOD5	20
Total Suspended Solids:	TSS	175	TSSa	5	TSSa	5
Total Kjeldahl Nitrogen:	TKN	29	TKN	--	TKN	--
Total Nitrogen:	--	--	TN	10.0	TN	10.0
Phosphorus:	Total P	8	--	--	--	--

SITE CONDITIONS

	Maximum		Minimum		Elevation (MSL)
Ambient Air Temperatures:	105 F	41.0 C	50 F	10.0 C	66 ft
Influent Waste Temperatures:	77 F	25.0 C	68 F	20.0 C	20.0 m

AGS BASIN DESIGN VALUES

			Water Depth			Basin Vol./Basin	
No./Basin Geometry:	4 Rectangular Basin(s)		**Process Level (PWL):**	21.0 ft	(6.4 m)	2.61 MG	(9,895 m³)
Freeboard (from PWL):	2.3 ft	(0.7 m)	**Discharge Level (DWL):**	21.8 ft	(6.7 m)		
Length of Basin:	129.0 ft	(39.3 m)					
Width of Basin:	129.0 ft	(39.3 m)					

Cycle Duration:	= 3.7 Hours/Cycle	
Food/Mass (F/M) ratio:	= 0.043 lbs. BOD5/lb. MLSS-Day	
MLSS Concentration:	= 8000 mg/l	
Hydraulic Retention Time:	= 0.41 Days	
Solids Retention Time:	= 24.60 Days	
Est. Net Sludge Yield:	= 0.92 Lbs. WAS/lb. BOD5	
Est. Dry Solids Produced:	= 27387.0 lbs. WAS/Day	= (12422.7 kg/Day)
Lbs. O2/lb. BOD5	= 1.25	
Lbs. O2/lb. TKN	= 4.60	
Peak O2 Factor:	= 1.17	
Actual Oxygen Required:	= 76230 lbs./Day	= (34577.7 kg/Day)
Air Flowrate/Basin:	= 8564 SCFM	= (242.5 Sm3/min)
Max. Discharge Pressure:	= 10.88 PSIG	= (75 KPA)
Average Aeration Power Consumption:	= 7369 kWh/day (at 83% design load)	

WATER LEVEL CORRECTION TANK DESIGN VALUES

No./Basin Geometry:	= 1 Rectangular Basin(s)	
Minimum Level:	= 0.0 ft	= (0.0 m)
Max. Water Depth:	= 14.4 ft	= (4.4 m)
Max. Basin Volume (Total):	= 92,460 gallons	= (350 m^3)
Length of Basin:	= 24.5 ft	= (7.5 m.)
Width of Basin:	= 35.0 ft	= (10.7 m)

WATER LEVEL CORRECTION VOLUME DETERMINATION

The water correction tank volume has been determined based on the required level drop in the AquaNereda reactors. The water from this tank will be pumped back to the head of the plant.

WATER LEVEL CORRECTION EQUIPMENT CRITERIA

Max. Capacity per Pump:	= 1,232.8 gpm	= 280.0 m3/hr
Number of Pumps:	= 2 operating	
Avg. Power Required:	= 240.4 kW-hr/day	

Sludge Buffer - Design Summary

Design#: 169144

Project: ***MANATEE COUNTY SWWRF FL***

Option: ***Preliminary Design Phase 2***

Designed by Thea Davis on Thursday, October 6, 2022

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

SLUDGE BUFFER DESIGN VALUES

No./Basins Geometry:	= 2 Rectangular Basin(s)	
Minimum Level:	= 1.0 ft	= (0.3 m)
Max. Level:	= 15.4 ft	= (4.7 m)
Max. Basin Volume:	= 141,386 gallons	= (535.0 m³)
Length of Basin:	= 31.0 ft	= (9.5 m)
Width of Basin:	= 39.5 ft	= (12.0 m)

SLUDGE BUFFER VOLUME DETERMINATION

The sludge buffer volume has been determined based on the sludge production and the concentration of sludge from the AquaNereda reactors. The Sludge from this basin will be pumped to the sludge handling system, and the supernatant back to the head of the plant.

SLUDGE BUFFER EQUIPMENT CRITERIA

Max. Sludge Flow Rate Required:	= 401 gpm	= (91 m³/hr)
Max. Supernatant Flow Rate Required:	= 1,603 gpm	= (364 m³/hr)
Average Power Consumption:	= 222 kWh/day (at 83% design load)	

AquaNereda

Influent Distribution System

2 Influent Distribution Assembly(ies) consisting of:

- Influent distribution system consisting of HDPE and PVC pipe with supports.

Effluent Weir Assembly

2 Effluent Weir Assembly(ies) consisting of:

- Concrete main effluent channel(s) provided by others.
- Stainless steel weir assembliy(ies) with supports.
- Stainless steel main channel(s).

Sludge Removal System

2 Solids Waste System(s) consisting of:

- HDPE or Stainless steel solids waste system(s).
- Pressure transmitter(s).

2 Sludge Decant/WLC Valve Set(s) consisting of:

- Each reactor includes two (2) of the following automatic control valves and two (2) of the following manual throttling valves:
- 30 inch electrically operated butterfly valve(s).
- 30 inch diameter Miliken manual plug valve(s).

2 Air Valve Set(s) consisting of:

- Each reactor includes two (2) of the following automatic valves and one (1) of the following manual valves:
- 4 inch manual butterfly valve(s).
- 4 inch electrically operated butterfly valve(s) with actuator.

Fixed Fine Bubble Diffusers

2 Fixed Fine Bubble Diffuser Assembly(ies) consisting of:

- 304 SS, 12 Ga. drop pipe(s).
- PVC, Sch 40 Manifold(s) with connection to drop pipe.
- PVC, Air distributor(s) with connection to the manifold and required PVC pipe joint connections.
- 304 Stainless steel piping supports with vertical supports, clamps, adjusting mechanism and anchor bolts.
- Fine bubble diffuser assemblies.

Positive Displacement Blowers

2 Positive Displacement Blower Package(s), with each package consisting of:

- Aerzen 300HP Rotary Positive Displacement Blower(s).
- 12" manual butterfly valve(s).

Level Sensor Assemblies

2 Pressure Transducer Assembly(ies) each consisting of:

- Pressure transducer(s).
- Mounting bracket weldment(s).
- Transducer mounting pipe weldment(s).

2 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).

- Stainless steel anchors.

Instrumentation

1 Process Control System will be provided as follows:

Instrumentation including sensors and/or analyzers along with mounting assemblies shall be provided to measure the following for the AquaNereda basin(s):
- Dissolved Oxygen
- pH
- ORP
- TSS
- Nitrate
- Ammonium

Instrumentation including sensors and/or analyzers along with mounting assemblies shall be provided to measure the following for the Sludge Buffer basin(s):
- TSS
- Hach Filtrax sampling system. Sampler includes stainless steel brackets and guiderail system.

AquaNereda: Water Level Correction Tank

Transfer Pumps/Valves

3 Submersible pump assembly(ies) consisting of the following items:

- 10 HP Submersible Pump(s) with painted cast iron pump housing, discharge elbow, and multi-conductor electrical cable.
- 6" Manual plug valve(s).
- 6 inch diameter swing check valve.
- Upper guide bar bracket(s).
- 304 stainless steel guide bar(s).
- 304 stainless steel intermediate support(s).

Level Sensor Assemblies

1 Sensor installation(s) consisting of:

- Pressure transducer(s).
- Stainless steel sensor guide rail weldment(s).
- PVC sensor mounting pipe(s).
- Top support(s).

1 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

AquaNereda: Sludge Buffer

Transfer Pumps/Valves

1 External Pump Assembly(ies) consisting of the following items:

- 25HP Pump assembly(ies).
- 6" Manual plug valve(s).

1 Sludge Valve(s) consisting of the following items:

- 8 inch diameter Milliken 601 electrically operated eccentric plug valve(s) with 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, EPDM coated ductile iron plug, assembled and tested with an Auma, 115 VAC, 60 hertz, single phase open/close service electric actuator. Valve actuator includes compartment heater.

1 Supernatant Valve(s) consisting of the following items:

- 12 inch diameter Milliken 601 electrically operated eccentric plug valve(s) with 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, EPDM coated ductile iron plug, assembled and tested with an Auma, 115 VAC, 60 hertz, single phase open/close service electric actuator. Valve actuator includes compartment heater.

2 Sludge Buffer Inlet Valve(s) consisting of:

- 30 inch electrically operated butterfly valve(s).

<u>Sludge Removal System</u>

1 Solids Removal Assembly(ies) consisting of:

- Solids removal assembly(ies) consisting of PVC and/or HDPE pipe with supports.

<u>Level Sensor Assemblies</u>

1 Pressure Transducer Assembly(ies) each consisting of:

- Pressure transducer(s).
- Mounting bracket weldment(s).
- Transducer mounting pipe weldment(s).

1 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Design Calculations

Manatee County SWWRF FL
Design # 169144
Option: Preliminary Design

AquaNereda®
Aerobic Granular Sludge System

October 6, 2022
Designed by Thea Davis

6306 N. Alpine Rd. Loves Park, IL 61111
(815) 654-2501 www.aqua-aerobic.com

DESIGN INFLUENT CONDITIONS

Avg. Design Flow	= 25.2 MG/Day	= 95392 m3/Day
Max. Design Flow	= 34.2 MG/Day	= 129461 m3/Day

		Conc. mg/l	Mass lbs./Day	KG/Day
Bio/Chemical Oxygen Demand:	BOD5	141.3	29715.9	13478.9
Total Suspended Solids:	TSS	174.9	36782.2	16684.1
Total Kjeldahl Nitrogen:	TKN	29.06	6111.4	2772.1
Phosphorus:	Total-P	8	1682.4315	763.1

SITE CONDITIONS

	Maximum		Minimum		Design	
Ambient Air Temperatures:	105.08 F	40.6 C	50 F	10 C	105.08 F	40.6 C
Influent Waste Temperatures:	77 F	25 C	68 F	20 C	68 F	20 C
Elevation (Mean Sea Level):	66 ft	20.1 m				

EFFLUENT OBJECTIVES

		Conc. mg/l	Mass lbs./Day	KG/Day
Bio/Chemical Oxygen Demand:	BOD5	20	4203.4	1906.3
Total Suspended Solids:	TSS	5	1050.8	476.6
Total Nitrogen	TN	10	2101.7	953.1

EFFLUENT ANTICIPATED

		Conc. mg/l	Mass lbs./Day	KG/Day
Bio/Chemical Oxygen Demand:	BOD5	20	4203.4	1906.3
Total Suspended Solids:	TSS	5	1050.8	476.6
Total Nitrogen:	TN	10	2101.7	953.1

Anticipated effluent is after filtration.

BIOREACTOR OXYGEN REQUIREMENT

Oxygen Requirement

1. **Oxygen Utilization Rates for Synthesis, Oxidation & Nitrification**

   Based upon a kinetic evaluation of the influent data with respect to the proposed design considerations, the estimated oxygen uptake rate (OUR) at average conditions is 48.6 mg/l/Hour.

   The process oxygen required is:

   OUR lbs./hour = OUR mg/l/hour x Vol/Basin x 8.34 = 1058.8 lbs. O2/Hour/Basin = (480.2 KG/Hour/Basin)

2. **Oxygen Required For Organic Reduction (Rb)**

   The aeration system shall be designed to provide 1.25 lbs. O2 for each lb. BOD5, as influent to the system. This oxygen provision shall account for the oxygen utilization for synthesis, as well as endogenous respiration.

   Rb = lbs. O2/lb. BOD5 x lbs. BOD5 Applied/Day = 37144.9 lbs. O2/Day = (16845.8 KG/Day)

3. **Oxygen Required For Nitrification (Rn)**

   Additional oxygen may be necessary for Nitrification of TKN to NO3-N. While an effluent requirement may or may not exist, it may be difficult to prevent Nitrification from exerting an oxygen demand (when nitrogen is present in the influent).

   Nitrification requires 4.6 lbs. O2 to oxidize each lb. of TKN to NO3-N.

   Rn = lbs. O2/lb. TKN x lbs. TKN Applied/Day = 28112.6 lbs. O2/Day = (12749.5 KG/Day)

4. **Carbon Stabilized via Denitrification (Rd)**

   When complete mixing occurs in the absence of aeration and the presence of organic substrate (and NO3-N), denitrification of NO3-N to N2 (gas) can occur. Denitrification makes 2.86 lbs. O2 available from each lb. NO3-N that is converted.

   Rd =lbs. NO3-N converted/Day x lbs. O2/lb. NO3-N converted/Day = 0 lbs O2/Day = (0 KG/Day)

5. **Total Oxygen Requirement (ORt)**
   The total oxygen demand under process (field) conditions with a peaking factor of 1.17 is (refer to notes for explanation):

   ORt = (Rb + Rn – Rd) x Peaking Factor = 76279.5 lbs. O2/Day (total) = (34593.9 KG/Day)

6. **Hourly Oxygen Requirement (ORh)**
   Based on 1.54 hours of aeration per cycle, 6.55 Cycles/Day/Basin, and 4 Basin(s), the hourly ORh is:

   ORh = 1891.9 lbs. O2/Hour/Basin = (858 KG/Hour/Basin)

7. **Actual Aeration Time Required To Meet Average Demand (At)**
   The aeration system has been designed to meet the design maximum oxygen requirement in 1.54 Hours/Cycle/Basin. Since average conditions will not require as much oxygen, the actual aeration time shall be adjusted to generate a power draw reflective of average conditions. The aeration time required at average conditions is:

   At = OURh/ORh*Aerobic Hours/Cycle = 0.86 Hours/Basin/Cycle

Process Wastewater Conditions - FIXED FINE BUBBLE DIFFUSERS

1. **Field Oxygen Transfer Factor (FTF)**
While the Oxygen Requirement quantifies the necessary oxygen to satisfy the biochemical reactions, the process water possesses inherent characteristics that typically inhibit oxygen transfer, as it compares to tap (clean) water. The FTF coefficient adjusts the oxygen transfer requirements in Field (dirty) conditions to Standard (clean) water conditions as follows:

FTF = Alpha x Theta^(T-20) x [(Beta x Csm) – Cr]/Cstm = 0.611

Where:
Alpha = Ratio of mass transfer rate of O2 in process water to clean water = 0.7
Beta = Ratio of saturation of O2 in process water to clean water = 0.95
Theta = Temperature correction factor for O2 transfer = 1.024
T = Design Reactor Temperature = 25 C

Cstm = Saturation DO at Mid-Depth and Standard Conditions = 11.8 mg/l

Csm = Cstm corrected for site Elevation and Temperature = 10.7 mg/l
Cr = Residual Dissolved Oxygen concentration = 1.03 mg/l

AERATION SYSTEM

Standard Conditions

1. **Standard Oxygen Requirement (SORh)**
The oxygen transferred at Standard conditions necessary to satisfy the required process oxygen demand at Field conditions is:

SORh = ORh / FTF = 3098.7 lbs. O2/Hour/Basin = (1405.3 KG/Hour/Basin)

2. **Standard Cubic Feet of Air per Minute (SCFM)**
The ability to transfer oxygen into the water under standardized conditions is:

SCFM = (SOR lbs./Hour/Basin)/(60 x 0.0175 x SOTE/FT x Dsub) = 8618 SCFM = (244.1 CMM)

Where:
0.0175 = lbs. O2 per cubic foot of air at standard conditions
SOTE/FT = Standard Oxygen Transfer Efficiency per foot submergence = 1.67%/FT = (5.48%/M)
Dsub= Average Diffuser Submergence = 20.5 FT = (6.3 M)

Blower Inlet Conditions

1. **Actual Inlet Pressure (Pa, due to elevation, and inlet filter/silencer/piping losses)**
Note: An assumed inlet loss due to blower fittings/piping of 0.25 PSIG has been assumed.

Pa = 14.696 – (Elevation_FT/2116.3) – 0.25 = 14.66 P.S.I.A. = (101.14 KPA)

2. **Blower Inlet Air Temperature in Degrees Rankine**
Ta = Ambient Air Temp (Deg F) + 460 = 565.08 Degrees R = (313.9 K)

3. **Inlet Cubic Feet of Air per Minute (ICFM)**
From the perfect gas law, the universal gas constant (MR) can relate standard conditions to inlet conditions, as:

ICFM = SCFM x (14.696 x Ta)/(Pa x 528) = 9242.9 ICFM/Basin = (261.8 CMM/Basin)

Blower Discharge Conditions

1. Discharge Pressure (Pd)

The discharge pressure includes the static pressure above the diffusers and dynamic losses from the blower discharge, through the diffusers expressed by:

Pd = (0.4333 x Diffuser Submergence, ft) + System Losses, PSIG

Where the assumed system losses account for 0.20 PSIG blower discharge losses, 0.50 PSIG piping losses from blower to diffuser and 1.30 PSIG diffuser losses.

Discharge Pressure (Pda) = 10.88 PSIG = (75 KPA)

Average Blower Power Estimate

1. Estimated Average Power Draw (BHP)

The following is a general equation that estimates the power draw of the blower at the average oxygen demand, and average pressure. While the actual blower selection shall be made from manufacturer supplied curves, programs or recommendations at maximum conditions, this equation shall be used to estimate the annual average aeration power. Unless stated otherwise, the blower efficiency (e) of 0.70 shall be used (typical range 0.60 to 0.70).

BHP = 0.227 x ICFM x [((Pa + Pda)/Pa)^0.283 – 1]/e = 509.9 BHP** = (380.3 KW)

**Note: Power draw may differ from actual BHP installed as actual blowers are designed based on providing oxygen on an applied basis.

2. Estimated Daily Power Required for Blowers (Pwa)

Pwa = (BHP x 0.7457 x At x Ncdb x Nb) = 8580.5 KW-Hours/Day at Max Month Loading Conditions
Estimated power at annual average loading conditions = 7368.9 KW-Hours/Day

Blower Selection

1. Blower Recommendation

The actual blower and motor sizing must consider inlet conditions under operating temperature and pressure extremes. Motor size, for example, must be selected to handle inlet air at maximum density which occurs at lowest operating temperatures. Blower size must be selected to deliver the required air volume at minimum density (maximum operation temperature) throughout the range of pressures. The following has been recommended to meet the design extremes:

Header Configuration:	= Common Header	
Number of Total Blower Operating:	= 6	
Number Of Standby Units:	= 1	
Total Number Of Installed Units:	= 7	
Motor Size of Each Blower:	= 300 HP	= 223.7 kW
Airflow Capacity of Each Blower:	= 3619 SCFM	= 102.4 CMM
Maximum Design Discharge Pressure:	= 10.9 PSIG	= 75 KPA

20-YEAR O&M ESTIMATE

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

MANATEE COUNTY SWWRF FL

Design#: 169144

Option: Preliminary Design Phase 2

Designed By Thea Davis on Thursday, October 6, 2022

Prepared By Thea Davis on Monday, October 10, 2022

O&M NOTES

* This is based upon operation at 100% of design conditions.

** The values listed are for estimating purposes only. The actual amount of operator attention provided will be dependent upon local requirements and the size of the staff available for testing.

All estimates are based upon equipment maintenance and operation in accordance with the O & M instructions provided by Aqua-Aerobic Systems. They are based on typical AquaNereda installations with a normal preventative maintenance schedule for the equipment. The actual maintenance man hours required for each project will vary depending upon site and climate conditions, which may alter the frequency of the maintenance schedule.

I. EQUIPMENT MAINTENANCE AND REPLACEMENT ESTIMATE

Qty	Unit	Service Required	Replacement Interval (Years)	Material Cost	20-Year Total
	Water Level Correction Tank				
3	Transfer Pump	Repair Kit	5	$567	$6,804
	Aerobic Granular Sludge Reactor				
4	D.O. Sensors	Replace Sensor Head	2	$224	$8,960
4	TSS Sensor	Replace Wiper (if available)	0.5	$16	$2,560
4	TSS Sensor	Seal Kit	2	$700	$28,000
4	pH Sensor	Replace Salt Bridge	1	$84	$6,720
4	ORP Sensor	Replace Salt Bridge	1	$84	$6,720
4	Nitrate Sensor	Seal Kit	2	$700	$28,000
4	Ammonium Analyzer	Reagent	0.25	$50	$16,000
8,960	FFB Disc Diff. Membranes	100% Diffuser Membrane Replacement	7	$5	$89,600
	Sludge Buffer				
2	Transfer Pump	Repair Kit	5	$2,068	$16,544
	Controls				
1	Controller	Replace Relays, Switches, Fuses	1	$50	$1,000
1	Controller	Replace Microprocessor Battery	3	$26	$156

INTERVAL TOTALS:

1-Year	2-Year	3-Year	5-Year	7-Year
$1,650	$6,496	$26	$5,837	$44,800

20-Year Estimated Total: $211,064

II. LABOR REQUIREMENTS ESTIMATE

Estimated General Operation & Maintenance **

14.0 = Man Hours/week for Process Testing

8.0 = Man Hours/week for General Plant Cleanup and Routine Maintenance

III. POWER CONSUMPTION ESTIMATE

Power Costs of All Equipment as Proposed *

Water Level Correction Tank	240	(kWh/day)
Aerobic Granular Sludge Reactor	7,369	(kWh/day)
Sludge Buffer	222	(kWh/day)
Total:	7,831	(kWh/day)
Estimated $/kWh:	$0.08	
Total Annual Power Cost:	$228,665	

20-Year Estimated Power Cost: $4,573,300

EXHIBIT 4, MASTER PLAN UPDATE

NOTE - This attachment is uploaded as a separate documents on the Procurement page of the County website with the solicitation document and available for download.

EXHIBIT 5, CAPITAL IMPROVEMENT PLAN SHEETS

FY2024-FY2028

Category: Wastewater **Subcategory:** Wastewater Treatment
Project Title: Southwest Water Reclamation Facility - Second Drain Station
Department: Public Works Projects
Project Mgr: Jeff Streitmatter
Infra.Sales Tax:
Project #: WW02031 **Status:** Existing

Comprehensive Plan Information

CIE Project: **N** Plan Reference:
LOS/Concurrency: **N** Project Need: Deficiency

Project Location

District 4 5101 65th Street West, Bradenton

Description and Scope

Design and construct a new plant drain station and associated piping. Near the existing station with interconnection between the old and new station. Replace/upsize piping from the drain stations to the headworks and provide for energy dissipation of flow emanating from the filter backwash. Project includes all necessary electrical instrument and control work.

Rationale

This will add reliability of Southwest Water Reclamation Facility (SWWRF) drain station function and decrease the probability of sanitary sewer overflows during storm events. The drain station piping to the headworks needs replacement for age and capacity. Filter backwash into the existing drain station causes station wear.

Schedule of Activities

Activity	Start	End	Amount
Design:	10/25	09/26	294,000
Land:			
Construction:	10/26	03/28	1,961,000
Equipment:			
Project Mgt.:	10/25	03/28	181,000
Total Budgetary Cost Estimate			2,436,000

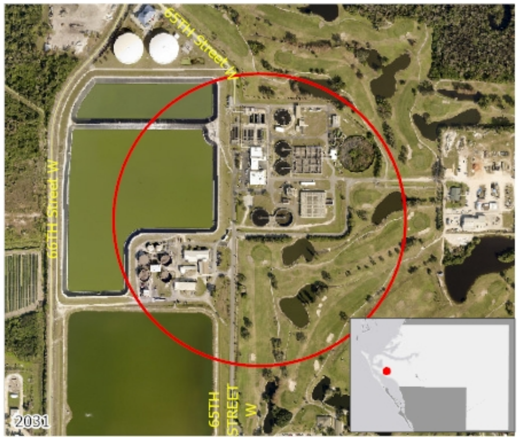
Annual Operating Budget Impacts

Category	Fiscal Year	Amount
Personal:		
Non-Personal:		
Operating Capital:		
Operating Total:		

Programmed Funding

Expended to Date	Appropriated To Date	FY2024	FY2025	FY2026	FY2027	FY2028	Future
				318,000	2,118,000		

Project Map



Funding Strategy

Utility Rates

Means of Financing

Funding Source	Amount
Debt Proceeds - Utility Rates	2,118,000
Rates	318,000
Total Funding:	2,436,000

MANATEE COUNTY GOVERNMENT
Capital Improvement Plan

FY2024-FY2028

Category: Wastewater **Subcategory:** Wastewater Treatment
Project Title: SWWRF Equalization System Rehabilitation & Cover Addition
Department: Public Works Projects
Project Mgr: Anthony Benitez
Infra.Sales Tax:
Project #: 6071781 **Status:** Existing

Comprehensive Plan Information

CIE Project: **N** Plan Reference:
LOS/Concurrency: **N** Project Need: Maintenance

Project Location

District 4 5101 65th St W, Bradenton

Description and Scope

The project will include rehabilitation of the existing EQ tank. The rehabilitation will consist of performing structural improvements and a new interior coating system, replacing the pump recirculation system, and installing a new floating cover. It is anticipated that the air compressors for the new recirculation system can be located within the existing DAF Blower Building. Modifications to DAF building to house the new air compressors. Replace the existing return pump station with a new station including a permanent hoist for removing pumps. Supervisory Controls and Data Acquisition (SCADA) programming should also be included.

Rationale

The Flow Equalization (FEQ) tank receives and stores raw influent during the day and returns it to the plant at night to equalize the incoming flow. The FEQ tank cover is near the end of its life span, and it has proven difficult to keep the top of the cover clear of vegetation; settling solids are also an issue. A mixing system is required to keep solids in suspension, making it easier to pump them back to the plant. The existing FEQ return pump station has been in constant use for over 25 years and needs numerous upgrades or replacements. Also, the wet well for the pump station was modified for prior construction causing one of the pumps to be blocked from retrieval or repair. Power should be supplied per the electrical master plan to facilitate installation reliability and minimize possible rework.

Schedule of Activities

Activity	Start	End	Amount
Design:	10/17	06/22	649,506
Land:			
Construction:	07/23	12/24	7,900,000
Equipment:			
Project Mgt.:	10/17	12/24	675,994
Total Budgetary Cost Estimate			9,225,500

Annual Operating Budget Impacts

Category	Fiscal Year	Amount
Personal:		
Non-Personal:		
Operating Capital:		
Operating Total:		

Project Map

Funding Strategy

Debt Proceeds

Means of Financing

Funding Source	Amount
All Prior Funding	9,225,500
Debt Proceeds - Utility Rates	0
Total Funding:	9,225,500

Programmed Funding

Expended to Date	Appropriated To Date	FY2024	FY2025	FY2026	FY2027	FY2028	Future
616,497	9,225,500						

EXHIBIT 6, SAMPLE AGREEMENT

CONSULTANT COMPETITIVE NEGOTIATION

ACT (CCNA)

AGREEMENT No. [ENTER NUMBER]

PROFESSIONAL SERVICES [ENTER TITLE]

between

MANATEE COUNTY (COUNTY)

and

[ENTER CONSULTANT NAME]

(CONSULTANT)

AGREEMENT FOR [INSERT TYPE OF SERVICE]

THIS AGREEMENT is made and entered into as of this _____ day of ___________, 20____ ("Effective Date"), by and between **MANATEE COUNTY**, a political subdivision of the State of Florida, (**"COUNTY")**, with offices located at 1112 Manatee Avenue West, Bradenton, Florida 34205, and **[INSERT COMPANY NAME]**, a [<enter the state of incorproation> and identify if it is a Company, Corporation, Limited Liability Company, etc.], (**"CONSULTANT")** with offices located at [Insert address], and duly authorized to conduct business in the State of Florida. COUNTY and CONSULTANT are collectively referred to as the "Parties" and individually as "Party."

WHEREAS, CONSULTANT engages in the business of providing [INSERT TYPE OF SERVICE]; and

WHEREAS, COUNTY has determined that it is necessary, expedient and in the best interest of COUNTY to retain CONSULTANT to render the professional services described in this Agreement; and

WHEREAS, this Agreement is a result of CONSULTANT'S submission of a proposal in response to Request for Qualifications No. [INSERT RFP NUMBER] and COUNTY thereafter conducted a competitive selection process in accordance with the Manatee County Procurement Code and Florida Statute § 287.055.

NOW, THEREFORE, the COUNTY and CONSULTANT, in consideration of the mutual covenants, promises, and representations contained herein, the sufficiency of which is hereby acknowledged, the Parties hereto agree as follows:

ARTICLE 1. SCOPE OF SERVICES

CONSULTANT shall provide professional services as described in **Exhibit A**, Scope of Services ("Services"). "Task" as used in this Agreement, refers to particular categories/groupings of services specified in **Exhibit A.**

ARTICLE 2. EXHIBITS INCORPORATED

This Agreement consists of a primary contract and <number> exhibits, which are as follows:

Exhibit A Scope of Services
Exhibit B Fee Rate Schedule
Exhibit C Affidavit of No Conflict
Exhibit D Insurance and Bond Requirements

These Exhibits are attached hereto and are incorporated into this Agreement. In the event of a conflict between the terms and conditions provided in the Articles of this Agreement and any Exhibit, the provisions contained within these Articles shall prevail unless the Exhibit specifically states that it shall prevail.

ARTICLE 3. AGREEMENT TERM

A. This Agreement shall commence on the Effective Date and remain in force until all Work issued during the effective period of this Agreement is completed, unless terminated by COUNTY pursuant to Article 10, but not to exceed [insert number of years] years.

ARTICLE 4. COMPENSATION

A. Compensation payable to CONSULTANT for the Services and expenditures incurred in providing the Services specified in **Exhibit A** shall be as stated in **Exhibit B**.

B. Compensation to CONSULTANT shall be based on actual hours performed times fee rate of the individual performing the work, plus reimbursable expenses up to the maximum compensation authorized in **Exhibit B**

C. The fee rates specified in **Exhibit B** shall be the total compensation for Services and shall contain all costs to include salaries, office operation, transportation, equipment, overhead, general and administrative, incidental expenses, fringe benefits and operating margin.

ARTICLE 5. INVOICES AND TIME OF PAYMENT

A. Subject to the provisions of this Agreement, COUNTY shall pay CONSULTANT for the Services at a rate of compensation according to the deliverable payment schedule stated in **Exhibit B**.

B. COUNTY shall approve of all invoices prior to payment.

C. When CONSULTANT seeks payment for any deliverable or reimbursable expense, it shall provide COUNTY with an invoice that includes a description of authorized Services performed and/or expense incurred, and the total unpaid compensation CONSULTANT represents as being due and owing as of the invoice date. All invoices shall include the number which COUNTY shall assign to this Agreement and will be provided to CONSULTANT in writing, upon execution of this Agreement.

D. If any Task requires units of deliverables, such units must be received and accepted in writing by the COUNTY prior to payment.

E. COUNTY shall have forty-five (45) days from the receipt of an invoice seeking payment of fees or costs to either pay the invoice, or notify CONSULTANT that the deliverable, or any part thereof, is unacceptable, and/or that any asserted expense is not reimbursable.

F. COUNTY shall have the right to retain from any payment due CONSULTANT under this Agreement, an amount sufficient to satisfy any amount of liquidated damages due and owing to COUNTY by CONSULTANT on any other Agreement between CONSULTANT and COUNTY.

G. All costs of providing the Services shall be the responsibility of CONSULTANT, with the exception of reimbursement by COUNTY for costs deemed reimbursable in **Exhibit B**.

H. Any dispute between COUNTY and CONSULTANT with regard to the Services or CONSULTANT'S invoice shall be resolved pursuant to the dispute resolution procedures established by Manatee County Procurement Code and Article 12 of this Agreement.

ARTICLE 6. RESPONSIBILITIES OF CONSULTANT

A. CONSULTANT shall appoint an Agent with respect to the Services. CONSULTANT'S Agent shall have the authority to make representations on behalf of CONSULTANT, receive information, and interpret and define the needs of CONSULTANT and make decisions pertinent to Services covered by this Agreement. CONSULTANT'S Agent shall have the right to designate other employees of CONSULTANT to serve in his or her absence. CONSULTANT reserves the right to designate a different agent, provided that COUNTY is given advance written notice thereof.

B. CONSULTANT shall perform the Services in accordance with the terms and conditions of this Agreement.

C. CONSULTANT shall ensure that all employees assigned to render the Services are duly qualified, registered, licensed or certified to provide the Services required.

D. CONSULTANT shall be responsible for collecting all existing data required for the successful completion of each Task.

E. CONSULTANT shall not engage in any obligations, undertakings, contracts or professional obligations that create a conflict of interest, or even an appearance of a conflict of interest, with respect to the Services. CONSULTANT attests to this via an Affidavit of No Conflict, **Exhibit C**.

F. CONSULTANT shall be entitled to rely upon information provided from COUNTY. Information includes, but is not limited to, additional services, consultations, investigations, and reports necessary for the execution of CONSULTANT'S work under this Agreement. CONSULTANT shall be fully responsible for verifying, to the extent practicable, documents and information provided by COUNTY and identifying any obvious deficiencies concerning the documents and information provided. CONSULTANT shall notify COUNTY of any errors or deficiencies noted in such information provided and assist, to the extent practicable, COUNTY in the identification and resolution of same. CONSULTANT agrees to incorporate the provisions of this paragraph in any subcontract into which it might enter with reference to the Services.

G. CONSULTANT shall be responsible for the professional quality, technical accuracy, and the coordination of all designs, drawings, specifications, and other services furnished by CONSULTANT under this Agreement. CONSULTANT shall, without additional compensation, correct or revise any errors or deficiencies in its designs, drawings, specifications, and other services.

H. CONSULTANT shall maintain an adequate and competent staff of professionally qualified persons during the term of this Agreement for the purpose of rendering the required services hereunder. CONSULTANT shall not sublet, assign or transfer any services under this Agreement without prior written consent of COUNTY.

I. COUNTY may require in writing that CONSULTANT remove from the project any of CONSULTANT'S personnel that COUNTY determines to be incompetent, careless or otherwise objectionable. No claims for an increase in compensation or agreement term based on COUNTY'S use of this provision will be valid.

ARTICLE 7. RESPONSIBILITIES OF COUNTY

A. COUNTY shall, through its County Administrator, appoint an individual to serve as County Representative. The County Representative shall have the authority to transmit instructions, receive information, interpret and define the policy of COUNTY and make decisions pertinent to services covered by this Agreement. COUNTY reserves the right to designate a different County Representative, provided that CONSULTANT is given written notice thereof.

B. COUNTY shall make available, at no cost to CONSULTANT, information relative to the project that is useful in the performance of the Services.

C. COUNTY shall provide prompt notice to CONSULTANT whenever COUNTY observes or otherwise becomes aware of any defect in the performance of the Services under this Agreement.

D. COUNTY shall give careful and reasonable consideration to the findings and recommendations of CONSULTANT and shall respond and issue notices to proceed in a timely manner.

E. COUNTY personnel shall be available on a time-permitting basis, where required and necessary to assist CONSULTANT. The availability and necessity of said personnel to assist CONSULTANT shall be at the discretion of COUNTY.

F. COUNTY shall perform the responsibilities enumerated in this Article at no cost to CONSULTANT.

ARTICLE 8. COUNTY'S PROJECT MANAGER

The Project Manager shall be appointed to represent COUNTY in all technical matters pertaining to the Services. The Project Manager shall have the following responsibilities:

A. The examination of all reports, sketches, drawings, estimates, proposals, and any other documents provided by CONSULTANT.

B. Providing CONSULTANT written decisions of COUNTY'S approval or disapproval of these documents within a reasonable time.

C. Transmission of instructions, receipt of information, and interpretation of COUNTY policies and decisions with respect to design, materials and other matters pertinent to the services provided under this Agreement.

D. Provide CONSULTANT with prompt written notice whenever COUNTY observes, or otherwise becomes aware of, any defects or changes necessary in a project.

ARTICLE 9. COUNTY OWNERSHIP OF WORK PRODUCT

The Parties agree that COUNTY shall have exclusive ownership of all reports, documents, designs, ideas, materials, reports, concepts, plans, creative works, and other work product developed for or provided to COUNTY in connection with this Agreement, and all patent rights, copyrights, trade secret rights and other intellectual property rights relating thereto (collectively "the Intellectual Property"). CONSULTANT hereby assigns and transfers all rights in the Intellectual Property to COUNTY. CONSULTANT further agrees to execute and deliver such assignments and other documents as COUNTY may later require to perfect, maintain and enforce COUNTY'S rights as sole owner of the Intellectual property, including all rights under patent and copyright law.

ARTICLE 10. TERMINATION OF AGREEMENT

A. TERMINATION FOR CAUSE:

1. COUNTY shall have the right, by written notice to CONSULTANT, to terminate this Agreement, in whole or in part, for failure to substantially comply with the terms and conditions of this Agreement, to include:

    a. Failure to provide products or Services that comply with the specifications herein or that fail to meet COUNTY'S performance standards;

    b. Failure to deliver the supplies or perform the Services within the time specified; or

    c. Progress that is at a rate that disrupts the overall performance of this Agreement.

2. Prior to termination for default, COUNTY shall provide adequate written notice to CONSULTANT, affording CONSULTANT the opportunity to cure the deficiencies or to submit a specific plan to resolve the deficiencies within ten (10) days (or the period specified in the notice) after receipt of the notice. Failure to adequately cure the deficiency shall result in termination action.

3. Such termination may also result in suspension or debarment of CONSULTANT in accordance with Manatee County's Procurement Ordinance, Chapter 2-26. CONSULTANT shall be liable for any damage to COUNTY resulting from CONSULTANT'S default of the Agreement.

4. In the event of termination of this Agreement, CONSULTANT shall be liable for any damage to COUNTY resulting from CONSULTANT'S default of this Agreement. This liability includes any increased costs incurred by COUNTY in completing performance under this Agreement.

5. In the event of termination by COUNTY for any cause, CONSULTANT shall not have any right or claim against COUNTY for lost profits or compensation for lost opportunities. After a receipt of COUNTY'S Notice of Termination and except as otherwise directed by COUNTY, CONSULTANT shall:

   a. Stop work on the date and to the extent specified;
   b. Terminate and settle all orders and subcontracts relating to the performance of the terminated work;
   c. Transfer all work in process, completed work, and other materials related to the terminated work as directed by COUNTY; and
   d. Continue and complete all parts of that work that have not been terminated.

B. TERMINATION WITHOUT CAUSE:

COUNTY may terminate this Agreement, in whole or in part, without cause. COUNTY shall provide CONSULTANT a written "Notice of Intent to Terminate" thirty (30) days prior to the date of termination. If this Agreement is terminated by the COUNTY without cause, CONSULTANT shall be entitled to payment for all Services performed to the satisfaction of the COUNTY and all expenses incurred under this Agreement prior to termination, less any costs, expenses or damages due to the failure of the CONSULTANT to properly perform pursuant to this Agreement. CONSULTANT shall not be entitled to any other compensation, including anticipated profits on unperformed Services.

ARTICLE 11. TRANSITION SERVICES UPON TERMINATION

Upon termination or expiration of this Agreement, CONSULTANT shall cooperate with COUNTY to assist with the orderly transfer of the Services to COUNTY. Prior to termination or expiration of this Agreement, COUNTY may require CONSULTANT to perform and, if so required, CONSULTANT shall perform, certain transition services necessary to shift the services of CONSULTANT to another provider or to COUNTY itself as described below (the "Transition Services"). The Transition Services may include but shall not be limited to:

A. Working with COUNTY to jointly develop a mutually agreed upon Transition Services plan to facilitate the termination of the services;

B. Executing the Transition Services plan activities;

C. Answering questions regarding the Services on an as-needed basis; and

D. Providing such other reasonable services needed to effectuate an orderly transition to a new Service provider or to COUNTY.

ARTICLE 12. DISPUTE RESOLUTION

A. Disputes shall be resolved in accordance with the Manatee County Purchasing Code (Chapter 2-26 of the Manatee County Code of Ordinances). Any dispute resolution constituting a material change in this Agreement shall not be final until an amendment to this Agreement has been approved and executed by the COUNTY.

B. CONSULTANT agrees it must exhaust all dispute resolution procedures set forth in Manatee County’s Procurement Code prior to instituting any action in state or federal court or before any administrative agency or tribunal.

ARTICLE 13. COMPLIANCE WITH LAWS

All Services rendered or performed by CONSULTANT pursuant to the provisions of this Agreement shall be in compliance with all applicable local, state and federal laws and ordinances. CONSULTANT shall have and keep current at all times during the term of this Agreement all licenses and permits as required by law.

ARTICLE 14. NON-DISCRIMINATION

CONSULTANT shall not discriminate against any employee or applicant for employment because of race, color, sex, creed, national origin, disability or age, and will take affirmative action to ensure that all employees and applicants are afforded equal employment opportunities. Such action will be taken with reference to, but shall not be limited to, recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff or termination, rates of training or retraining (including apprenticeship and on-the-job training).

ARTICLE 15. MAINTENANCE OF RECORDS; AUDITS; LICENSES

A. CONSULTANT shall maintain records, accounts, property records, and personnel records in accordance with generally accepted accounting principles, as deemed necessary by COUNTY to assure proper accounting of funds and compliance with the provisions of this Agreement.

   CONSULTANT shall provide COUNTY all information, reports, records and documents required by this Agreement or by COUNTY ordinances, rules or procedures, or as needed by COUNTY to monitor and evaluate CONSULTANT’S performance. Such materials shall also be made available to COUNTY upon request for auditing purposes. Inspection or copying will occur during normal business hours, and as often as COUNTY may deem necessary. COUNTY shall have the right to obtain and inspect any audit pertaining to the performance of this Agreement or CONSULTANT made by any local, state or federal agency. To the extent such materials are in the possession of a third party, CONSULTANT must obtain them from that third party, or certify in writing to COUNTY why it was unable to do so. CONSULTANT shall retain all records and supporting documents related to this Agreement in accordance with all applicable laws, rules and regulations, and, at a minimum, retain all records and supporting documents related to this Agreement, except duplicate copies or drafts, for at least three (3) years after the termination date.

B. CONSULTANT shall obtain any licenses required to provide the Services and maintain full compliance with any licensure requirements. Copies of reports provided to or by any licensing or regulatory agency shall be forwarded to COUNTY within ten (10) days of receipt by CONSULTANT. CONSULTANT shall immediately notify COUNTY if the required licenses of any of its principles or agents working on this Agreement are terminated, suspended, revoked or are otherwise invalid and/or are no longer in good standing.

ARTICLE 16. PUBLIC RECORDS

Pursuant to Florida Statutes §119.0701, to the extent CONSULTANT is performing services on behalf of COUNTY, CONSULTANT shall:

A. Keep and maintain public records that would ordinarily be required by COUNTY to perform the service.

B. Upon request from COUNTY'S custodian of public records, provide COUNTY with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes, or as otherwise provided by law.

C. Ensure that public records that are exempt or confidential from public records disclosure requirements are not disclosed except as authorized by law for the duration of this Agreement and following completion of this Agreement if CONSULTANT does not transfer the records to COUNTY.

D. Upon completion of this Agreement, transfer, at no cost, to COUNTY all public records in possession of CONSULTANT or keep and maintain public records required by COUNTY to perform the service. If CONSULTANT transfers all public records to COUNTY upon completion of this Agreement, CONSULTANT shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If CONSULTANT keeps and maintains public records upon completion of this Agreement, CONSULTANT shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to COUNTY, upon request from COUNTY'S custodian of public records, in a format that is compatible with the information technology systems of COUNTY.

IF CONSULTANT HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO COUNTY'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS AGREEMENT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:

Phone: 941.742.5845
Email: lacy.pritchard@mymanatee.org

Mail or hand delivery:
Attn: Records Manager
1112 Manatee Avenue West
Bradenton, FL 34205

ARTICLE 17. INDEMNIFICATION

A. The CONSULTANT shall indemnify and hold harmless County, its officers, and employees from liabilities, damages, losses and costs, including but not limited to reasonable attorney's fees, to the extent caused by negligence, recklessness, or intentionally wrongful conduct of the CONSULTANT, its personnel, design professionals and other persons employed or utilized by the CONSULTANT in the performance of this Agreement. Such indemnification shall include the payment of all valid claims, losses, and judgments of any nature whatsoever in connection therewith and the payment of all related fees and costs. County reserves the right to defend itself.

B. CONSULTANT shall indemnify, defend, save and hold harmless the COUNTY, its officers, and employees all third-party claims, liabilities, loss, or cause of action that the Services constitutes an infringement of any third-party intellectual property right(s), unless such claim is based on COUNTY'S wrongful or illegitimate use of the Services. The foregoing states the entire liability of CONSULTANT and the sole and exclusive remedy for COUNTY with respect to any third-party claim of infringement or misappropriation of intellectual property rights. Such indemnification shall include, but not be limited to, the payment of all valid claims, losses, and judgments of any nature whatsoever in connection therewith and the payment of all related fees and costs, including attorneys' fees.

ARTICLE 18. NO WAIVER OF SOVEREIGN IMMUNITY

Nothing herein shall be interpreted as a waiver by COUNTY of its rights, including the limitations of the waiver of immunity as set forth in Florida Statutes § 768.28, or any other statutes or immunities. COUNTY expressly reserves these rights to the full extent allowed by law.

ARTICLE 19. INSURANCE

A. CONSULTANT shall, at its own cost and expense, acquire and maintain (and cause any subcontractors, representatives, or agents to acquire and maintain) insurance policies that comply with the Insurance Requirements, attached as **Exhibit D**, during the term of this Agreement, to include any renewal terms.

   Certificates of Insurance and copies of policies evidencing the insurance coverage specified in **Exhibit D** shall be filed with the Purchasing Official before the Effective Date of this Agreement. The required certificates shall identify the type of policy, policy number, date of expiration, amount of coverage, companies affording coverage, shall refer specifically to the title of this Agreement, and shall name Manatee County as an additional insured. No changes shall be made to the insurance coverage without prior written approval by COUNTY'S Risk Management Division.

B. Insurance shall remain in force for at least three (3) years after completion of the Services in the amounts and types of coverage as required by **Exhibit D**, including coverage for all Services completed under this Agreement.

C. If the initial insurance expires prior to the termination of this Agreement, renewal Certificates of Insurance and required copies of policies shall be furnished by CONSULTANT and delivered to the Purchasing Official thirty (30) days prior to the date of their expiration.

ARTICLE 20. SOLICITATION OF AGREEMENT

CONSULTANT warrants that it has not employed or retained any company or person other than a bona fide employee working solely for CONSULTANT to solicit or secure this Agreement, and that it has not paid or agreed to pay any company or person other than an employee working solely for CONSULTANT, any fee, commission, percentage, brokerage fee, gift, contingent fee, or any other consideration contingent upon or resulting from the award or making of this Agreement. For breach or violation of this warranty, COUNTY shall have the right to terminate this Agreement without liability, or at its discretion, to deduct from this Agreement price or consideration or otherwise recover the full amount of such fee, commission, percentage, brokerage fee, gifts, or contingent fee.

ARTICLE 21. ASSIGNMENT AND SUBCONTRACTING

CONSULTANT shall not assign or transfer any right or duty under this Agreement to any other party without the prior written consent of COUNTY. In the event CONSULTANT asserts it is necessary to utilize the services of third parties to perform any Service under this Agreement, CONSULTANT shall first obtain prior written approval of COUNTY.

Approval to utilize any third party shall not relieve CONSULTANT from any direct liability or responsibility to COUNTY pursuant to the provisions of this Agreement, or obligate COUNTY to make any payments other than payments due to CONSULTANT as outlined in this Agreement. All terms and conditions of this Agreement shall extend to and be binding on any approved purchaser, assignee, or other successor in interest.

Assignment, pledging, sale, transfer or encumbering of any interest or rights under this Agreement, to anyone other than the CONSULTANT, without the prior written consent of the COUNTY, shall be grounds for immediate termination of this Agreement.

ARTICLE 22. CERTIFICATION OF NON-PAYMENT OF COMMISSION OR GIFT

CONSULTANT warrants that it has not employed or retained any company or person other than a bona fide employee working solely for CONSULTANT to solicit or secure this Agreement, and that it has not paid or agreed to pay any company or person other than an employee working solely for CONSULTANT, any fee, commission, percentage, brokerage fee, gift, contingent fee, or any other consideration contingent upon or resulting from the award or making of this Agreement. For breach or violation of this warranty, COUNTY shall have the right to annul this Agreement, without liability or at its discretion to deduct from the agreement price consideration or otherwise recover the full amount of such fee, commission, percentage, brokerage fee, gifts, or contingent fee.

ARTICLE 23. KEY PERSONNEL

The following key personnel are hereby assigned to this Agreement by CONSULTANT:

Enter Name, Title

CONSULTANT shall not remove such key personnel from providing the Services; provided, however, that the removal of such personnel due to their incapacity, voluntary termination, or termination due to just cause will not constitute a violation of this Agreement. The COUNTY will require that, at a minimum, any proposed replacement have equal or greater qualifications and experience as the key personnel being replaced. CONSULTANT shall not make any personnel changes of the key personnel until written notice is made to and approved by the COUNTY.

ARTICLE 24. SUB-CONTRACTOR

If CONSULTANT receives written approval from the COUNTY to use the services of a sub-contractor(s), CONSULTANT shall utilize the sub-contractor fees specified in **Exhibit B**. CONSULTANT shall notify COUNTY of any replacements or additions to **Exhibit B** and receive prior written approval of COUNTY for replacements or additions before the use of the sub-contractor.

ARTICLE 25. PROFESSIONAL LIABILITY

To the fullest extent allowed by law, the individuals performing the Services shall be personally liable for negligent acts or omissions. To the fullest extent allowed by law, CONSULTANT shall likewise be liable for negligent acts or omissions in the performance of the Services.

ARTICLE 26. NOTICES

All notices, requests and authorizations provided for herein shall be in writing and shall be delivered by hand or mailed through the U.S. Mail, addressed as follows:

To COUNTY:	Manatee County Government Department Attn: Title Name Address City, State, Zip Phone: (941) Email:
To CONSULTANT:	Consultant Name Attn: Representative Name Address City, State, Zip Phone: ( ) Email:

ARTICLE 27. RELATIONSHIP OF PARTIES

The relationship of CONSULTANT to COUNTY shall be that of an independent contractor. Nothing herein contained shall be construed as vesting or delegating to CONSULTANT or any of the officers, employees, personnel, agents, or sub-consultants of CONSULTANT any rights, interest or status as an employee of COUNTY. COUNTY shall not be liable to any person, firm or corporation that is employed by Agreements or provides goods or services to CONSULTANT in connection with this Agreement or for debts or claims accruing to such parties. CONSULTANT shall promptly pay, discharge or take such action as may be necessary and reasonable to settle such debts or claims.

ARTICLE 28. NO CONFLICT

By accepting award of this Agreement, CONSULTANT, its directors, officers and employees, represents that it presently has no interest in and shall acquire no interest in any business or activity which would conflict in any manner with the performance of the Services.

ARTICLE 29. ETHICAL CONSIDERATIONS

CONSULTANT recognizes that in rendering the Services, CONSULTANT is working for the residents of Manatee County, Florida, subject to public observation, scrutiny and inquiry; and based upon said recognition CONSULTANT shall, in all of its relationships with COUNTY pursuant to this Agreement, conduct itself in accordance with all of the recognized applicable ethical standards set by any related national societies, and the reasonable traditions to perform the Services. CONSULTANT shall be truthful in its communications with COUNTY personnel regarding matters pertaining to this Agreement and the Services rendered to COUNTY.

ARTICLE 30. PUBLIC ENTITY CRIMES

CONSULTANT has been made aware of the Florida Public Entity Crimes Act, Florida Statutes § 287.133, specifically section 2(a), and COUNTY'S requirement that CONSULTANT comply with it in all respects prior to and during the term of this Agreement.

ARTICLE 31. TAXES

COUNTY is exempt from Federal Excise and State Sales Taxes (F.E.T. Exemption Certificate No. 59-78-0089K; FL Sales Tax Exemption Certificate No. 51-02-027548-53C). Therefore, CONSULTANT is prohibited from charging or imposing any sales or service taxes. Nothing herein shall affect CONSULTANT'S normal tax liability.

CONSULTANT shall be responsible for payment of federal, state, and local taxes which may be imposed upon CONSULTANT under applicable law to the extent that CONSULTANT is responsible for the payment of same under applicable law.

ARTICLE 32. FORCE MAJEURE

Neither Party shall be considered in default in performance of its obligations hereunder to the extent that performance of such obligations or any of them is delayed or prevented by Force Majeure.

Force Majeure shall include, but not be limited to, hostility, revolution, civil commotion, strike, epidemic, accident, fire, flood, wind, earthquake, hurricane, explosion, lack of or failure of transportation facilities, any law, proclamation, regulation, ordinance or other act of government, or any act of God or any cause whether of the same or different nature, existing or future; provided that the cause, whether or not enumerated in this Article, is beyond the control and without the fault or negligence of the Party seeking relief under this Article.

ARTICLE 33. GOVERNING LAW, JURISDICTION AND VENUE

This Agreement shall be governed by the laws of the State of Florida. Any action filed regarding this Agreement will be filed only in Manatee County, Florida, or if in Federal Court, the Middle District of Florida, Tampa Division.

ARTICLE 34. ATTORNEY FEES

In the event of any litigation arising under the terms of this Agreement, each Party shall be responsible for their own attorney's fees, including appellate fees, regardless of the outcome of the litigation.

ARTICLE 35. PATENT AND COPYRIGHT RESPONSIBILITY

Any material, design or supplied specified by CONSULTANT or supplied by CONSULTANT pursuant to this Agreement shall not knowingly infringe any patent or copyright, and CONSULTANT shall be solely responsible for securing any necessary licenses required for patented or copyrighted material utilized by CONSULTANT in the performance of the Services.

ARTICLE 36. AMENDMENTS

This Agreement and Exhibits referenced herein constitute the entire Agreement between the Parties with respect to subject matter and mutually agree that no verbal agreements, representations, warranties or other understandings affecting the same exist. No amendment hereof shall be effective until and unless reduced to writing and executed by the Parties. The Parties shall execute any additional documents as may be necessary to implement and carry out the intent of this Agreement.

ARTICLE 37. SEVERABILITY

It is understood and agreed by the Parties hereto that if any part, term, or provision of this Agreement is held to be illegal or in conflict with any law, the validity of the remaining portions or provisions shall not be affected, and the rights and obligations of the Parties shall be construed and enforced as if this Agreement did not contain the particular part, term or provision held to be invalid.

ARTICLE 38. LEGAL REFERENCES

All references to statutory sections or chapters shall be construed to include subsequent amendments to such provisions, and to refer to the successor provision of any such provision. References to “applicable law” and “general law” shall be construed to include provisions of local, state and federal law, whether established by legislative action, administrative rule or regulation, or judicial decision.

ARTICLE 39. HEADINGS, CONSTRUCTION

The Parties agree that they have each participated in the drafting of this Agreement and that the rules with respect to construing ambiguities against the drafter of a contract shall not apply in any action or litigation regarding this Agreement. All articles and descriptive headings of paragraphs of this Agreement are inserted for convenience only and shall not affect the construction or interpretation hereof.

ARTICLE 40. TIME

For purposes of computing any period of number of days hereunder for notices or performance of ten (10) days or less, Saturdays, Sundays and holidays shall be excluded, unless otherwise stated.

ARTICLE 41. E-VERIFY

The CONSULTANT, and any subcontractor thereof, shall register with and use the E-Verify system to verify the work authorization status of all new employees of the CONSULTANT or subcontractor. The CONSULTANT hereby represents and warrants that it has, and shall remain throughout the duration of this Agreement, registered with, and uses and shall continue to use, the E-Verify system. The CONSULTANT shall not enter into any contract with a subcontractor for services hereunder unless such subcontractor also has registered with and uses the E-Verify system. If the CONSULTANT enters into a contract with a subcontractor, the subcontractor shall provide the CONSULTANT with an affidavit stating that the subcontractor does not employ, contract with, or subcontract with an unauthorized alien. The CONSULTANT shall maintain a copy of such affidavit for the duration of this Agreement.

Pursuant to Section 488.095(5)(c)3, Florida Statutes, the COUNTY is authorized to terminate this Agreement if it has a good faith belief that the CONSULTANT has knowingly violated Section 448.09(1), Florida Statutes, regarding the employment of someone not authorized to work by the immigration laws of the United States, the U.S. Attorney General, or the Secretary of the Department of Homeland Security. Such termination action is not considered a breach of contract.

ARTICLE 42. FUNDS FOR IDENTIFICATION DOCUMENTS

No funds provided by the COUNTY pursuant to this Agreement shall be used for the purpose of issuing an identification card or document to an individual who does not provide proof of lawful presence in the United States.

ARTICLE 43. AUTHORITY TO EXECUTE

Each of the Parties hereto covenants to the other Party that it has lawful authority to enter into this Agreement.

[Remainder of page intentionally left blank]

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be duly executed effective as of the date set forth above.

CONSULTANT NAME

By: ______________________________

Printed Name: _____________________

Title: ____________________________

Date: ____________________________

MANATEE COUNTY, a political subdivision of the State of Florida

____

INSERT PURCHASING OFFICIAL
Purchasing Official

Date: ____________________________

EXHIBIT A, SCOPE OF SERVICES

EXHIBIT B, FEE RATE SCHEDULE

1. FEES

Fees for the Services detailed in this Agreement shall be as set forth in this **Exhibit B**.

2. REIMBURSEABLE EXPENSES

[Remainder of page intentionally left blank]

EXHIBIT C, AFFIDAVIT OF NO CONFLICT

STATE OF ____________________
COUNTY OF __________________

BEFORE ME, the undersigned authority, this day personally appeared [INSERT NAME] ______ ______________________________, as [INSERT TITLE] _______________________ of [INSERT CONSULTANT NAME] ____________________________ (hereinafter "CONSULTANT") with full authority to bind, who being first duly sworn, deposes and says that CONSULTANT:

(a) Is not currently engaged and will not become engaged in any obligations, undertakings or contracts that will require CONSULTANT to maintain an adversarial role against the County or that will impair or influence the advice, recommendations or quality of work provided to the County; and

(b) Has provided full disclosure of all potentially conflicting contractual relationships and full disclosure of contractual relationships deemed to raise a question of conflict(s); and

(c) Has provided full disclosure of prior work history and qualifications that may be deemed to raise a possible question of conflict(s).

CONSULTANT makes this Affidavit for the purpose of inducing Manatee County, a political subdivision of the State of Florida, to enter into this Agreement No. ______

for ____

DATED this ______ day of ________________________, 20_______.

____
CONSULTANT Signature

The foregoing instrument was sworn to and acknowledged before me this ______ day of _______ ____________, 20____, by [NAME]________________________, as [TITLE] ______________ ____________ of [CONSULTANT]______________________________. He / She is personally known to me or has produced ___________________________ [TYPE OF IDENTIFICATION] as identification.

____
Notary Signature
Commission No. _____________________

EXHIBIT D, INSURANCE AND BOND REQUIREMENTS

REQUIRED INSURANCES

The CONSULTANT will not commence work under the resulting Agreement until all insurance coverages indicated by an "X" herein have been obtained. The CONSULTANT shall obtain and submit to the Procurement Division within ten (10) calendar days from the date of notice of intent to award, at its expense, the following minimum amounts of insurance (inclusive of any amounts provided by an umbrella or excess policy): Work under this Agreement cannot commence until all insurance coverages indicated herein have been obtained on a standard ACORD form (inclusive of any amounts provided by an umbrella or excess policy):

☒ **Automobile Liability Insurance Required Limits**

Coverage must be afforded under a per occurrence policy form including coverage for all owned, hired and non-owned vehicles for bodily injury and property damage of not less than:

- $1,000,000 Combined Single Limit; OR
- $ 500,000 Bodily Injury and $500,000 Property Damage
- $10,000 Personal Injury Protection (No Fault)
- $500,000 Hired, Non-Owned Liability
- $10,000 Medical Payments

This policy shall contain severability of interests' provisions.

☒ **Commercial General Liability Insurance Required Limits (per Occurrence form only; claims-made form is not acceptable)**

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County, a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- $1,000,000 Single Limit Per Occurrence
- $2,000,000 Aggregate
- $1,000,000 Products/Completed Operations Aggregate
- $1,000,000 Personal and Advertising Injury Liability
- $50,000 Fire Damage Liability
- $10,000 Medical Expense, and
- $1,000,000, Third Party Property Damage
- $ Project Specific Aggregate (Required on projects valued at over $10,000,000)

This policy shall contain severability of interests' provisions.

☒ **Employer's Liability Insurance**

Coverage limits of not less than:

- $100,000 Each Accident
- $500,000 Disease Each Employee
- $500,000 Disease Policy Limit

☒ Worker's Compensation Insurance

☐ **US Longshoremen & Harbor Workers Act**
☐ **Jones Act Coverage**

Coverage limits of not less than:

- Statutory workers' compensation coverage shall apply for all employees in compliance with the laws and statutes of the State of Florida and the federal government.
- If any operations are to be undertaken on or about navigable waters, coverage must be included for the US Longshoremen & Harbor Workers Act and Jones Act.

Should 'leased employees' be retained for any part of the project or service, the employee leasing agency shall provide evidence of Workers' Compensation coverage and Employer's Liability coverage for all personnel on the worksite and in compliance with the above Workers' Compensation requirements. NOTE: Workers' Compensation coverage is a firm requirement. Elective exemptions are considered on a case-by-case basis and are approved in a very limited number of instances.

☐ **Aircraft Liability Insurance Required Limits**
Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- $ Each Occurrence Property and Bodily Injury with no less than $100,000 per passenger each occurrence or a 'smooth' limit.
- $ General Aggregate.

☐ **Un-Manned Aircraft Liability Insurance (Drone)**
Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- $ Each Occurrence Property and Bodily Injury; Coverage shall specifically include operation of Unmanned Aircraft Systems (UAS), including liability and property damage.
- $ General Aggregate

☐ **Installation Floater Insurance**
When the contract or agreement **does not** include construction of, or additions to, above ground building or structures, but does involve the installation of machinery or equipment, Installation Floater Insurance shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- 100% of the completed value of such addition(s), building(s), or structure(s)

☒ **Professional Liability and/or Errors and Omissions (E&O) Liability Insurances**

Coverage shall be afforded under either an occurrence policy form or a claims-made policy form. If the coverage form is on a claims-made basis, then coverage must be maintained for a minimum of three years from termination of date of the contract. Limits must not be less than:

- $ 1,000,000 Bodily Injury and Property Damage Each Occurrence
- $ 2,000,000 General Aggregate

☐ **Builder's Risk Insurance**

When the contract or agreement includes the construction of roadways and/or the addition of a permanent structure or building, including the installation of machinery and/or equipment, Builder's Risk Insurance shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- An amount equal to 100% of the completed value of the project, or the value of the equipment to be installed
- The policy shall not carry a self-insured retention/deductible greater than $10,000

Coverage shall be for all risks and include, but not be limited to, storage and transport of materials, equipment, supplies of any kind whatsoever to be used on or incidental to the project, theft coverage, and Waiver of Occupancy Clause Endorsement, where applicable.

☐ **Cyber Liability Insurance**

Coverage shall comply with Florida Statute 501.171, shall be afforded under a per occurrence policy form, policy shall be endorsed and name 'Manatee County, a political subdivision of the State of Florida' as an Additional Insured, and include limits not less than:

- $ Security Breach Liability
- $ Security Breach Expense Each Occurrence
- $ Security Breach Expense Aggregate
- $ Replacement or Restoration of Electronic Data
- $ Extortion Threats
- $ Business Income and Extra Expense
- $ Public Relations Expense

NOTE: Policy must not carry a self-insured retention/deductible greater than $25,000.

☐ **Hazardous Materials Insurance (As Noted Below)**

Hazardous materials include all materials and substances that are currently designated or defined as hazardous by the law or rules of regulation by the State of Florida or federal government.

All coverage shall be afforded under either an occurrence policy form or a claims-made policy form, and the policy shall be endorsed and name 'Manatee County, a political subdivision of the State of Florida' as an Additional Insured. If the coverage form is on a claims-made basis, then coverage must be maintained for a minimum of three years from termination of date of the contract.

Limits must not be less than:

☐ ***Pollution Liability***
Amount equal to the value of the contract, subject to a $1,000,000 minimum, for Bodily Injury and Property Damage to include sudden and gradual release, each claim and aggregate.

☐ ***Asbestos Liability (If handling within scope of Contract)***
Amount equal to the value of the contract, subject to a $1,000,000 minimum, for Bodily Injury and Property Damage to include sudden and gradual release, each claim and aggregate.

☐ ***Disposal***
When applicable, CONSULTANT shall designate the disposal site and furnish a Certificate of Insurance from the disposal facility for Environmental Impairment Liability Insurance covering liability.

- Amount equal to the value of the contract, subject to a $1,000,000 minimum, for Liability for Sudden and Accidental Occurrences, each claim and an aggregate.
- Amount equal to the value of the contract, subject to a $1,000,000 minimum, for Liability for Non-Sudden and Accidental Occurrences, each claim and an aggregate.

☐ **Hazardous Waste Transportation Insurance**
CONSULTANT shall designate the hauler and have the hauler furnish a Certificate of Insurance for Automobile Liability insurance with Endorsement MCS-90 for liability arising out of the transportation of hazardous materials. EPA identification number shall be provided.

All coverage shall be afforded under either an occurrence policy form or a claims-made policy form and the policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured. If the coverage form is on a claims-made basis, then coverage must be maintained for a minimum of three years from termination of date of the contract. Limits must not be less than:

- Amount equal to the value of the contract, subject to a $1,000,000 minimum, per accident.

☐ **Liquor Liability Insurance**
Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- $1,000,000 Each Occurrence and Aggregate

☐ **Garage Keeper's Liability Insurance**
Coverage shall be required if the maintenance, servicing, cleaning or repairing of any County motor vehicles is inherent or implied within the provision of the contract.

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- Property and asset coverage in the full replacement value of the lot or garage.

☐ **Bailee's Customer Liability Insurance**
Coverage shall be required for damage and/or destruction when County property is temporarily under the care or custody of a person or organization, including property that is on, or in transit to and from the person or organization's premises. Perils covered should include fire, lightning, theft, burglary, robbery, explosion, collision, flood, earthquake and damage or destruction during transportation by a carrier.

Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- Property and asset coverage in the full replacement value of the County asset(s) in the CONSULTANT'S care, custody and control.

☐ **Hull and Watercraft Liability Insurance**
Coverage shall be afforded under a per occurrence policy form, policy shall be endorsed and name "Manatee County, a political subdivision of the State of Florida" as an Additional Insured, and include limits not less than:

- $ Each Occurrence
- $ General Aggregate
- $ Fire Damage Liability
- $10,000 Medical Expense, and
- $ Third Party Property Damage
- $ Project Specific Aggregate (Required on projects valued at over $10,000,000)

☐ **Other [Specify]**

REQUIRED BONDS

☐ **Bid Bond**
A Bid Bond in the amount of $______ or ____% of the total offer. Bid bond shall be submitted with the sealed response and shall include project name, location, and / or address and project number. In lieu of the bond, the bidder may file an alternative form of security in the amount of $______ or ____% of the total offer. in the form of a money order, a certified check, a cashier's check, or an irrevocable letter of credit issued to Manatee County. NOTE: A construction project over $200,000 requires a Bid Bond in the amount of 5% of the total bid offer.

☐ **Payment and Performance Bond**
A Payment and Performance Bond shall be submitted by Successful Bidder for 100% of the award amount and shall be presented to Manatee County within ten (10) calendar days of issuance of the notice of intent to award. NOTE: A construction project over $200,000 requires a Payment and Performance Bond.

I. INSURANCE REQUIREMENTS

THE POLICIES ARE TO CONTAIN, OR BE ENDORSED TO CONTAIN, THE FOLLOWING PROVISIONS:

Commercial General Liability and Automobile Liability Coverages

a. **"Manatee County, a Political Subdivision of the State of Florida," is to be named as an Additional Insured in respect to:** Liability arising out of activities performed by or on behalf of the CONSULTANT, his agents, representatives, and employees; products and completed operations of the CONSULTANT; or automobiles owned, leased, hired or borrowed by the CONSULTANT. The coverage shall contain no special limitation(s) on the scope of protection afforded to the COUNTY, its officials, employees or volunteers.

   In addition to furnishing a Certificate of Insurance, the CONSULTANT shall provide the endorsement that evidences Manatee COUNTY being listed as an Additional Insured. This can be done in one of two ways: (1) an endorsement can be issued that specifically lists "Manatee County, a Political Subdivision of the State of Florida," as Additional Insured; or, (2) an endorsement can be issued that states that all Certificate Holders are Additional Insured with respect to the policy.

b. The CONSULTANT'S insurance coverage shall be primary insurance with respect to the COUNTY, its officials, employees and volunteers. Any insurance or self-insurance maintained by the COUNTY, its officials, employees or volunteers shall be excess of CONSULTANT's insurance and shall be non-contributory.

c. The insurance policies must be on an occurrence form.

Workers' Compensation and Employers' Liability Coverages

The insurer shall agree to waive all rights of subrogation against the COUNTY, its officials, employees and volunteers for losses arising from work performed by the CONSULTANT for the COUNTY.

II. General Insurance Provisions Applicable To All Policies:

a. Prior to the execution of contract, or issuance of a Purchase Order, and then annually upon the anniversary date(s) of the insurance policy's renewal date(s) for as long as this contract remains in effect, CONSULTANT shall furnish the COUNTY with a Certificate(s) of Insurance (using an industry accepted certificate form, signed by the Issuer, with applicable endorsements, and containing the solicitation or contract number, and title or description) evidencing the coverage set forth above and naming

"Manatee County, a Political Subdivision of the State of Florida" as an Additional Insured on the applicable coverage(s) set forth above.

b. If the policy contains an aggregate limit, confirmation is needed in writing (letter, email, etc.) that the aggregate limit has not been eroded to procurement representative when supplying Certificate of Insurance.

In addition, when requested in writing from the COUNTY, CONSULTANT will provide the COUNTY with a certified copy of all applicable policies. The address where such certificates and certified policies shall be sent or delivered is as follows:

Manatee County, a Political Subdivision of the State of Florida
Attn: Risk Management Division
1112 Manatee Avenue West, Suite 969
Bradenton, FL 34205

c. The project's solicitation number and title shall be listed on each certificate.

d. CONSULTANT shall provide thirty (30) days written notice to the Risk Manager of any cancellation, non-renewal, termination, material change, or reduction in coverage of any insurance policies to procurement representative including solicitation number and title with all notices.

e. CONSULTANT agrees that should at any time CONSULTANT fail to meet or maintain the required insurance coverage(s) as set forth herein, the COUNTY may terminate this contract.

f. The CONSULTANT waives all subrogation rights against COUNTY, a Political Subdivision of the State of Florida, for all losses or damages which occur during the contract and for any events occurring during the contract period, whether the suit is brought during the contract period or not.

g. The CONSULTANT has sole responsibility for all insurance premiums and policy deductibles.

h. It is the CONSULTANT'S responsibility to ensure that his agents, representatives and subcontractors comply with the insurance requirements set forth herein. CONSULTANT shall include his agents, representatives, and subcontractors working on the project or at the worksite as insured under its policies, or CONSULTANT shall furnish separate certificates and endorsements for each agent, representative, and subcontractor working on the project or at the worksite. All coverages for agents, representatives, and subcontractors shall be subject to all of the requirements set forth to the procurement representative.

i. All required insurance policies must be written with a carrier having a minimum A.M. Best rating of A- FSC VII or better. In addition, the COUNTY has the right to review the CONSULTANT's deductible or self-insured retention and to require that it be reduced or eliminated.

j. CONSULTANT understands and agrees that the stipulated limits of coverage listed herein in this insurance section shall not be construed as a limitation of any potential liability to the COUNTY, or to others, and the COUNTY'S failure to request evidence of this insurance coverage shall not be construed as a waiver of CONSULTANT'S obligation to provide and maintain the insurance coverage specified.

k. CONSULTANT understands and agrees that the COUNTY does not waive its immunity and nothing herein shall be interpreted as a waiver of the COUNTY'S rights, including the limitation of waiver of immunity, as set forth in Florida Statutes § 768.28, or any other statutes, and the COUNTY expressly reserves these rights to the full extent allowed by law.

l. No award shall be made until the Procurement Division has received the Certificate of Insurance in accordance with this section.

III. BONDING REQUIREMENTS

Bid Bond/Certified Check. By submitting a proposal, the CONSULTANT agrees should its proposal be accepted, **to execute the form of Agreement and present the same to COUNTY for approval within ten (10) calendar days after notice of intent to award**. The CONSULTANT further agrees that failure to execute and deliver said form of Agreement **within ten (10) calendar days** will result in damages to COUNTY and as guarantee of payment of same a bid bond/certified check shall be enclosed within the submitted sealed proposal in the amount of five (5%) percent of the total amount of the proposal. The CONSULTANT further agrees that in case the CONSULTANT fails to enter into an Agreement, as prescribed by COUNTY, the bid bond/certified check accompanying the proposal shall be forfeited to COUNTY as agreed liquidated damages. If COUNTY enters into an agreement with a CONSULTANT, or if COUNTY rejects any and/or all proposals, accompanying bond will be promptly returned.

Payment and Performance Bonds. Prior to commencing work, the CONSULTANT shall obtain, for the benefit of and directed to COUNTY, a Payment and Performance Bond satisfying the requirements of Florida Statutes § 255.05 covering the faithful performance by the CONSULTANT of its obligation under the Contract Documents, including but not limited to the construction of the project on the project site and the payment and obligations arising thereunder, including all payments to Subcontractors, laborers, and materialmen. The surety selected by the CONSULTANT to provide the Payment and Performance Bond shall be approved by COUNTY prior to issuance of such Bond, which approval shall not be unreasonably withheld or delayed provided that surety is rated A- or better by Best's Key Guide, latest edition.

Failure to provide the required bonds on the prescribed form may result in CONSULTANT being deemed nonresponsive. Bonds must be in the form prescribed in Florida Statutes § 255.05 and must not contain notice, demand or other terms and conditions, including informal pre-claim meetings, not provided for in Florida Statutes § 255.05.

Bonds shall be in an amount equal to 100% of the contract price issued by a duly authorized and nationally recognized surety company, authorized to do business in the State of Florida, satisfactory to COUNTY. Surety shall be rated as “A-” or better by Best’s Key Guide, latest edition. The attorney-in-fact who signs the bonds must file with the bonds, a certificate and effective dated copy of power-of-attorney. Payment and Performance Bonds shall be issued to “Manatee County, a political subdivision of the State of Florida”, **within ten (10) calendar days after issuance of notice of intent to award**.

In addition, pursuant to Section 255.05(1)(b), Florida Statutes, prior to commencing work, the CONSULTANT shall be responsible and bear all costs associated to record the Payment and Performance Bond with the Manatee County Clerk of the Circuit Court. A certified copy of said recording shall be furnished to the Procurement Division upon filing. Pursuant to Florida Statutes § 255.05(1)(b) COUNTY will make no payment to the CONSULTANT until the CONSULTANT has complied with this paragraph.

Furnishing Payment and Performance Bonds shall be requisite to execution of an Agreement with COUNTY. Said Payment and Performance Bonds will remain in force for the duration of this Agreement with the premiums paid by the CONSULTANT. Failure of the CONSULTANT to execute such Agreement and to supply the required bonds shall be just cause for cancellation of the award. COUNTY may then contract with the next lowest, responsive and responsible CONSULTANT or re-advertise the RFP.

Failure of COUNTY at any time to require performance by the CONSULTANT of any provisions set out in the resulting Agreement will in no way affect the right of COUNTY, thereafter, to enforce those provisions.

[Remainder of page intentionally left blank]

CONSULTANT'S INSURANCE STATEMENT

THE UNDERSIGNED has read and understands the aforementioned insurance and bond requirements of this Agreement and shall provide the insurance and bonds required by this section within ten (10) days from the date of notice of intent to award.

Date: ____

Consultant's Name: _________________________________

Authorized Signature: _______________________________

Printed Name/Title: _________________________________

Insurance Agency: __________________________________

Agent Name: _______________________________________

Agent Phone: ______________________________________

Surety Agency: _____________________________________

Surety Name: ______________________________________

Surety Phone: ______________________________________

Please return this completed and signed statement with your agreement.