TOWN OF DISCOVERY BAY

A COMMUNITY SERVICES DISTRICT

SDLF Gold-Level of Governance

President – Bill Mayer • Vice-President – Bill Pease • Director – Kevin Graves • Director – Robert Leete • Director – Bryon Gutow

NOTICE OF THE REGULAR MEETING
OF THE WATER AND WASTEWATER COMMITTEE
OF THE TOWN OF DISCOVERY BAY
Wednesday, August 7, 2019
STANDING WATER AND WASTEWATER COMMITTEE REGULAR MEETING
5:30 P.M. – 6: 30 P.M.
Community Center
1601 Discovery Bay Boulevard, Discovery Bay, California
Website address: www.todb.ca.gov

Water and Wastewater Committee Board Members
Chair Bill Pease
Vice-Chair Bill Mayer

A. ROLL CALL

1. Call business meeting to order 5:30 p.m.
2. Roll Call

B. PUBLIC COMMENTS (Individual Public Comments will be limited to a 3-minute time limit)

During Public Comments, the public may address the Committee on any issue within the District's jurisdiction which is not on the Agenda. The public may comment on any item on the Agenda at the time the item is before the Committee for consideration by filling out a comment form. The public will be called to comment in the order the comment forms are received. Any person wishing to speak will have 3 minutes to make their comment. There will be no dialog between the Committee and the commenter as the law strictly limits the ability of Committee members to discuss matters not on the agenda. We ask that you refrain from personal attacks during comment, and that you address all comments to the Committee only. Any clarifying questions from the Committee must go through the Chair. Comments from the public do not necessarily reflect the view point of the Committee members.

C. DRAFT MINUTES TO BE APPROVED

1. June 5, 2019 Regular Water and Wastewater Committee DRAFT meeting minutes.

D. PRESENTATIONS

1. Water and Wastewater Update.

E. DISCUSSION ITEMS

1. Discussion Regarding the Notice of Completion and Final Payment for Newport Water Treatment Plant PLC and SCADA Upgrades Project.
2. Discussion Regarding a Procedure Which the Town Shall Pursue to Acquire Ownership of the Sanitary Sewer Facilities Serving Tract 6274 of the Harbor Bay Condominiums Community.
3. Discussion Regarding Well No. 8 Update.
4. Discussion Regarding Submittal of Comments to the Preliminary DRAFT of the Town's Proposed NPDES Permit Renewal.
5. Discussion Regarding the Diffuser Permitting and CEQA.
6. Discussion Regarding the Masterplan Update Regarding Denitrification.
7. Discussion Regarding the Geotech Report for Wastewater Plant.

F. FUTURE DISCUSSION/AGENDA ITEMS

G. ADJOURNMENT

1. Adjourn to the next Standing Water and Wastewater Committee meeting at the Community Center located at 1601 Discovery Bay Boulevard.

"This agenda shall be made available upon request in alternative formats to persons with a disability, as required by the American with Disabilities Act of 1990 (42 U.S.C. § 12132) and the Ralph M. Brown Act (California Government Code § 54954.2). Persons requesting a disability related modification or accommodation in order to participate in the meeting should contact the Town of Discovery Bay, at (925) 634-1131, during regular business hours, at least forty-eight hours prior to the time of the meeting."

"Materials related to an item on the Agenda submitted to the Town of Discovery Bay after distribution of the agenda packet are available for public inspection in the District Office located at 1800 Willow Lake Road during normal business hours."

MINUTES OF THE REGULAR MEETING
OF THE WATER AND WASTEWATER COMMITTEE
OF THE TOWN OF DISCOVERY BAY
Wednesday, June 5, 2019
STANDING WATER AND WASTEWATER COMMITTEE REGULAR MEETING
5:30 P.M. – 6:30 P.M.
Community Center
1601 Discovery Bay Boulevard, Discovery Bay, California
Website address: www.todb.ca.gov

Water and Wastewater Committee Board Members
Chair Bill Pease
Vice-Chair Bill Mayer

A. ROLL CALL

1. Call business meeting to order 5:30 p.m. – By Chair Pease.
2. Roll Call – All present with the exception of Water and Wastewater Manager Goldsworthy and District Water Engineer Shobe.
   District Water Engineer Shobe arrived at 5:45 p.m.

B. PUBLIC COMMENTS (Individual Public Comments will be limited to a 3-minute time limit)

None.

C. DRAFT MINUTES TO BE APPROVED

1. May 1, 2019 Regular Water and Wastewater Committee DRAFT meeting minutes – Approved.

D. PRESENTATIONS

1. Water and Wastewater Update.

District Engineer Harris – Provided handouts and an update regarding the Wastewater Master Plan; flows and lows, the testing results, land use map with boundaries, and the population. There was discussion regarding the number of empty lots.
Stantec Senior Principal Water – Steve Beck – Provided additional details regarding the Wastewater Master Plan; flows and lows, water conservation, organic loading, and the testing results of the BOD. There was discussion regarding the previous Wastewater Master Plan, the flows, and the BOD at other communities.
General Manager Davies – Stated the District Engineer and Stantec will be presenting to the full Board this evening the final sampling numbers for the Wastewater Master Plan. There was discussion regarding the sampling numbers.
District Water Engineer Shobe – Provided an update regarding the items listed below:

- Water System Overview
- Well 2 and Well 4A Rehabilitations
- Well 8 Alternatives Study
- Laguna Court Pipeline Crossing Break
- PLC and SCADA Upgrades for Newport Drive WTP

E. DISCUSSION ITEMS

1. Discussion Regarding Reject Water – Item trailed to the next meeting
2. Discussion Regarding Shed for Vehicles – Item trailed to the next meeting.
3. Discussion Regarding Security.

Project Manager Sadler – Provided an update regarding security; phases, options, components and monitoring of the system for all of the Town's Facilities.

Edgeworth Security – Provided additional details regarding security; the different phases and options. There was discussion regarding the phases, maintenance options and cost for the system. The discussion continued regarding a special meeting with the Water and Wastewater Committee related to the security system,

F. FUTURE DISCUSSION/AGENDA ITEMS

Reject Water.
Shed for Vehicles.

G. ADJOURNMENT

1. The meeting adjourned at 6:47 p.m. to the next Standing Water and Wastewater Committee meeting at the Community Center located at 1601 Discovery Bay Boulevard.

//cmc – 06-10-19
http://www.todb.ca.gov/agendas-minutes

Town of Discovery Bay

"A Community Services District"

Water and Wastewater Committee

STAFF REPORT

Meeting Date

August 7, 2019

Prepared By: Justin Shobe, District Water Engineer, Luhdorff & Scalmanini Consulting Engineers
Submitted By: Michael R. Davies, General Manager MRD

Agenda Title

Discussion Regarding the Notice of Completion and Final Payment for Newport Water Treatment Plant PLC and SCADA Upgrades Project.

Recommended Action

Approve the Notice of Completion and authorize the General Manager to release final payments to the Contractor, ICAD Lighthouse Electric, Inc.

Executive Summary

The Newport Water Treatment Plant PLC and SCADA Upgrade Project is now complete. The Contractor has completed the installations. The facility testing was successfully conducted with Veolia and the design engineer in April 2019. Since then, the Contractor has provided all final as-built drawings, program codes and operation manuals, as required in the contract.

All work required under the contract has been approved by Luhdorff & Scalmanini Consulting Engineers and Veolia. Enclosed is the Letter of Acceptance from the engineer. Enclosed is also the Notice of Completion that needs to be filed with the County.

The Contractor's work was completed on schedule and within the approved cost. There were no change orders or extra costs on the project. Total payment to the contractor under the contract is: $153,383.99

Staff recommends approval of the Notice of Completion and release of any remaining payments or retention due to the contractor.

Previous Relevant Board Actions for This Item

Attachments

Notice of Completion.
Letter of Acceptance.

AGENDA ITEM: E-1

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

TOWN OF DISCOVERY BAY COMMUNITY
SERVICES DISTRICT
1800 Willow Lake Road
Discovery Bay, CA 94505-9376

NOTICE OF COMPLETION

NOTICE IS HEREBY GIVEN THAT:

1. The undersigned is the Owner who contracted for the work of improvement hereinafter described.

2. The full name of the undersigned is:

   TOWN OF DISCOVERY BAY COMMUNITY SERVICES DISTRICT, a Political Subdivision of the State of California.

3. The full address of the undersigned is:

   1800 Willow Lake Road
   Discovery Bay, CA 94505-9376

4. The nature of the title of the undersigned is that of a fee holder.

5. A work of improvement on the property hereinafter described was completed on 06/15/2019.

6. The name of the contractor(s) for such work of improvement are:
   ICAD Lighthouse Electric, Inc.

7. The property on which said work of improvement was completed is in the unincorporated portion of the County of Contra Costa, State of California, and is described as follows:

   Newport Drive Water Treatment Plant
   1800 Newport Drive
   Discovery Bay, CA 94505

8. The work of improvement consists generally of:

   A. Upgrade of PLC and SCADA systems.

MICHAEL R. DAVIES, GENERAL MANAGER
FOR TOWN OF DISCOVERY BAY COMMUNITY SERVICES DISTRICT

____

Luhdorff & Scalmanini
Consulting Engineers

July 15, 2019
File No. 17-5-105

Dina Breitstein
Finance Manager
Town of Discovery Bay Community Services District
1800 Willow Lake Road
Discovery Bay, CA

SUBJECT: Acceptance of Work on the Newport Water Treatment PLC and SCADA Upgrades Project

Dear Ms. Breitstein:

Luhdorff & Scalamanini Consulting Engineers (LSCE) has reviewed the work conducted by ICAD Lighthouse Electric, Inc. (Contractor) for the Newport Drive Water Treatment Plant PLC and SCADA System Upgrades. The total amount of the contract is $153,383.99. LSCE inspected the new PLC components in the manufacturer's factory prior to shipment to verify the correct components were provided. LSCE witnessed the PLC system startup at the Newport Water Treatment Plant and confirmed proper programming and plant operation through the PLC. LSCE has reviewed and approves the Contractor's as-builts and program documentation in accordance with the specifications. The water system operator (Veolia) has also stated that the final project documentation is acceptable. LSCE recommends approval of the project and release of any remaining final payments to the Contractor. LSCE will prepare a Notice of Completion for approval by the District's Board of Directors.

Sincerely,

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Justin Shobe, PE
Supervising Engineer

Town of Discovery Bay

"A Community Services District"

Water and Wastewater Committee

STAFF REPORT

Meeting Date

August 7, 2019

Prepared By: Andy Pinasco, General Counsel
Submitted By: Michael R. Davies MRD

Agenda Title

Discussion Regarding a Procedure Which the Town Shall Pursue to Acquire Ownership of the Sanitary Sewer Facilities Serving Tract 6274 of the Harbor Bay Condominiums Community.

Recommended Action

Pursue Method #1 to acquire ownership of the sanitary sewer facilities serving Tract 6274 of the Harbor Bay Condominiums Community and delegate authority to the Town's General Manager to execute an Offer of Dedication Agreement upon receipt of legal opinion from Harbor Bay Condominiums Association demonstrating authority to make dedication.

Executive Summary

On September 5, 2018, the Town of Discovery Bay Board of Directors took action directing General Manager to work with legal counsel to acquire ownership of the sanitary sewer facilities serving Tract 6274 of the Harbor Bay Condominiums Community and corresponding access rights for operation and maintenance of the facilities (hereinafter collectively referred to as the "Sewer Facilities").

In performing the Town's due diligence the Town's General Counsel looked to the Harbor Bay Condominiums Association (the "Association") governing documents to determine whether the Association possessed the authority to dedicate the Sewer Facilities to the Town. The Town's General Counsel determined that the Association must obtain the consent of its members in order to dedicate the Sewer Facilities, which is contrary to the Association's claim that its Board possessed the authority to do so.

Due to the difficulty associated with the Association obtaining the required vote from its members, the Town's General Counsel reviewed the available documents related to the Sewer Facilities for Tracts 6272, 6273, and 6274 in an effort to identify an alternate method to carry out the Town Board's September 5, 2018, direction to acquire ownership of the sanitary sewer facilities serving Tract 6274.

In conducting such review, it was noted that documentation related to the 1989 acceptance of Tracts 6272 and 6273 contains conflicting information as to whether Tract 6274 was intended to be offered for dedication. For example, a June 1, 1982, letter from the Developer informed the Contra Costa County Public Works that the sanitary sewer system for all three tracts (6272, 6273, and 6274) would be privately maintained. However, despite such claim, the Board of Supervisors accepted the sanitary facilities and water distribution system for Tracts 6272 and 6273 on December 12, 1989, with no mention of Tract 6274. Yet on December 12, 1989 (same day as the aforementioned acceptance), a bond guaranteeing completion of agreed upon improvements (which presumably included the sanitary sewer facilities) for Tract 6274 was returned to the Developer by the Delta Diablo Sanitation District stating that Subdivision 6274 had been "accepted by the Board of Supervisors on 12-12-89." Thus, it is uncertain as to whether the County inadvertently omitted Tract 6274 from the resolution accepting the sewer facilities for Tracts 6272 and 6273, or whether Tract 6274 was ever intended to be offered for dedication.

In light of these relevant facts, Town General Counsel presents the following two methods upon which the Town of Discovery Bay may acquire ownership of the Sewer Facilities for the Board to consider.

"Continued to the next page"

Method #1
Request that Association provide a legal opinion signed by a practicing California attorney demonstrating that the Association Board has the legal authority to offer the Sewer Facilities to the Town. Upon receipt of such legal opinion, the Town's General Manager and General Counsel will work directly with the Association to execute an Offer of Dedication Agreement. Upon executing the Offer of Dedication Agreement, staff will prepare a resolution of acceptance for the Town's Board to consider for approval at a future Town Board of Director's meeting.

Method #2
Presume that Developer offered the Sewer Facilities serving Tract 6274 for dedication at the same time that the Developer offered the sewer facilities for Tracts 6272 and 6273 of the same subdivision. The legal effect intended by this presumption is that the offer of dedication remains open for Town to accept. In order for the Town to accept the presumed offer of dedication, the Town must adopt a resolution of acceptance and file such resolution with the Contra Costa County Recorder.

Previous Relevant Board Actions for This Item

Board directed General Manager to work with legal counsel to acquire ownership of the sanitation facilities at Harbor Bay Condominiums Tract #6274.

Attachments

- September 5, 2018 Town of Discovery Bay Staff Report.
- June 1, 1982, letter from Developer to Contra Costa Public Works.
- December 12, 1989, Contra Costa County Board of Supervisors Resolution Accepting Sanitary Facilities and Water Distribution System for Subdivisions 6272 and 6273.
- December 12, 1989, Transmittal Referencing County's Acceptance of Tract 6274.
- Offer of Dedication Agreement.
- Resolution [NUMBER] Accepting Offer of Dedication for Sewer Facilities.

Town of Discovery Bay

"A Community Services District"

STAFF REPORT

Meeting Date

September 5, 2018

Prepared By: Michael R. Davies, General Manager
Submitted By: Michael R. Davies, General Manager MRD

Agenda Title

Discussion and Possible Action to Acquire the Sanitation Facilities at the Harbor Bay Condominiums Tract No. 6274.

Recommended Action

Direct the General Manager to work with legal counsel to acquire ownership of the sanitation facilities at Harbor Bay Condominiums Tract #6274 (Lot 3).

When the Discovery Bay Community Services District was formed it acquired from Sanitation District No.19 the ownership and maintenance responsibility of the sanitation facilities at Harbor Bay Condominiums (aka, Blue Roofs). It was recently discovered that the sanitation facilities at one of the three tracts located at Harbor Bay had not officially been turned over to Sanitation District No. 19.

The sanitation facilities at Harbor Bay are located across three tracts (#6272, #6273 & #6274). Staff recently discovered that on December 12, 1989, the County accepted into Sanitation District No. 19 the sanitary facilities for two of the three Harbor Bay tracts. It appears that the third tract (#6274) was inadvertently omitted due to an administrative oversight by the County. The Harbor Bay Condominiums Association has written to the Town expressing its desire that the Town rectify the oversight and acquire the ownership and maintenance responsibility for the sewer facilities on Tract #6274 (Lot 3).

Staff brought this matter before the Board on June 6, 2018. The Board directed staff to investigate and assess the condition of the sanitation facilities on Tract #6274 prior to acquiring Town ownership. Town staff as well as Veolia personnel conducted an assessment.

Veolia's report is attached, and Town staff is in concurrence that the sanitary facilities at Tract #6274 has no major flaws or issues. Since Town formation, Town ownership of all the sanitation facilities at Harbor Bay has been presumed. Over the years, the Town has provided ongoing service and maintenance to all three tracts and staff suggests that this responsibility continue.

Staff recommends that the Town correct the County's administrative oversight by accepting the sanitation facilities at Harbor Bay Condominiums Tract #6274 and directing the General Manager to work with legal counsel to acquire ownership.

Previous Relevant Board Actions for This Item

June 6, 2018 BOD Meeting.

Attachments

Veolia Assessment Report.
Letter from Harbor Bay Condominiums Association dated April 17, 2018.

AGENDA ITEM: G-2

SD 7/16 S-D. 6145

M&M Consultants

Engineers, Planners
& Surveyors

700 Edgewater Drive.
Suite 654
Oakland, California
94621

Telephone
415/635 0750

June 1, 1982

1059-690

Paul Kilkenny, Assist. Public Works Director
Environmental Control
Public Works Dept.
County Administration Building
Martinez, CA 94553

RE: Subdivision 6145
Harbor Bay Condominiums
Discovery Bay

Dear Mr. Kilkenny:

We are preparing improvement plans, condominium plans and a final subdivision map for The Hofmann Co. on the above referenced project.

It was our intention to dedicate water line and sanitary sewer easements to District #19 for water and sewer service including construction, access and maintenance. Due to conversations and meetings with Stan Matsumoto regarding the County sanitary sewer standards, we have decided to maintain the system as a private sanitary sewer system.

We are requesting that District #19 accept dedication of the water system for this project and would like to discuss this item at your convenience.

Very truly yours,

M & M CONSULTANTS

Fred Burton

Fred Burton

FB:lh
cc: Stan Matsumoto
Al Shaw, The Hofmann Co.

1) Up to Std
2) Dedicate R/W
3) Access [illegible]
4) [illegible]
5) Fire hydrant?

RECEIVED
JUN 3 1982
PUBLIC WORKS DEPARTMENT

SM7/6272
1-21

THE BOARD OF SUPERVISORS OF CONTRA COSTA COUNTY, CALIFORNIA

Adopted this Order on December 12, 1989 by the following vote:

AYES: Supervisors Powers, Fahden, Schroder, McPeak & Torlakson

NOES: None

ABSENT: None

ABSTAIN: None

SUBJECT: Accepting Sanitary Facilities and Water Distribution System for Subdivisions 6272 and 6273 , Discovery Bay Area.

The Public Works Director, as Engineer of Contra Costa County Sanitation District No. 19, recommends acceptance of the sanitary facilities and water distribution system for Subdivisions 6272 and 6273, in Discovery Bay. Plan review and construction inspection of these improvements was provided by Delta Diablo Sanitation District. This recommendation is based upon the recommendation of Ronald Tsugita, General Manager/District Engineer of Delta Diablo Sanitation District.

IT IS BY THE BOARD ORDERED, as the Board of Directors of Contra Costa County Sanitation District No. 19, that the sanitary facilities and water distribution systems for Subdivisions 6272 and 6273 be accepted as a part of the Sanitation District No. 19 sewage collection and water distribution systems. The acceptance shall become effective upon receipt of a Correction of Defects Security equal to or greater than fifteen (15) percent of the construction cost, to be in effect for one year in accordance with Sanitation District No. 19 Ordinance No. 2.

I hereby certify that this is a true and correct copy of an action taken and entered on the minutes of the Board of Supervisors on the date shown.

ATTESTED: DEC 12 1989

PHIL BATCHELOR, Clerk of the Board of Supervisors and County Administrator

By Barbara Sidari, Deputy

8

SD 19/6274

Delta Diablo Sanitation District

(Contra Costa County Sanitation District No. 7-A)

OFFICE AND TREATMENT PLANT: 2500 PITTSBURG-ANTIOCH HIGHWAY: ANTIOCH, CA 94509
ADMIN. FAX: (415) 778-8513 TELEPHONE: (415) 778-4040 MAINT. FAX: (415) 778-8565

TO: The Hofmann Company
P. O. Box 907
Concord, California 94522
Attention: Mr. David Lennon

SUBJECT: Discovery Bay Subdivision 6274

WE ARE SENDING: ☒ ATTACHED ☐ UNDER SEPARATE COVER ☐ VIA

☐ LETTERS ☐ DRAWINGS ☒ OTHER Payment Bond #SC6398352 - $10,000.00
☐ CONTRACTS ☐ SPECIFICATIONS
☐ PLANS ☐ CHANGE ORDERS
☐ PRINTS ☐ PROGRESS PAYMENTS

THESE ARE BEING SENT:

☒ FOR YOUR INFORMATION
☐ FOR YOUR REVIEW/COMMENTS
☐ FOR YOUR APPROVAL
☐ FOR YOUR SIGNATURE
☐ APPROVED AS SUBMITTED
☐ PER YOUR REQUEST
☐ APPROVED AS NOTED
☐ APPROVED AS CHANGED
☐ REJECTED AS NOTED
☐ RETURNED FOR CORRECTIONS
☐ RETURNED FOR MORE INFORMATION
☐ RESUBMIT ______ COPIES FOR APPROVAL
☐ SUBMIT ______ COPIES FOR DISTRIBUTION
☐ SUBMIT ______ COPIES FOR ______
☐ OTHER

COMMENTS: The subject subdivision has been accepted by the Board of Supervisors on 12-12-89, therefore, we are returning your bond to you.

DATE: 12-12-89

TITLE: Gregory G. Baatrup
Assistant Engineer

SIGNATURE: Gregory Baatrup

OFFER OF DEDICATION
AND
DEDICATION AGREEMENT

(Harbor Bay Lot 3 (Subdivision # 6274 Being Lot # 3 of Subdivision # 6145 Filed in Book 264 of Maps at Page 32 in Contra Costa County) – Sanitary Sewer Facilities,

This offer of Dedication and Dedication Agreement ("Agreement"), dated ______, 2019, is entered into by and between DISCOVERY BAY COMMUNITY SERVICES DISTRICT, a political subdivision of the State of California (the "Town") and HARBOR BAY CONDOMINIUM ASSOCIATION, a California nonprofit mutual benefit corporation ("Harbor Bay").

Recitals

A. Subdivision 6145, Filed in Book 264 of Maps at Page 32 in Contra Costa County was subsequently Subdivided to include Subdivisions 6272, 6273, and 6274.
B. On December 12, 1989, the Board of Directors of Contra Costa County Sanitation District No. 19 accepted the sanitary sewer facilities and water distribution system for Subdivisions 6272 and 6273 as a part of the Sanitation District No. 19 sewage collection and water distribution systems.
C. Subdivision 6274 was not included in the December 12, 1989 Sanitary District No. 19 Board order.
D. Upon formation, the Town took over sanitary sewer service and water service from Sanitation District No. 19, including ownership of the sanitary sewer facilities in Subdivisions 6272 and 6273.
E. The Town continued maintenance of the sanitary sewer facilities located in Subdivisions 6272, 6273, and 6274. The Town discontinued maintenance of the sanitary sewer facilities on Subdivision 6274 upon discovering the administrative oversight.
F. It has been determined by the Town that the omission of Subdivision 6274 from Sanitation District No. 19's December 12, 1989, Board order was an administrative oversight.
G. To correct this administrative oversight Harbor Bay is offering for dedication the sanitary sewer facilities described herein that serve Subdivision 6274.

NOW, THEREFORE, in consideration of the foregoing and the mutual covenants contained herein, the parties agree as follows:

Agreement

1. Incorporation of Recitals. The Recitals are hereby incorporated into this Agreement.

2. Offer of Dedication. Harbor Bay hereby offers for dedication the sanitary sewer facilities serving Subdivision 6274, in the Town of Discovery Bay, Contra Costa County, State of California set forth and described in more detail in Exhibit A, attached hereto and incorporated herein (the "Improvements").

3. Conditions of Dedication. Harbor Bay hereby gives, grants, bargains, sells, transfers, assigns, conveys, and delivers to the Town, all of Harbor Bay's right, title and interest in all assets, rights, materials and/or claims used, owned or held in connection with the use, management, development or enjoyment of the Improvements, including, without limitation: (i) all plans, specifications, maps, drawings and other renderings relating to the Improvements; and (ii) all warranties, claims and any similar rights relating to and benefiting the Improvements or the assets transferred hereby.

5. Operation and Maintenance. District hereby assumes total responsibility for the operation and maintenance of the Improvements. The Town hereby asserts that the Improvements have been fully inspected and reviewed and found to be "complete and operational" within the required performance standards as defined in the Town's Ordinances and other requirements and are ready for public use.

6. Indemnification. Harbor Bay agrees to defend, indemnify and hold harmless the Town, its officers, agents, employees and volunteers for any and all liability related to the Improvements to the extent caused by the negligence or willful act of Harbor Bay arising out of the acts or omissions of Harbor Bay, and to pay all claims, damages, judgments, legal costs, adjuster fees and attorney fees relating thereto.

The Town agrees to defend, indemnify and hold harmless Harbor Bay, its officers, agents, employees and volunteers for any and all liability related to the Improvements to the extent caused by the negligence or willful act of the Town arising out of the acts or omissions of the Town, and to pay all claims, damages, judgments, legal costs, adjuster fees and attorney fees relating thereto.

7. Additional Documentation. Harbor Bay hereby covenants that it will, at any time and from time to time upon written request therefore, execute and deliver to the Town, its nominees, successor and /or assigns, any new or confirmatory instruments and do and perform any other reasonable acts which the Town, its nominees, successors and/or assigns, may request in order to fully transfer possession and control of, and protect the title rights of the Town, its nominees, successors and/or assigns in, all the assets of Harbor Bay intended to be transferred and assigned hereby.

8. Interpretation. This Agreement shall be construed as a whole and in accordance with the fair meaning of its language, and shall not be construed for or against either party. Captions are for convenience and shall not be used in construing meaning.

9. Inurement. This Agreement and its terms shall be binding upon and inure to the benefit of the parties, their respective heirs, personal representatives, permitted assigns, and other successors in interest.

10. Attorney's Fees. Should any action be filed to interpret, enforce the performance or any term or condition of this Agreement, or to recover damages for the breach of this Agreement, as between the Town and Harbor Bay, the prevailing party therein shall be entitled to recover, as an element of its costs of suit and not as damages, reasonable attorney's fees and costs from the party not prevailing. The prevailing party shall be the party who is entitled to costs of suit.

11. Survivability. This Agreement shall be continuous and shall survive the acceptance of the Offer of Dedication and the receipt of consideration.

12. Severability. If any term, covenant, or provision of this Agreement is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remainder of the provisions shall remain in full force and effect and shall in no way be affected, impaired or invalidated.

13 Acceptance of Offer of Dedication. In signing this Agreement, District accepts Harbor Bay's Offer of Dedication of the Improvements subject to the terms of this Agreement.

14. Counterparts. This Agreement may be executed in several counterparts, each of which shall be an original, but all of which shall constitute but one and the same instrument.

"Harbor Bay"

HARBOR BAY CONDOMINIUM ASSOCIATION,

a California nonprofit mutual benefit corporation

By: ____________________________

Name: ____________________________

Its: ____________________________

By: ____________________________

Name: ____________________________

Its: ____________________________

"Town"

Town of Discovery Bay Community Services District

By: ____________________________

Name: Michael R. Davies

Its: General Manager

APPROVED AS TO FORM:

By: ____________________________

Name: Rod A. Attebery

Its: General Counsel

Exhibit "A"

Town of Discovery Bay Community Services District
1601 Discovery Bay Boulevard, Discovery Bay, California, 94505
Tel (925) 392-4575

CERTIFICATE OF ACCEPTANCE

THIS IS TO CERTIFY that the interest in real property conveyed by the deed or grant dated __________ from HARBOR BAY CONDOMINIUM ASSOCIATION, a California nonprofit mutual benefit corporation company, to the Town of Discovery Bay Community Service District, a political subdivision of the State of California, is hereby accepted by the order of the General Manager on behalf of the Town of Discovery Bay Community Service District and the grantee consents to the recordation thereof by its duly authorized officer.

Dated: _________________ By: ____________________

Michael R. Davies

GENERAL MANAGER

"To provide responsive service to our growing community that exceeds expectations at a fair value"

1226711-1

TOWN OF DISCOVERY BAY
COMMUNITY SERVICES DISTRICT

RESOLUTION 20XX-XX

A RESOLUTION OF THE BOARD OF DIRECTORS
OF THE TOWN OF DISCOVERY BAY,
A CALIFORNIA COMMUNITY SERVICES DISTRICT,
ACCEPTING DEDICATION OF IMPROVEMENTS TO THE
TOWN OF DISCOVERY BAY COMMUNITY SERVICES DISTRICT

WHEREAS, Harbor Bay Condominium Association ("Grantor") has executed an Offer of Dedication and Dedication Agreement, a copy of which is attached hereto as "Exhibit A", dedicating the sanitary sewer facilities serving Subdivision 6274, in the Town of Discovery Bay, Contra Costa County, State of California set forth and described in more detail in "Exhibit B" to the Town of Discovery Bay Community Services District (the "Town; and

WHEREAS, it is necessary and desirable that Grantor's Offer of Dedication be accepted by the Board of Directors of the Town.

NOW, THEREFORE, IT IS RESOLVED by the Board of Directors of the Town that the Grantor's Offer of Dedication is hereby accepted by and on behalf of the Town, subject to the terms of the Offer of Dedication and Dedication Agreement.

PASSED, APPROVED AND ADOPTED THIS ____ Day OF [MONTH], 2019.

____
Bill Mayer
Board President

I hereby certify that the foregoing Resolution was duly adopted by the Board of Directors of the Town of Discovery Bay Community Services District at a regularly scheduled meeting, held on [DATE], by the following vote of the Board:

AYES:
NOES:
ABSENT:
ABSTAIN:

____
Michael R. Davies
Board Secretary

1231279-1

Town of Discovery Bay

"A Community Services District"

Water and Wastewater Committee

STAFF REPORT

Meeting Date

August 7, 2019

Prepared By: Michael R. Davies, General Manager
Submitted By: Michael R. Davies, General Manager MRD

Agenda Title

Discussion Regarding Submittal of Comments to the Preliminary Draft of the Town's Proposed NPDES Permit Renewal.

Recommended Action

Provide additional comments to RWQCB, if any, in response to the Draft NPDES Permit No. CA0078590. This item will also be presented to the Board at the Regular Meeting on August 7, 2019.

Executive Summary

Staff has submitted an application for a renewal of our wastewater five-year National Pollution Discharge Elimination Permit ("NPDES"). On July 24, 2019, staff received from the Regional Water Quality Control Board ("RWQCB") a "Preliminary Draft" of the NPDES Permit No. CA0078590. Staff was given until August 7, 2019 to review the Preliminary Draft NPDES and provide comment to RWQCB.

The Preliminary Draft NPDES Permit document is not attached to this staff report. The document is 147 pages and the electronic version can be found as Item G-4 in the August 7, 2019 Regular Board Meeting Agenda packet, starting at page 32. https://www.todb.ca.gov/sites/main/files/file-attachments/2019-08-07_agenda_packet_0.pdf

Hardcopies will be provided at the committee meeting.

Staff has met, reviewed the Preliminary Draft NPDES, and provided written comments in response thereto (comment letter to RWQCB is attached).

Staff has requested that RWQCB grant an extension of comment time (until August 9, 2019) in order to allow the Town of Discovery Bay ("TODB") Board to review the Preliminary Draft at their Regular Board Meeting on August 7, 2019, take public input, and make any additional comments, if any, to the TODB response letter.

As of the writing of this staff report (August 2, 2019), staff has not heard back from the RWQCB on our request for an extension of comment time. If staff does not obtain a reply from RWQCB or is not granted an extension of time, it is staff's intention to submit the draft comment letter to RWQCB on or before end of business day August 7, 2019. A subsequent document will be sent to RWQCB if additional comments are generated at the August 7, 2019 Board Meeting.

Attachments

TODB Comment Letter to RWQCB re: Renewal of NPDES Permit No. CA0078590 – Preliminary Draft

AGENDA ITEM: E-4

August 2, 2019

DRAFT

Mr. Tyson Pelkofer
Water Resources Control Engineer
San Joaquin Delta Permitting
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670

Re: ORDER No. R5-2014-0073, NPDES No. CA0078590

Subject: **Town of Discovery Bay Community Services District - Discovery Bay WWCF - Renewal of NPDES Permit No. CA0078590 - Preliminary Draft**

Dear Mr. Pelkopfer:

The Town of Discovery Bay (Town) has reviewed the draft NPDES permit Number CA0078590 and offers the following comments.

1. Page 5, Table 4 - Ammonia Nitrogen Effluent Limitations. As will be discussed later relative to the Fact Sheet, we do not understand how these limits were developed. We need to have a clear understanding because we are in the process of asking our constituency for a significant amount of money in order to comply with this specific limitation.

2. Page 6, Section IV.A.2.a - Change "During the period beginning 1 October 2019 and ending on" to "Effective immediately and through". It is our understanding the effective date will be after 1 October 2019.

3. Page 14, Section VI.C.1 - We would like to insert the reopener provision section VI.C.1.m "2013 Ammonia Criteria", from Order R5-2014-0073, into Section VI.C.1.m because we believe sufficient information on freshwater mussels can be gathered to modify the ammonia criteria.

4. Page 14, Section VI.C.2.a.i - We believe the toxicity monitoring trigger is > 10 (per Order R5-2014-0073 and as referenced elsewhere in the draft WDRs as "greater than 10 TUc"). Please add ">" before "10 TUc", in the first sentence.

5. Page 15, Section VI.C.3.a - We recommend that this first reference to the Technical Reports Table be followed by "(see Table E-12)" so that readers know where to find said table. This same reference "(see Table E-12" should be added to all references of "Technical Reports Table" throughout the document (including Section VI.C.3.b, VI.C.3.c, VI.C.7.a, VI.C.7.b, and VI.C.7.c).

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6. Page 15, Section VI.C.3.b - The word “salinity” should be replaced with “TSS, turbidity, and total coliform”.

7. Page 17, Section VI.C.5 - Pretreatment requirements are not applicable because the trigger for these requirements (from 40 CFR 403) is a design capacity over 5-MGD and the District only has a capacity of 2.35 MGD. Please remove the pre-treatment requirements Section VI.C.5 from the permit and any other pre-treatment references throughout the permit (including Table E-12).

8. Page 20 and 21, Section VII.G - “part “c” of” in the third sentence should be removed and the entire last sentence should be eliminated because there are no parts “a” or “b” or “c” anymore. We assume you mean Section V.A.5. Please clarify which section is being referenced for compliance.

9. Page E-4, Table E-1 - Sample Location INT-001 description. There is no reference to INT-001 anywhere in the permit. It should be added to Table E-9 as noted below. The filters have been constructed. Turbidity is currently monitored downstream of the clarifiers/prior to the filters. We recommend making INT-001 downstream of the clarifiers and prior to the filters. The new description would read as follows.

   Internal monitoring location immediately downstream of the secondary clarifiers and prior to the tertiary filters.

10. Page E-4, Table E-1 - Sample Location INT-002 description. There is no reference to INT-002 anywhere in the permit. It should be added to Table E-9 as noted below. The filters have been constructed. Turbidity is currently monitored downstream of the filters/prior to the UV system. We recommend making INT-002 downstream of the filters and prior to the UV system. The UV-3000 system was replaced with a New UV-3000 plus system. Both UV channels are now identical and there is no difference between channel 1 and channel 2. Change the description to say UV-3000 plus. The new description would read as follows.

    Internal monitoring location immediately downstream of the tertiary filters and prior to the ultraviolet light (UV) disinfection system UV-3000 plus.

11. Page E-4, Table E-1 - Sample Location UVS-001 description. The UV-3000 system was replaced with a New UV-3000 plus system. Both UV channels are now identical and there is no difference between channel 1 and channel 2. Change the description to say UV-3000 plus.

12. Page E-4, Table E-1 - Sample Location UVS-002 description. Both UV channels are now identical and there is no difference between channel 1 and channel 2. Samples are now collected at one location UVS-001. There is also no UVS-002 in table E-9. Delete UVS-002 to be consistent with Table E-9.

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13. Page E-4, Table E-2 - The TSS "Sample Type" footnote should be "1," not "3". All "Grab" samples should have footnote "3".

14. Page E-5, Table E-3 - Remove lbs/day calculation for ammonia since there is no lbs/day limit (see Table 4). Is the increase in methylmercury monitoring (from 1/Quarter to 1/Month) necessary? There appears to be some confusion regarding Total Coliform monitoring at EFF-001 (or via footnote "11 at any point following disinfection") at a frequency of 3/Week and Table E-9 with Total Coliform testing only at UVS-001 (not UVS-002) at a frequency of 1/Day. Coliform monitoring requirements are not clear. Please make the coliform monitoring requirements consistent.

15. Page E-5, Table E-3 - Based on footnote "3" and 1/Week monitoring of both pH and ammonia, the temperature sampling frequency should also be 1/Week.

16. Page E-7, section V.B.4 - As we understand this, we are to conduct all chronic toxicity testing using the most sensitive species (of the three listed) based on historical results, which for the District is Selenastrum (see Table F-14). If our understanding is correct, then we suggest replacing the proposed two sentences with something like the following.

    The testing shall be conducted using the most sensitive species to Discharger's effluent (listed below) based on chronic toxicity testing results to date, unless otherwise specified in writing by the Executive Officer.

17. Page E-7, Table E-4 - We do not understand the proposed dilution series. Should the shown Dilution percentages be 100, 55, 10, 5, and 2.5 rather than 100, 75, 50, 25, and 12.5?

18. Page E-12, Table E-9 - Is Total Coliform monitoring to occur 3/Week (table E-3) or 1/Day (Table E-9)?

19. Page E-12, Table E-9 - Based on Revisions to Table E-1 as noted above, Flow is measured at INT-002.

20. Page E-12, Table E-9 - Based on Revisions to Table E-1 as noted above, turbidity is measured at INT-001 and INT-002. There is no FIL-001 in Table E-1. This location is picked up by INT-002 in Table E-1.

21. Page E-12, Table E-9 - Based on Revisions to Table E-1 as noted above, UV Transmittance is measured at INT-002.

22. Page E-12, Section IX.D – Please change Table "E-15" should be "E-10", there is no Table E-15 in the permit.

23. Page E-19, Section X.B.7.b - This section could be deleted because the draft WDRs do not contain mass loading limitations on BOD, TSS, or ammonia.

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24. Page E-24, Tabl2 E-12 - Items 41 through 45 should be deleted as a pretreatment program is not required for this facility per Comment 7 above.

25. Page F-21 to F-22, Section viii - This section states “The Central Valley Water Board has determined that these dilution factors are not needed or necessary for the Discharger to achieve compliance with this Order, except for copper, as described above.” We disagree. The District believes that new information, as summarized in the draft WDRs and elsewhere shows that dilution credits are available for ammonia (see Attachment H, ammonia B (maximum receiving water concentration) = 0.12 mg/L, which is far less than CMC = 1.17 and CCC = 1.50), and are needed to avoid the public expense to build and operate more advanced nitrification-denitrification facilities capable of reliably complying with proposed effluent limitations on both ammonia (0.7 mg/L) and nitrate + nitrite (10 mg/L) under design flows and reasonable worst-case conditions. We have spent considerable money developing a design to achieve compliance with both, but we have not yet spent public money to build and operate those facilities to achieve compliance with both. We support the overall plan to reduce nitrate emissions to the Delta, we do not support an expensive low limit on ammonia that is not conservative in the environment and that the environment is able to assimilate safely based on available data. This issue of freshwater mussel sensitivity is still under study. Our diffuser design directs our effluent up, not along the river bottom. Our effluent is warmer than the river; thus, it naturally tends to buoy up, not hug the river bottom where mussels may exist. We believe dilution credits for ammonia are needed to avoid a waste of public money considering situation-specific factors of dilution, available assimilative capacity, diffuser design, and effluent buoyancy. The issue of ammonia can be re-visited any time warranted by new information; however, once we spend the public’s money, they will never get it back.

Please feel free to give me a call or email to discuss any of these items further.

Sincerely,

Gregory Harris, PE
Partner HERWIT Engineering

cc: Michael R. Davies, General Manager, Discovery Bay CSD

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Town of Discovery Bay
Community Services District

Wastewater Master Plan Update

July 23, 2019

Prepared for:

Town of Discovery Bay

Prepared by:

Stantec Consulting Services Inc.

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11.0 SECONDARY TREATMENT FACILITIES (DRAFT 7-23-19)

In this section, the existing secondary treatment system is described and methods to upgrade the system to meet new discharge requirements for ammonia-nitrogen and nitrate+nitrite-nitrogen at the future buildout flows and loads are evaluated. A recommended plan of improvements is developed.

11.1 EXISTING FACILITIES

The existing secondary treatment facilities are divided between Plant 1 and Plant 2 and consist of oxidation ditches, clarifiers and associated facilities. Plant 1 includes one oxidation ditch and two clarifiers, while Plant 2 includes two oxidation ditches and three clarifiers. At the present time, only the facilities at Plant 2 are being used. Facilities at Plant 1 remain available for use if units at Plant 2 need to be taken out of service for maintenance or repair. Additionally, Plant 1 can be restored to normal use if needed to serve future flows and loads, a topic that is evaluated in this section.

A flow diagram and key design criteria for these facilities are presented in Section 6. For ease of reference in this section, sizing and capacity data for the various components of the secondary treatment systems in Plant 1 and Plant 2 are listed in Tables 11-1 and 11-2, respectively.

The secondary treatment facilities at Plant 1 and Plant 2 comprise two separate activated sludge systems. The oxidation ditches are the reactor basins wherein mixed cultures of microorganisms are used to remove organic material and ammonia contained in the influent wastewater and produced within the process. Currently, no specific features are included for removal of nitrite or nitrate-nitrogen by denitrification, although limited removals can occur coincidentally.

The suspension of microorganisms and other wastewater solids in each oxidation ditch is referred to as mixed liquor. The microorganisms require oxygen, which is provided by four brush rotors in each ditch. The brush rotors also provide the motive force needed to keep the mixed liquor circulating around each ditch at a velocity that is adequate to keep the microorganisms and other solids in suspension.

The mixed liquor from the oxidation ditches flows to splitter boxes that are used to divide the flow equally to the secondary clarifiers within each plant. Within the secondary clarifiers, the microorganisms and other wastewater solids are settled to the bottom, while the clarified secondary effluent flows over weirs and into a collection channel arranged around the periphery of the clarifier before exiting the clarifier structure. The settled solids are collected by a rotating mechanism above the floor of the clarifier and are, for the most part, pumped back to the oxidation ditches using return activated sludge (RAS) pumps. A portion of the settled solids are wasted from the system and are pumped by waste activated sludge (WAS) pumps to the solids handling facilities.

In Plant 1, the clarifiers are at a higher elevation than the upstream splitter box; therefore, a clarifier lift pump station is used ahead of each clarifier.

Table 11-1 Secondary Treatment Facilities Component Sizing and Capacity Data – Plant 1

Component	Parameter	Value
Oxidation Ditch 1	Volume, Mgal	1.0
Oxidation Ditch 1	Number of Brush Rotors	4
Oxidation Ditch 1	Brush Rotor Horsepower, ea	30
Oxidation Ditch 1	Capacity per Brush Rotor, lb O_2 / d (Standard)	2,200(a)
Clarifier Lift Pump Station 1 (Serves Clarifier 1)	No. Pumps	1 + 1 Standby
Clarifier Lift Pump Station 1 (Serves Clarifier 1)	Capacity per Pump, Mgal/d	1.6
Clarifier Lift Pump Station 2 (Serves Clarifier 2)	No. Pumps	1 + 1 Standby
Clarifier Lift Pump Station 2 (Serves Clarifier 2)	Capacity per Pump, Mgal/d	1.6
Clarifier 1	Diameter, ft	50
Clarifier 1	Depth, ft	10
Clarifier 2	Diameter, ft	50
Clarifier 2	Depth, ft	12
RAS Pump Station 1 (Serves Clarifier 1)	No. Pumps	1 + 1 Standby
RAS Pump Station 1 (Serves Clarifier 1)	Capacity per Pump, Mgal/d	0.80
RAS Pump Station 2 (Serves Clarifier 2)	No. Pumps	1 + 1 Standby
RAS Pump Station 2 (Serves Clarifier 2)	Capacity per Pump, Mgal/d	0.80
WAS Pump Station	No. Pumps	1 + 1 Standby
WAS Pump Station	Capacity per Pump, Mgal/d	0.58

(a) Estimated value, same as rotors in Oxidation Ditch 2, per District Engineer.

Table 11-2 Secondary Treatment Facilities Component Sizing and Capacity Data – Plant 2

Component	Parameter	Value
Oxidation Ditch 2 and 3	Volume, Each Ditch, Mgal	1.0
Oxidation Ditch 2 and 3	Number of Brush Rotors per Ditch	4
Oxidation Ditch 2 and 3	Brush Rotor Horsepower, Each Rotor	30
Oxidation Ditch 2 and 3	Capacity per Brush Rotor, lb O_2 / d (Standard)	2,200
Clarifier 3 - 5	Diameter, Each, ft	50
Clarifier 3 - 5	Depth, ft	14
RAS Pumps (Serving Clarifiers 3 - 5)	No. Pumps	3 + 1 Standby
RAS Pumps (Serving Clarifiers 3 -5)	Capacity per Pump, Mgal/d	1.1
WAS Pumps	No. Pumps	1 (a)
WAS Pumps	Capacity per Pump, Mgal/d	0.58

1. Standby RAS pump can also be used for WAS.

As noted in Tables 11-1 and 11-2, the clarifiers at Plant 2 are deeper than the clarifiers at Plant 1. Additionally, the clarifiers at Plant 2 have density baffles to mitigate the impacts of the sludge blanket rising up at the wall. This rise is caused by the introduction of the mixed liquor at the center of the clarifier. Since the mixed liquor has a higher bulk density than the clarified effluent in most of the clarifier volume, the mixed liquor tends to fall to the floor at the center and create a current that sweeps radially outward at the clarifier bottom. The density baffles in the Plant 2 clarifiers help to keep any rising solids away from the effluent weirs. Because of the clarifier depth and the density baffles, Plant 2 clarifiers are believed to provide a higher reliability of good performance, as compared to the Plant 1 clarifiers.

11.1.1 Rotor Capacity

Based on the manufacturer's submittal during construction, the rotors in Oxidation Ditch 3 (and presumed the same for Oxidation Ditches 1 and 2) should be operated at a maximum immersion of 13.25 inches, unless a higher immersion is approved by the factory. At this immersion, performance charts provided by the manufacturer indicate a power draw at the rotor shaft of 27.2 hp and a standard oxygen transfer rate (SOTR) of 2,133 lb/d. Due to losses in the belt and gear drives, the power draw at the motor could be around 6 to 11 percent higher than at the rotor shaft, or about 28.8 to 30.2 hp. Therefore, at 13.25 inches immersion, the 30 hp motors should be nearly fully loaded. At 30 hp full load, the motors are rated to draw 35.1 amps. Although the motors have a 1.25 service factor that could allow operation at higher immersion and power draw, it is typically desirable to avoid encroachment on the service factor, which should be considered as a safety margin.

Based on recent information provided by the Chief Engineer of Lakeside (the rotor manufacturer), the rotors could be operated at an immersion up to 13.9 inches, which would require 28.8 hp at the rotor shaft (perhaps around 30.5 to 32.0 hp at the motor shaft, which is about 2% to 7% above motor rating, but well within the 1.25 service factor). In this case the rotor oxygen delivery capacity would be 2,177 lb/d. If an SOTR of 2,133 lb/d is presumed to correspond to a current draw of 35.1 amps and to 27.2 hp at the rotor shaft and 30.0 hp at the motor shaft, then, based on rotor performance charts, 2,177 lb/d would be estimated to correspond to about 28.2 hp at the rotor shaft, 31.1 hp at the motor shaft, and a current draw of 36.4 amps.

Based on startup testing of the rotors, the District Engineer reported a current of 37 amps at the inside rotors (rotors closest to the center island in the ditch) with an immersion of approximately 13 inches (immersion estimated from water depth at the rotors when not running). Due to minor discrepancies in ditch floor elevation and rotor elevation as compared to the design values, it is possible that the actual immersion may have been higher than 13 inches. However, the current draw of 37 amps would correspond to a theoretical immersion of about 14 inches.

Based on the above, it is reasonable to say that rotor capacity should be in the range of 2,133 to 2,177 lb/d SOTR. Therefore, a value of 2150 lb/d is a reasonable assumption for this study.

In the same startup field testing mentioned above, the outside rotors, when operated at the same time as the inside rotors, had a current draw of only 24 amps. Since power delivery should be proportional to the current, the power draw at the outside rotors is estimated to be only 24/37 = 65 percent that of the inside rotors. Based on Lakeside rotor performance Charts, the corresponding SOTR of the outside rotor would be about 69 percent that of the inside rotor (SOTR is not directly proportional to power input). Thus, if an SOTR capacity of 2,150 lb/d is assumed for the inside rotors, then the outside rotors running at the same time would be estimated to have an SOTR of about 1480 lb/d. In that case, the average SOTR for all four rotors running at the same time would be 1,815 lb/d.

It is believed that the different performances of the inside and outside rotors are due to different hydrodynamic conditions (particularly ditch water velocities approaching the rotors). It is not known how the hydrodynamic conditions and the impacts on rotor current draw, power input, and SOTR would vary depending on which and how many inside and outside rotors run at the same time. Furthermore, accurate determinations of SOTR for the various conditions would require clean water oxygen transfer testing in at least one of the ditches. These types of analyses are beyond the scope of this Master Plan, but should be considered in the context of a preliminary design study. For this Master Plan, it is considered adequate to estimate the following SOTRs:

- All four rotors running: 2 x 2,150 + 2 x 1,480 = 7,260 lb/d
- Two inside and one outside rotor running: 2 x 2,150 + 1,480 = 5,780 lb/d
- Two outside and one inside rotor running: 2,150 + 2 x 1,480 = 5,110 lb/d

11.2 SECONDARY TREATMENT OBJECTIVES AND BACKGROUND

The existing secondary treatment system was designed to produce a secondary effluent with relatively low BOD and TSS concentrations (10 to 30 mg/L), with only minor coincidental removals of ammonia and nitrate-nitrogen. However, the District's National Pollutant Discharge Elimination System (NPDES) permit that was adopted on June 6, 2014, includes strict limits on effluent ammonia-nitrogen (0.7 mg/L monthly average) and nitrite+nitrate-nitrogen (10 mg/L monthly average), which are scheduled to take effect on December 30, 2023. Currently, the District must meet interim limits for ammonia-nitrogen and nitrite+nitrate-nitrogen of 8.4 mg/L and 31 mg/L, respectively, both as daily maximums. The main purpose of this section is to determine how to meet the future permit limits most cost-effectively.

In the previous Wastewater Treatment Plant Master Plan, Amendment 2, dated July 2015, three key alternatives for the secondary treatment system were evaluated. In all cases, ammonia removal was to be accomplished in the oxidation ditches. The three alternatives were based around the methods to be used to remove nitrite+nitrate-nitrogen, as follows:

1. Simultaneous Nitrification and Denitrification (SND).
2. Anoxic Basins
3. Denitrification Filters

Simultaneous nitrification and denitrification was not recommended for two key reasons:

1. The cyclically low dissolved oxygen (DO) concentrations needed to meet the nitrite+nitrate-nitrogen limit would prevent reliable compliance with the ammonia-nitrogen limit, which would require consistently high DO.
2. Operation at low DO concentrations frequently leads to sludge bulking (failure of solids to settle well in the secondary clarifiers) and solids carryover from the secondary clarifiers.

Shortly before the start of this current Master Plan evaluation, there was some hope that the California Regional Water Quality Control Board, Central Valley Region, was going to review and relax the ammonia-nitrogen limit, which could have potentially made the SND alternative more attractive. However, it has since been determined that no significant relaxation of the ammonia-nitrogen limit is likely. Therefore, an SND alternative would have to be accompanied by additional treatment facilities for ammonia removal. This could be in the form of new aerobic suspended growth reactors after the oxidation ditches and before the clarifiers or new attached growth reactors (e.g., moving bed bioreactors) after the clarifiers and before the filters. However, even with additional ammonia removal facilities, the concern with SND sludge bulking would still exist. Also, SND design and performance is not precise and cannot be adequately validated without full-scale performance testing over more than a year, which would require significant modifications to the operation and control of the mechanical aeration systems in the oxidation ditches, with no guaranty of success. Based on all these factors, which apply regardless of the recent changes in flows and loads, the SND alternative is again not recommended.

The denitrification filter alternative was pilot tested at the Discovery Bay Wastewater Treatment Plant and was evaluated in detail in the previously mentioned Amendment 2 and was determined to be inferior to the anoxic basin alternative. Therefore, the District proceeded with construction of filters that are not structurally deep enough and do not have the chemical feed systems needed for denitrification.

Based on the above, the recommended method for denitrification is the addition of anoxic basins ahead of the existing oxidation ditches, which is consistent with the previous Master Plan, Amendment 2. However, because of recent changes in wastewater flows and loads, which are documented in Section 5, and because of reduced wastewater temperatures (discussed in the next subsection), it is necessary to re-evaluate the anoxic basin alternative and the capacities of Plant 1 and Plant 2 with these improvements.

11.3 WASTEWATER TEMPERATURE

Wastewater temperature has a large impact on microbiological activity and, therefore, on the rate of treatment in an activated sludge system. In particular, the slow growth rate of ammonia oxidizing bacteria (AOB) with cold temperatures in the winter months is the main limiter of oxidation ditch capacity.

Wastewater influent temperatures are measured weekly and effluent temperatures are measured twice per week at the Discovery Bay Wastewater Treatment Plant. Temperature data for the years of 2017, 2018 and a portion of 2019 are shown in Figure 11-1. Effluent temperatures are probably most indicative of temperatures in the activated sludge process. As indicated in the figure, however, influent and effluent temperatures were generally similar over the data period shown. For process design, the lowest seasonal temperatures that are sustained for a couple of weeks are most important (neglecting outlier data). Accordingly, from the data shown in Figure 11-1, a minimum process design temperature of 13°C is recommended.

In Figure 11-2, similar wastewater temperature data from the years 2004-2007, which were used as the basis of the previous Master Plan are shown. By comparing Figure 11-1 to Figure 11-2, it can be seen that minimum winter influent temperatures have decreased by about 7°C and effluent temperatures have decreased by about 2°C. The lower wastewater temperatures could be the result of lower flows and higher residence times in the sewer system and changed habits with regards to the use of hot water (e.g., shorter showers and more efficient use of hot water in appliances resulting from water and energy conservation). The lesser incremental change in effluent temperatures as compared to influent temperatures is likely due to the fact that the wastewater in the treatment basins was exposed to similar ambient temperatures in the earlier and later periods of record.

If all else remains equal, the 2°C decrease in effluent and process design temperature has the net effect of decreasing the capacity of the oxidation ditches by about 13 percent due to a similar decrease in AOB growth rate.

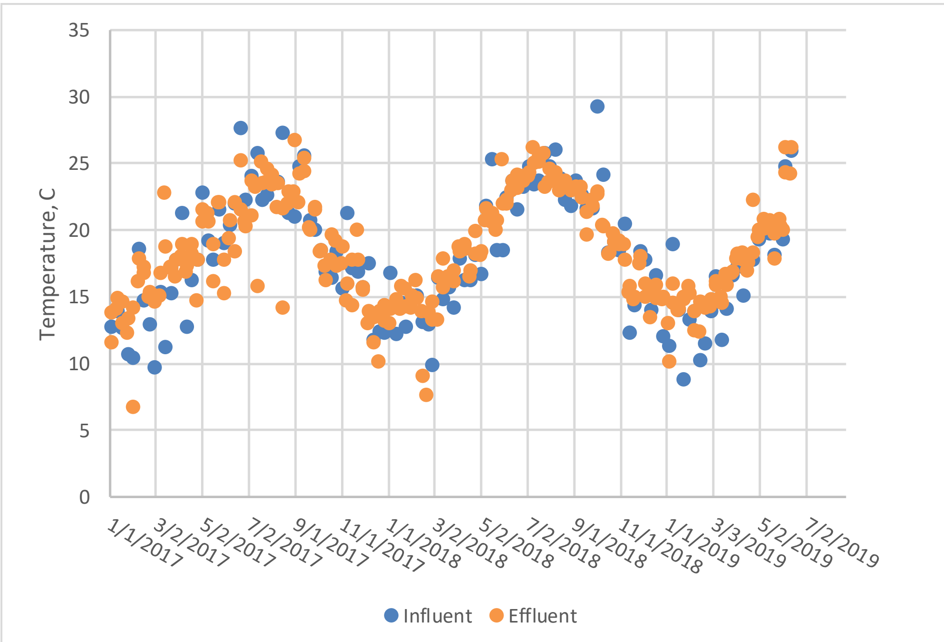

Figure 11-1 Wastewater Temperatures 2017-2019

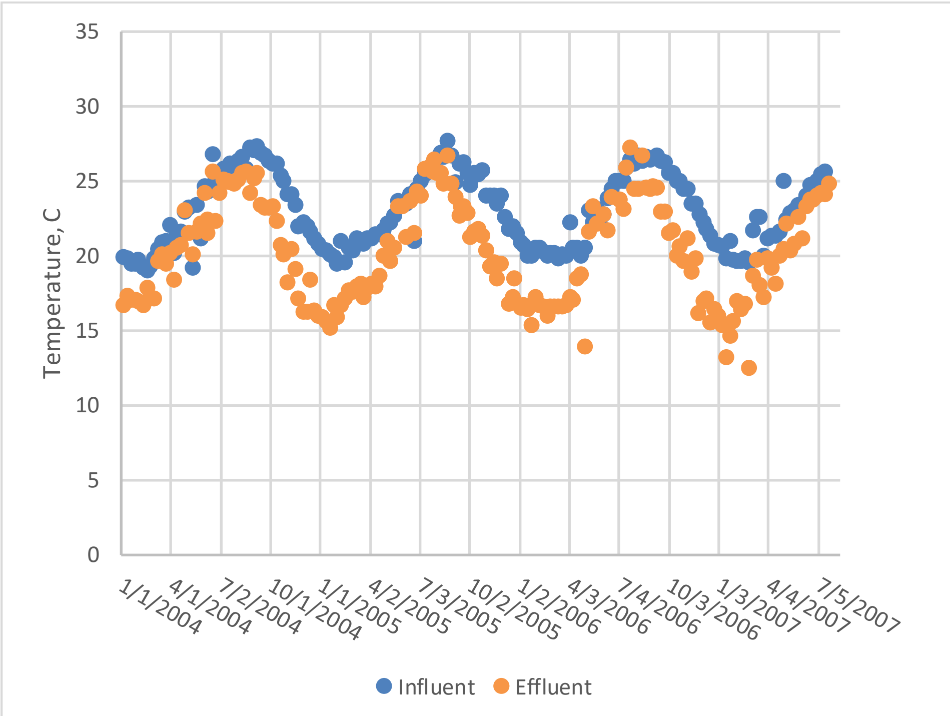

Figure 11-2 Wastewater Temperatures 2004-2007

11.4 RECYCLE FLOWS AND LOADS

In-plant recycle flows and loads can be significant and must be considered in the design and evaluation of the secondary treatment system. Critical peak month (for secondary process design) recycle flows and loads are considered first below, followed by consideration of annual average recycle flows and loads.

11.4.1 Critical Peak Month Recycle Allowances

As developed later in this section, the critical peak month design condition for the secondary treatment process is expected to occur in the winter and is assumed to occur when the plant influent flow is equal to the annual average flow. Estimated average in-plant recycle flows corresponding to these conditions are shown in Table 11-1. It is noted that all of these recycle flows would be returned to the Plant 2 oxidation ditches (not to the anoxic basins). No return flows would go to Plant 1.

The flows indicated in Table 11-1 are based on the assumption that the belt presses are fed from one of the two sludge lagoons at Plant 2, but the return flows are directed to the other lagoon, which would also receive waste activated sludge decant from the aerobic digester. The sludge lagoon receiving all of the indicated flows would be decanted at a controlled average rate to the Decant Pump Station. The Decant Pump Station would be used to pump the lagoon decant and the filter backwash water to the Plant 2 oxidation ditches. It was assumed that there would be no net flow of storm water from the sludge lagoons after allowing for evaporation in a month when the average plant influent flow was equal to the average annual flow (which is the basis of the critical design month), implying only minor precipitation. Recycle flows from the lagoons will contain algae. Based on observations by plant staff, there is significantly less algae during winter periods than during summer periods.

The BOD and TSS of the filter backwash water was assumed to be 333 mg/L (based on removal of 10 mg/L from the main plant flow through the filters), while the BOD and TSS of the lagoon decant flow were assumed to be 50 mg/L (representative of winter conditions with minor amounts of algae). The TKN content of both streams was assumed to be 8% of the BOD and TSS (typical for algal or bacterial solids).

11.4.2 Annual Average Recycle Allowances

Annual average recycle flows and loads are shown in Table 11-2. Average filter backwash water characteristics were assumed to be the same as in the critical month. The average annual BOD and TSS of the recycle flows from the lagoons was assumed to be 75 mg/L, based on estimated average sludge lagoon decant characteristics. The recycle TKN was assumed to be 8% of the recycle BOD.

Table 11-1 Assumed Recycle Flows in Critical Design Month

Recycle Steam	Basis	Estimate Flow and Loads
Waste Activated Sludge	Assume sludge yield solids load approximately equal to peak month influent BOD load = 4860 lb/d. Assume Waste Activated Sludge at 10,000 mg/L. Return as lagoon decant.	Flow=0.06 Mgal/d BOD Load = 25 lb/d TSS Load = 25 lb/d TKN Load = 2 lb/d
Filter Backwash Water	3% of 1.63 Mgal/d forward flow	Flow=0.05 Mgal/d BOD Load = 136 lb/d TSS Load = 136 lb/d TKN Load = 11 lb/d
Sludge Dewatering Return Flow	Belt press feed flow = 300 gpm (total, 3 units) Belt press sprays = 210 gpm (total, 3 units) Belt Press Average Operation Time in Critical Design Month (Winter) = 72 hrs/month Return as Lagoon Decant	Flow=0.07 Mgal/d BOD Load = 29 lb/d TSS Load = 29 lb/d TKN Load = 2 lb/d
Total		Flow=0.18 Mgal/d BOD Load = 190 lb/d TSS Load = 190 lb/d TKN Load = 15 lb/d
Total as Percent of Influent Flows and Loads	Compare to average influent flow and peak month loads. These are very approximate numbers; just use rounded allowances as indicated.	Flow = 10% BOD Load = 5% TSS Load = 5% TKN Load = 2%

Table 11-2 Assumed Annual Average Recycle Flows

Recycle Stream	Basis	Estimate Flow and Loads
Waste Activated Sludge	Assume sludge yield solids load approximately equal to average influent BOD load = 3738 lb/d. Assume Waste Activated Sludge at 10,000 mg/L. Return as lagoon decant.	Flow=0.04 Mgal/d BOD Load = 25 lb/d TSS Load = 25 lb/d TKN Load = 2 lb/d
Filter Backwash Water	3% of 1.63 Mgal/d Forward Flow	Flow=0.05 Mgal/d BOD Load = 136 lb/d TSS Load = 136 lb/d TKN Load = 11 lb/d
Net Precipitation Minus Evaporation on Sludge Lagoon Used as Recycle Source	Lagoon area = 90,000 ft^2. Net evaporation rate estimated at 0.22"/d for six months and zero for six months each year.	Flow=-0.006 Mgal/d This can be neglected
Sludge Dewatering Return Flow (a)	Estimated annual average solids dewatering rate of 2,840 lb/d after solids destruction in lagoons. Belt presses loaded at 500 lb/hr at 1% solids and belt wash water flow = 70% of feed flow. Return as lagoon decant.	Flow=0.06 Mgal/d BOD Load = 38 lb/d TSS Load = 38 lb/d TKN Load = 3 lb/d
Total		Flow=0.15 Mgal/d BOD Load = 199 lb/d TSS Load = 199 lb/d TKN Load = 16 lb/d
Total as Percent of Influent Flows and Loads	Compare to average influent flows and loads. These are very approximate numbers; just use rounded allowances as indicated.	Flow = 10% BOD Load = 5% TSS Load = 5% TKN Load = 2%

(a) Total solids remaining after holding in the sludge lagoons was estimated to be 76% of the solids yield from the secondary process. This allowance was assumed to account for all factors impacting sludge lagoon solids, including any solids in sludge dewatering return flows, solids due to algal growth and deposition in the lagoons, and solids decomposition (digestion) in the lagoons and digester.

11.5 SECONDARY PROCESS ANALYSIS METHODS AND CRITERIA

Process design calculations were completed using both a spreadsheet-based model and using the BioWin process simulator. Each of these methods are discussed below, including key input criteria. In all cases, a critical design winter temperature of 13°C was used. Additionally, the critical design condition was based on average day maximum monthly loads occurring at the same time as average annual flows. This represents a reasonable worst case leading to high influent constituent concentrations (BOD and TSS at 358 mg/L and TKN at 72 mg/L; see Table 5-12 in Section 5).

The focus of the process analysis discussed below is on Plant 2. It is considered particularly important to maximize the capacity and use of Plant 2 and to use Plant 1 when necessary. All of the improvements and capacity determinations developed for Plant 2 are adapted to Plant 1 later in this Section.

Because the sizing of anoxic basins will impact the capacity and performance of the oxidation ditches, it is necessary to consider the anoxic basins and oxidation ditches in a combined analysis. In particular, increased sizing of the anoxic basins will generally improve denitrification performance and compliance with the effluent nitrate+nitrite-N permit limit of 10 mg/L. However, increasing anoxic volumes will result in a lower net growth rate of the microorganisms responsible for ammonia removal (nitrification). The objective of this analysis is to find the most efficient and cost-effective means of accomplishing both nitrification and denitrification as needed to meet effluent limitations for ammonia-N and nitrate+nitrite-N at the same time.

One of the most important design parameters used in the spreadsheet model and in BioWin simulations is the aerobic mean cell residence time (MCRT) needed to attain reliable nitrification. Therefore, this topic is considered first below.

11.5.1 Preliminary Evaluation of Mean Cell Residence Time Required for Reliable Nitrification

Nitrification, which is the biological conversion of ammonia to nitrite and nitrate, is the first step in nitrogen removal and is the rate-limiting step under low temperature conditions. Nitrification occurs under aerobic conditions (in the presence of dissolved oxygen), while the subsequent conversion of nitrate to nitrogen gas (denitrification) occurs under anoxic conditions (oxygen absent, but nitrate present). For Discovery Bay, nitrification will occur in the oxidation ditches and denitrification will occur in the anoxic basins.

Since the bacteria that accomplish nitrification grow only under aerobic conditions, it is necessary that the aerobic MCRT (total MCRT multiplied by the fraction of the total reactor basin volume that is aerobic; i.e., oxidation ditch volume divided by the total volume of the oxidation ditch and associated anoxic basin) be long enough so that the net growth rate is faster than the rate at which these bacteria are removed in waste activated sludge and so that an adequate population of nitrifiers can be sustained to attain the desired effluent ammonia-nitrogen concentration (ammonia-N<0.7 mg/L). The net growth rate is the rate of growth minus the rate of decay, noting that growth occurs only under aerobic conditions (in the oxidation ditches), but decay occurs under both aerobic and anoxic conditions (in the oxidation ditches and in the anoxic basins). Therefore, in the anoxic basins, the population of active nitrifiers will decrease. Theoretical aerobic MCRTs (with no safety factor) required to attain an effluent ammonia-nitrogen concentration of 0.7 mg/L are shown in Figure 11-3 as a function of the fraction of the total reactor basin volume that is under anoxic conditions and for various temperatures. For this study, anoxic basin volumes in the range of 0.2 to 0.4 Mgal at each oxidation ditch are considered. This range of anoxic volumes corresponds to anoxic volume fractions (anoxic volume divided by total reactor volume) of 0.17 to 0.29. For this range of anoxic volumes, and at the process design temperature of 13°C, the required aerobic MCRT ranges from approximately 10.7 days to 12.4 days (not including a safety factor). A modest safety factor of 1.25 would result in aerobic MCRTs from 13.4 to 15.5 days.

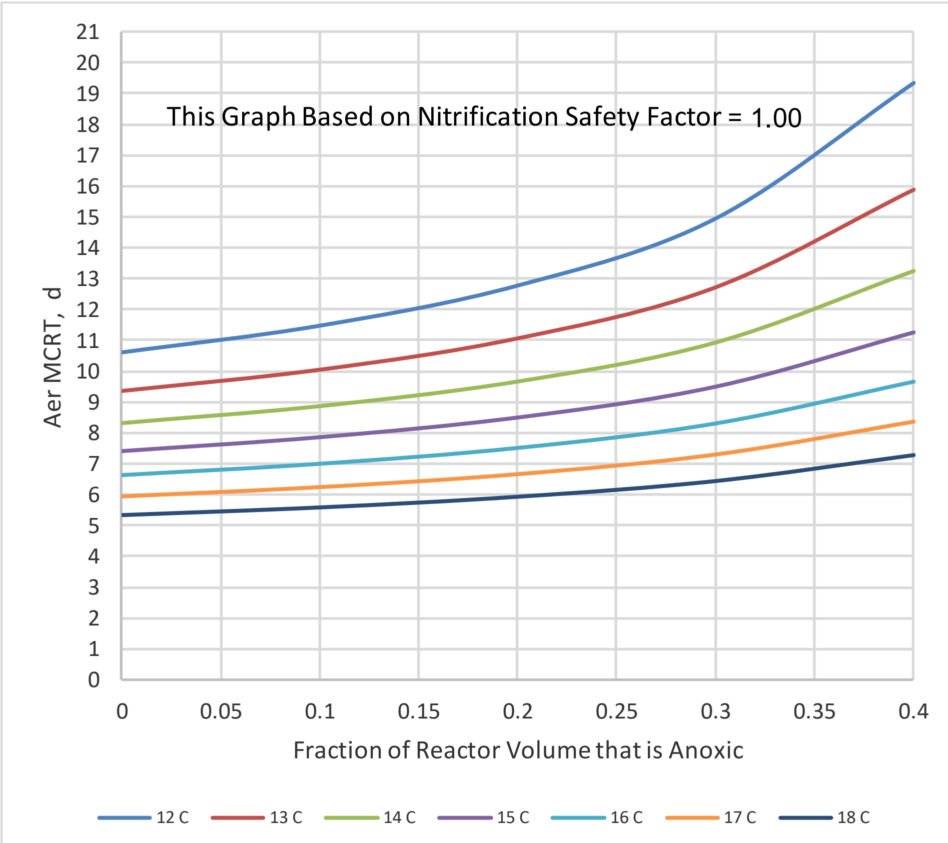

Figure 11-3 Aerobic MCRT for Nitrification vs Anoxic Volume Fraction and Temperature

The aerobic MCRTs shown in Figure 11-3 and discussed above are based on theoretical calculations that assume that the oxidation ditch is a completely mixed reactor in which the effluent ammonia-N concentration is 0.7 mg/L and the dissolved oxygen concentration is 2.0 mg/L everywhere throughout the volume. In reality, influent ammonia-N is introduced at one location in the oxidation ditch and is at that location immediately diluted by the flow of mixed liquor circulating around the ditch. As the mixed liquor continues its travel from the influent location to the effluent location in the ditch, the ammonia concentration is reduced. This means that the ammonia concentration at the influent location will be higher than the ammonia concentration at the effluent location. Since the rate of ammonia removal is higher with higher concentrations of ammonia, the average ammonia removal rate within the oxidation ditch will be higher than would occur at a constant ammonia-N concentration of 0.7 mg/L and the effluent ammonia-N will be lower than 0.7 mg/L. Similarly, dissolved oxygen concentrations are highest at the rotors and decrease downstream from the rotors, which also impacts the rate of ammonia removal. BioWin simulations are required to evaluate these impacts, as discussed later in this section.

11.5.2 Spreadsheet Model Description and Key Criteria

The capacity of the existing secondary treatment system at Plant 2 was assessed using a spreadsheet model to simultaneously solve biological process design equations for the oxidation ditches, secondary clarifiers and RAS pumping systems. In essence, the spreadsheet model is used to determine if the oxidation ditches are large enough to hold the biomass necessary for treatment and if the clarifiers are large enough to settle the mixed liquor solids flowing from the oxidation ditches, considering the settling characteristics of those solids. Although the spreadsheet model includes features for analysis of nitrification and denitrification, BioWin simulations are necessary to accurately evaluate performance with respect to ammonia-N and nitrate+nitrite-N concentrations.

Key parameter values used in the spreadsheet model, unless noted otherwise, are listed below:

- Average influent BOD = 275 mg/L
- Average influent TSS = 275 mg/L
- Average influent TKN = 55 mg/L
- Peak month BOD and TKN load = 1.3 x average annual BOD and TKN load
- Peak day BOD and TKN load = 2.0 x average annual BOD and TKN load
- Peak hour BOD and TKN load = 3.0 x average annual BOD and TKN load
- Peak day flow = 2.1 x average annual flow
- Peak hour flow = 3.0 x average annual flow
- Sludge yield based on Water Environment Federation Manual of Practice 8 (MOP8, Fourth Edition), Figure 11.7b, with mixed liquor solids 80% volatile
- Sludge Volume Index (SVI) = 175 mL/g
- Peak month recycle flow = 10% of influent flow
- Peak month recycle loads = 5% of influent loads

As noted above, sludge yields were based on values shown in Figure 11.7b of MOP8. For example, with a hypothetical 20-day total mean cell residence time (MCRT) and a temperature of 13°C, the sludge yield would be estimated to be about 0.93 pounds of total suspended solids (TSS) per pound of BOD removed. The MOP8 sludge yields are known to be conservatively high for most plants. Typical values would perhaps be around 80% of the MOP8 values. However, the MOP8 values are based on COD:BOD ratios of 1.9 to 2.2, while the ratio for Discovery Bay is estimated at 2.5 (see Section 5), and this would imply higher than typical sludge yields. Unfortunately, long-term reliable plant influent load data that would be needed to verify actual plant sludge yields are not available. Based on the uncertainty of actual sludge yields, the capacity assessments presented herein are approximate, but believed to be reasonably conservative.

The SVI of 175 mL/g assumed for this analysis is believed to be reasonably conservative (high) for the proposed system with an anoxic basin ahead of an aerobic basin when the aerobic basin is operated always with a relatively high dissolved oxygen concentration (2 mg/L) to assure reliable nitrification. Use of low dissolved oxygen concentrations are detrimental to nitrification and can cause sludge bulking (higher SVI).

11.5.3 Basis of BioWin Simulations

In addition to wastewater characteristics described for use in the spreadsheet model, BioWin requires more detailed characterization of the influent wastewater in terms of COD fractions. Key parameter values used in this study are summarized in Table 11-3. In addition to COD fractions, an SND switching function parameter is identified in Table 11-3 and discussed below because of its importance in the denitrification evaluations. BioWin default values were used for parameters not specifically mentioned below.

Table 11-3 COD Fractions Used in BioWin Simulations

Symbol	Description and Comments	BioWin Default	Value Used
F_{up}	Fraction of total COD that is unbiodegradable particulate. This value can vary significantly from plant to plant. Higher values are common with a high COD/BOD ratio. Theoretical calculations for conversions between BOD and COD were used to determine a value of 0.28.	0.13	0.28
F_{bs}	Fraction of total COD that is soluble and biodegradable (i.e., readily biodegradable COD or rbCOD). This parameter is very important in anoxic basin sizing. A value of 0.17 was determined in the previous Master Plan Amendment 2 and was used in this study.	0.16	0.17
F_{us}	Fraction of total COD that is soluble and unbiodegradable. A value of 0.07 was determined in the previous Master Plan Amendment 2 and was used in this study.	0.05	0.07
K	SND Switching Function Constant. This value determines the extent that denitrification can occur in a reactor with low dissolved oxygen concentrations. A higher value results in increased simultaneous denitrification in an aerobic reactor. When the previous Master Plan Amendment 2 was prepared, the BioWin default for this parameter was 0.05 mg/L. The current version of BioWin uses a default value of 0.15, which has the net effect of indicating improved denitrification and allowing smaller anoxic sizing. The lower BioWin default value was used in the previous Master Plan and the new higher default value was used for this study.	0.15	0.15

Because of the high recirculation rates around an oxidation ditch, the ditch is almost like a completely mixed reactor and is frequently modeled as such with adequate accuracy. However, as mentioned previously, some variations in process conditions do occur as the mixed liquor circulates around the oxidation ditch from the influent location to the effluent location. Most importantly for this study, and as previously mentioned, dissolved oxygen and ammonia concentrations vary (dissolved oxygen varies to a much greater extent than ammonia).

To provide a more precise evaluation of nitrification and denitrification performance, the oxidation ditch was modeled as six completely mixed reactor basins in series with a high recirculation flow rate representing the velocity of mixed liquor circulating around the oxidation ditch and with oxygen supply (rotors) only in the first and fourth reactor compartments. At a velocity of 1.0 ft/s, the mixed liquor circulating around each ditch is equivalent to a flow rate of about 135 Mgal/d. However, the two oxidation ditches and the three clarifiers at Plant 2 were combined into a single process train with total basin volumes and areas equivalent to the sum of the individual units. Therefore, in the model, a single 2 Mgal oxidation ditch with a recirculation flow rate of 270 Mgal/d was used. The BioWin flow diagram used to represent the Plant 2 secondary treatment system is show in Figure 11-4.

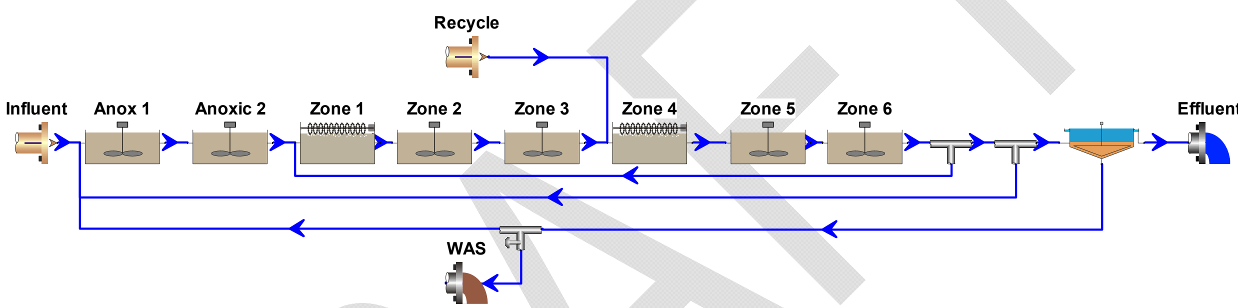

Figure 11-4 BioWin Flow Diagram for Plant 2 Secondary Treatment Facilities

As shown in Figure 11-4, the anoxic volume ahead of the ditch was modeled as two reactors in series, which is consistent with the design intent to compartmentalize these anoxic zones.

After some experimentation, it was determined that a dissolved oxygen setpoint concentration of 2.5 mg/L in Zones 1 and 4 (at the rotors), generally resulted in dissolved oxygen concentration of about 2.0 and 1.5 mg/L in the subsequent two zones, respectively, and in an average dissolved oxygen concentration of about 2.0 mg/L throughout the ditch.

As shown in the flow diagram, plant recycle streams were introduced between Zones 3 and 4, which represents the actual configuration in the field.

11.6 PLANT 2 CAPACITY EVALUATIONS USING THE SPREADSHEET MODEL

After preliminary evaluations, it was determined that process analyses should be accomplished over a range of aerobic MCRT values of 10 to 16 days and over a range of anoxic/aerobic volume ratios of 0.2 to

0.4. Accordingly, aerobic MCRT values of 10, 12, 14, and 16 days were evaluated at anoxic/aerobic volume ratios of 0.20, 0.25, 0.30, 0.35, and 0.40, resulting in 20 different combinations. The results of the 20 analyses are shown graphically in Figure 11-5, which shows the "potential capacity" of Plant 2 as a function of aerobic MCRT and the anoxic volume at each oxidation ditch. Since each oxidation ditch has a volume of 1.0 Mgal, the anoxic volume at each ditch in Mgal is numerically equivalent to the to the anoxic/aerobic volume ratio. The term "potential capacity" is used to indicate the capacity as limited by the volume of the ditches, the area of the clarifiers, and the RAS pumping rates. To realize the potential capacity, the nitrification and denitrification performance must be confirmed by BioWin simulations and the capacity of the oxygen delivery system (aeration rotors) must be adequate to support this capacity.

As shown in Figure 11-5, plant capacity is primarily a function of the aerobic MCRT, and is only slightly impacted by the anoxic volume.

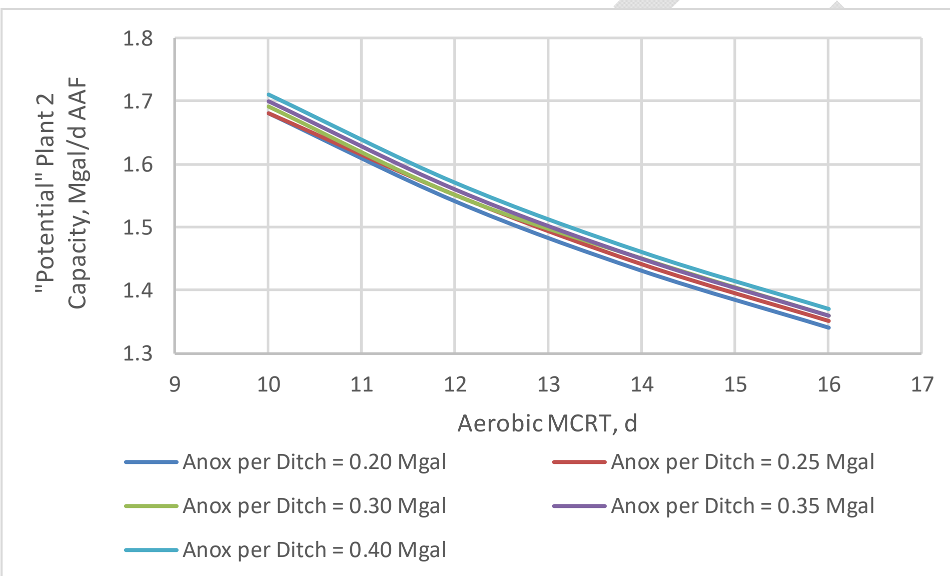

Figure 11-5 Plant 2 "Potential Capacity" Determined by Spreadsheet Model

11.7 PLANT 2 NITRIFICATION AND DENITRIFICATION PERFORMANCE DETERMINED FROM BIOWIN SIMULATIONS

Nitrification and denitrification performance was evaluated first by a series of steady state simulations and then refined by dynamic simulation as discussed below.

11.7.1 Steady State BioWin Simulations

A separate steady state BioWin simulation was performed for each of the twenty combinations of aerobic MCRT and anoxic/aerobic volume ratio described for the spreadsheet analysis. In each case, the influent flow rate used in BioWin was the capacity determined in the spreadsheet model. Key results are shown in Figures 11-5 through 11-7, which are discussed below.

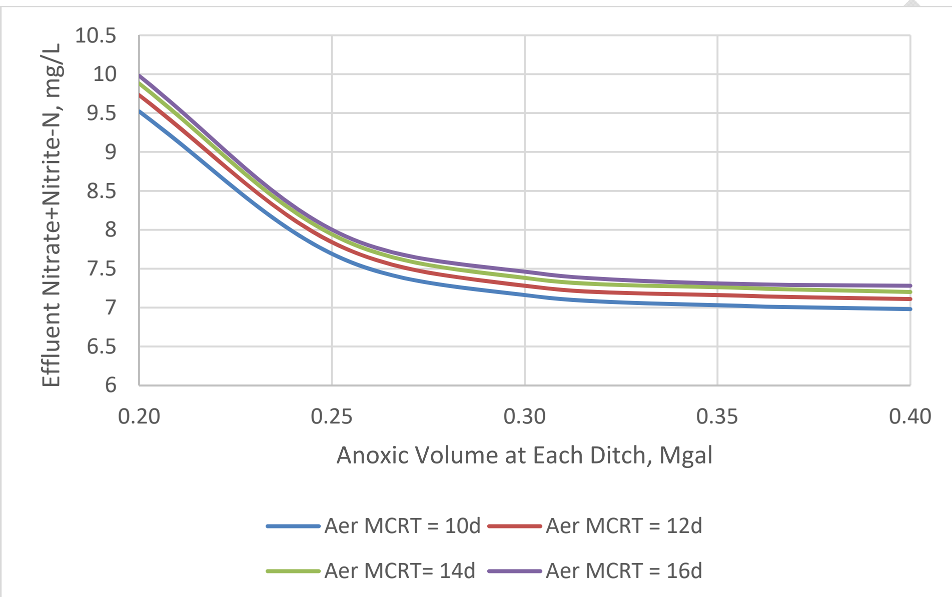

Figure 11-6 Effluent Nitrate+Nitrite-N Determined from BioWin Simulations

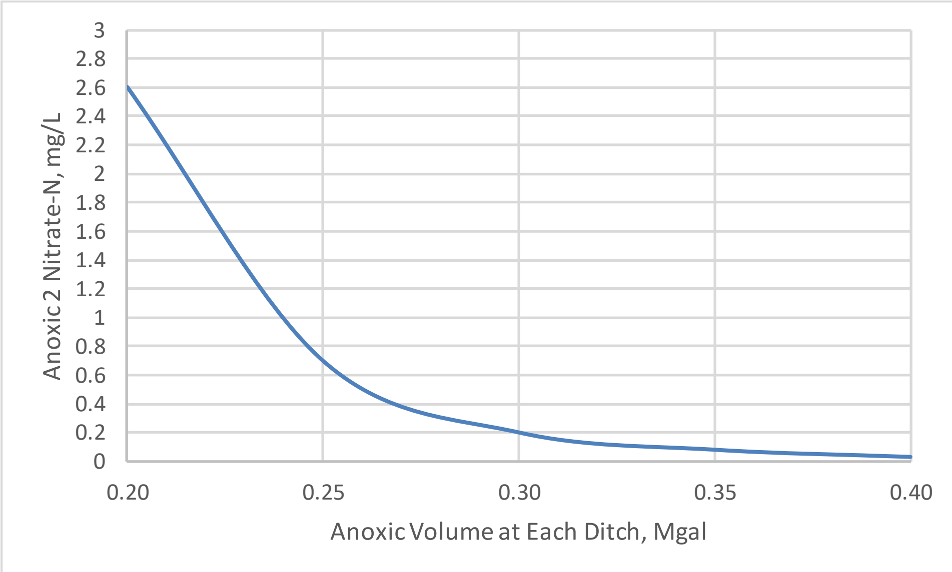

Figure 11-7 Anoxic2 Nitrate-N Determined from BioWin Simulations

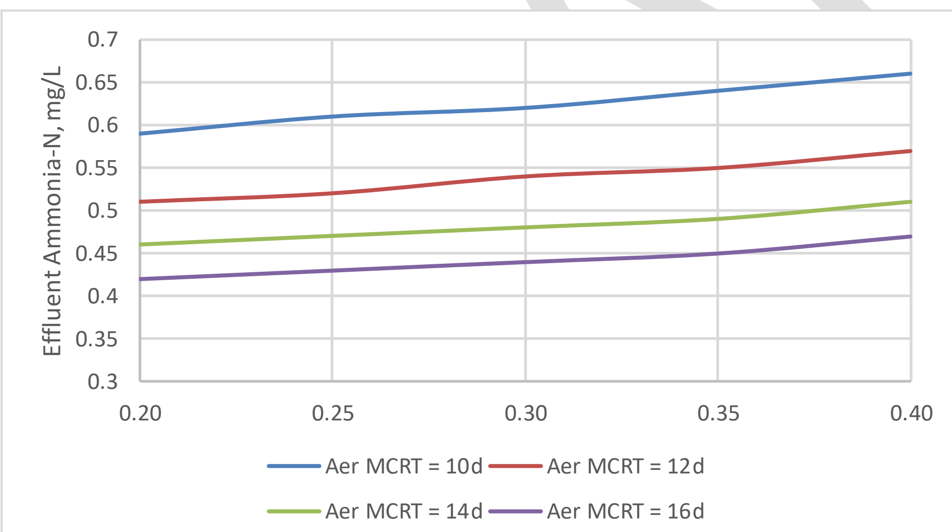

Figure 11-8 Effluent Ammonia-N Determined from BioWin Simulations

Appropriate sizing of the anoxic basin is indicated when essentially all of the nitrate-nitrogen returned to the anoxic basin is removed in the anoxic basin and the effluent nitrate+nitrite-N concentration remains within the design objective. In this case the design objective was to meet an effluent nitrate+nitrite-N concentration below 8.0 mg/L, providing a 2 mg/L safety buffer below the permit limit of 10 mg/L. As shown in Figure 11-6, this limit was satisfied for all anoxic volumes above 0.25 Mgal at each ditch, although the results for 0.25 Mgal are marginal and not recommended. The aerobic MCRT has only a minor impact on the denitrification performance. Essentially complete nitrate removal (<0.2 mg/L) in the anoxic zones was indicated for anoxic volumes over 0.30 Mgal per ditch (Figure 11-7). Higher nitrate concentrations in the second anoxic zone (Anoxic 2) are indicative of inadequate anoxic volume and/or inadequate readily biodegradable COD.

Although an anoxic volume of only 0.3 Mgal at each ditch would be expected to perform adequately, an anoxic volume of 0.35 Mgal would provide additional resiliency against potential adverse conditions, which could include a reduction in the influent readily biodegradable COD below the value assumed for this analysis (i.e., F_{bs} < 0.17). Another potential adverse outcome could occur if a value of the SND switching function constant lower than the current BioWin default used in this analysis was found to more accurately represent the performance of the Discovery Bay oxidation ditches after improvements. The value of the switching function constant is sensitive to the degree of mixing and to the extent to which oxygen delivery is distributed over the entire ditch volume rather than be localized at two rotor locations. Therefore, increased mixing and less DO variations in the ditch could occur with supplemental aeration equipment (discussed later in this section) and could lead to a lower switching function value after improvement than before. While it is believed that the current value of the switching function should be appropriate even after improvements, it is nice to have an additional safety buffer. For this reason, an anoxic volume of 0.35 Mgal at each ditch is suggested.

In the previous Master Plan Amendment 2, an anoxic volume of 0.4 Mgal at each ditch was suggested. This higher volume is believed to be mostly the result of the lower switching function constant value used at that time (0.05 mg/L, which was the BioWin default value at that time).

As shown in Figure 11-8, the effluent ammonia-N concentration is mostly a function of the aerobic MCRT, with some variation due to anoxic volume (higher ammonia concentrations with higher anoxic volumes). To provide a safety buffer below the permit limit of 0.7 mg/L, a target value of 0.5 mg/L is suggested. This would require an aerobic MCRT of at least 14 days.

11.7.2 Dynamic BioWin Simulations to Confirm Performance

Based on the steady state simulations discussed above, the recommended anoxic volume at each ditch is 0.35 Mgal and the tentatively recommended aerobic MCRT is 14 days. The spreadsheet model indicates a Plant 2 capacity of 1.45 Mgal/d average annual flow for these conditions.

To estimate the impact of diurnal flow and load variations, a hypothetical influent flow pattern was used in five-day dynamic BioWin simulations. The influent flow was assumed to be 50%, 100%, 150%, and 100% of the average annual flow (1.45 Mgal/d), respectively, in successive 6 hour blocks of time during each day. Influent concentrations for all parameters were held constant at the “worst-case” values previously indicated (i.e., 358 mg/L for BOD and TSS and 75 mg/L for TKN).

Several dynamic runs were completed based on BioWin default kinetics for the ammonia oxidizing bacteria (AOB) to investigate impacts of varying the DO and aerobic MCRT. A subsequent simulation was performed with revised AOB kinetics, which may be more representative of actual conditions in the oxidation ditches. All of the simulations are discussed below.

11.7.2.1 Dynamic BioWin Simulations with Default AOB Kinetics

The resulting variability in effluent ammonia-nitrogen concentrations and the daily average values that would be measured in hypothetical Plant 2 effluent flow-proportional composite samples are shown in Figure 11-9. A similar graph showing effluent nitrate- and nitrite-nitrogen results is presented in Figure 11-10.

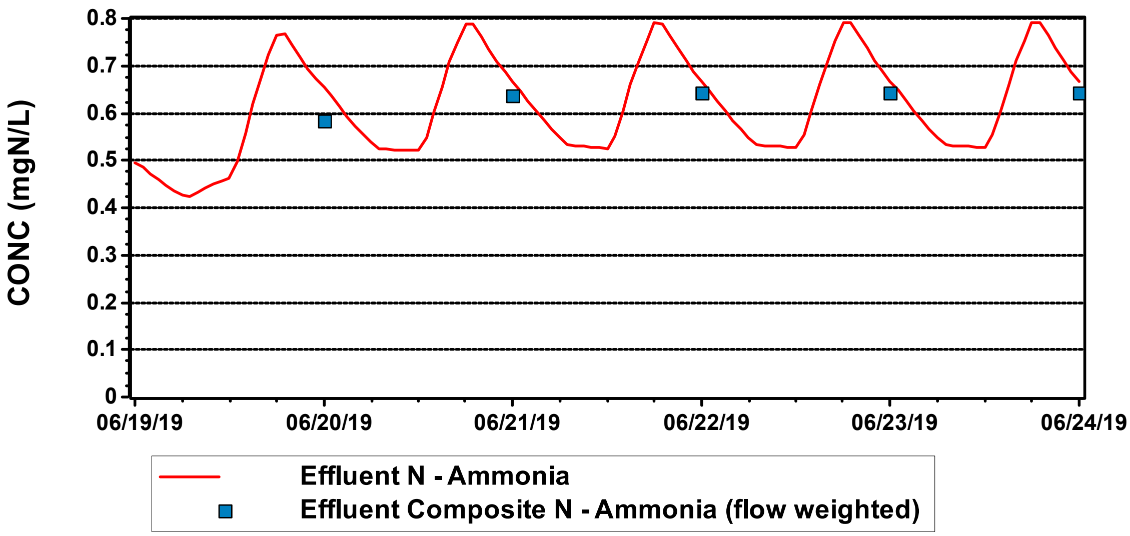

Figure 11-9 Effluent Ammonia-N Determined from Dynamic BioWin Simulation (1.45 Mgal/d, Aerobic MCRT = 14d, DO at Rotor = 2.5 mg/L)

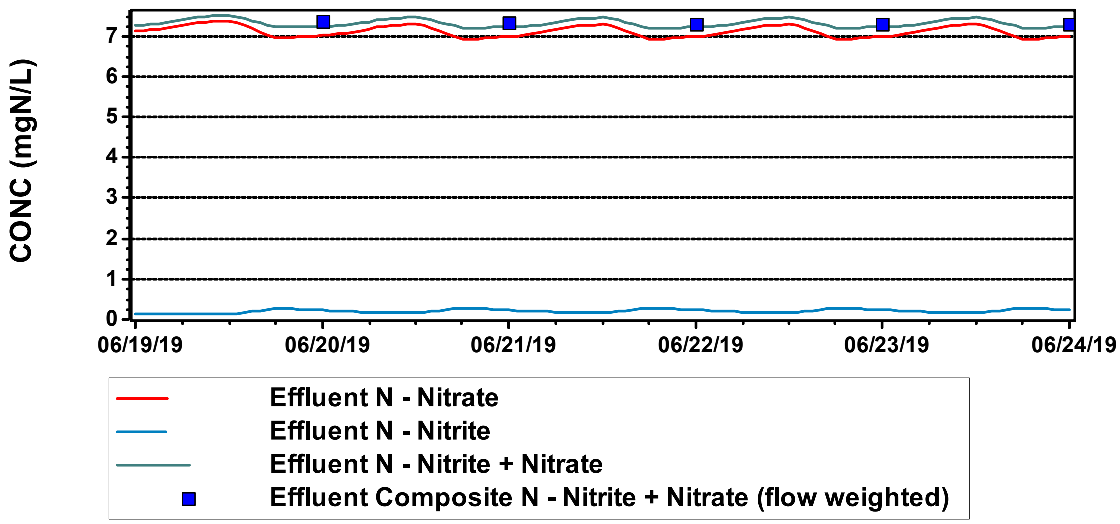

Figure 11-10 Effluent Nitrate and Nitrite Determined from Dynamic BioWin Simulation (1.45 Mgal/d, Aerobic MCRT = 14d, DO at Rotor = 2.5 mg/L)

As shown in Figure 11-9, the assumed diurnal flow and load variation resulted in significant diurnal variations in the effluent ammonia concentration and resulted in 24-hour flow weighted composite effluent ammonia-N concentrations near 0.64 mg/L, which is below the permit limit of 0.7 mg/L, but uncomfortably close. It is noted that these results are based on assumed diurnal flow and load variations and results could vary somewhat with an actual flow and load diurnal pattern for Discovery Bay. This topic should be investigated in detail during final design. From Figure 11-10, it is apparent that the effluent nitrate+nitrite-N was fairly stable and always below the target value of 8 mg/L.

To help lower the effluent ammonia concentration, the oxidation ditch dissolved oxygen concentration could be increased, but this would require more aeration capacity and would result in higher energy consumption than operation at lower dissolved oxygen. The results of a dynamic BioWin simulation with the dissolved oxygen concentration increased from 2.5 to 3.0 mg/L at the rotors are shown in Figures 11-11 and 11-12. As indicated in Figure 11-11, the effluent ammonia-N daily composite concentration was lowered to about 0.60 mg/L. Nitrate and nitrite performance remained very good (Figure 11-12).

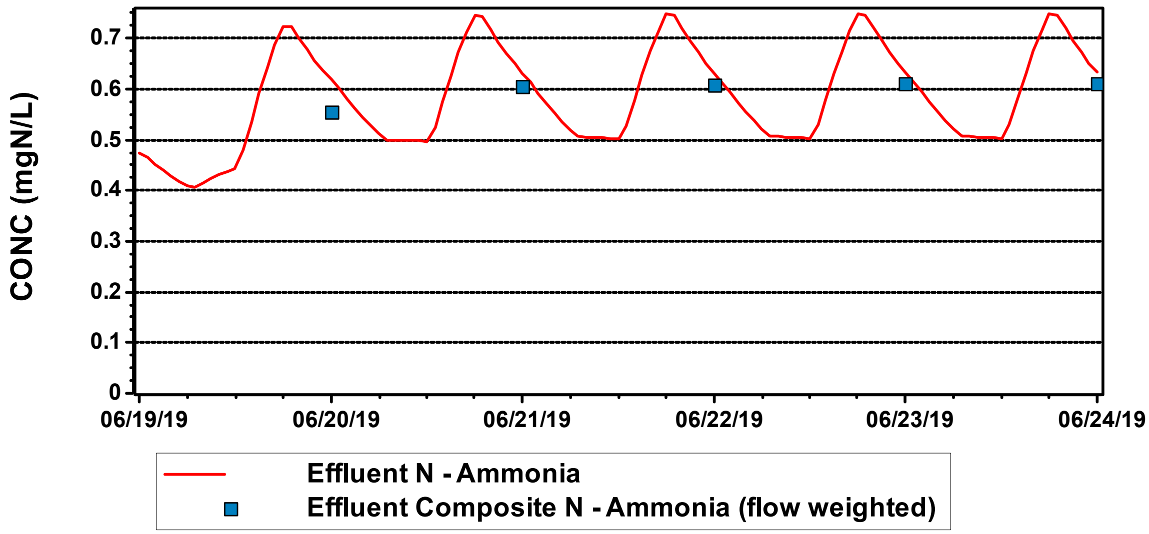

Figure 11-11 Effluent Ammonia-N Determined from Dynamic BioWin Simulation (1.45 Mgal/d, Aerobic MCRT = 14d, DO at Rotor = 3.0 mg/L)

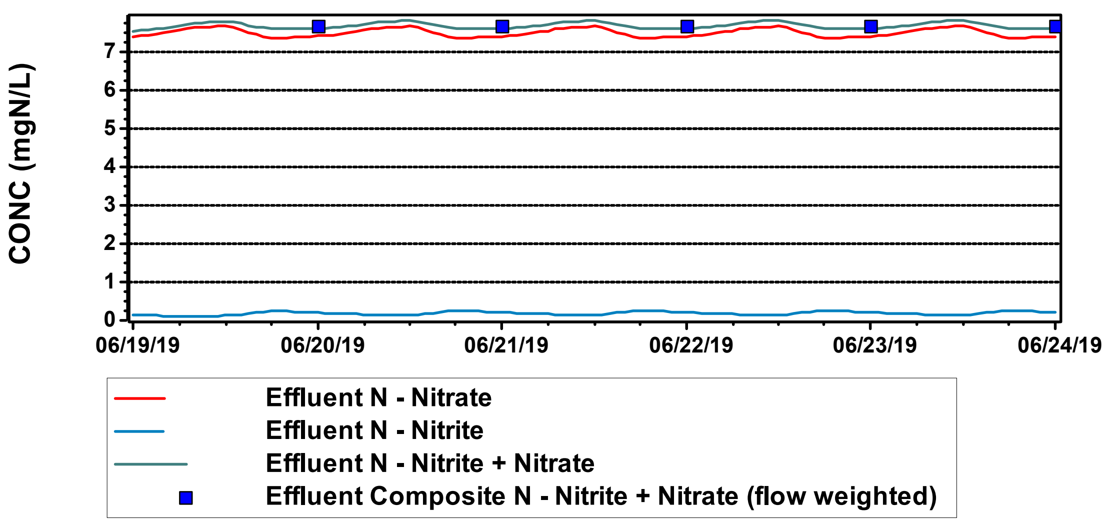

Figure 11-12 Effluent Nitrate and Nitrite Determined from Dynamic BioWin Simulation (1.45 Mgal/d, Aerobic MCRT = 14d, DO at Rotor = 3.0 mg/L)

To help further lower the effluent ammonia concentration, the aerobic MCRT was increased to 16 days and the influent flow was decreased to the corresponding capacity of 1.36 Mgal/d in another dynamic BioWin simulation. The dissolved oxygen concentration at the rotors was kept at the higher value of 3.0

mg/L. As shown in Figure 11-13, the effluent ammonia-N composite concentration was lowered to about 0.56 mg/L, while the nitrate+nitrite remained at desired levels (Figure 11-14).

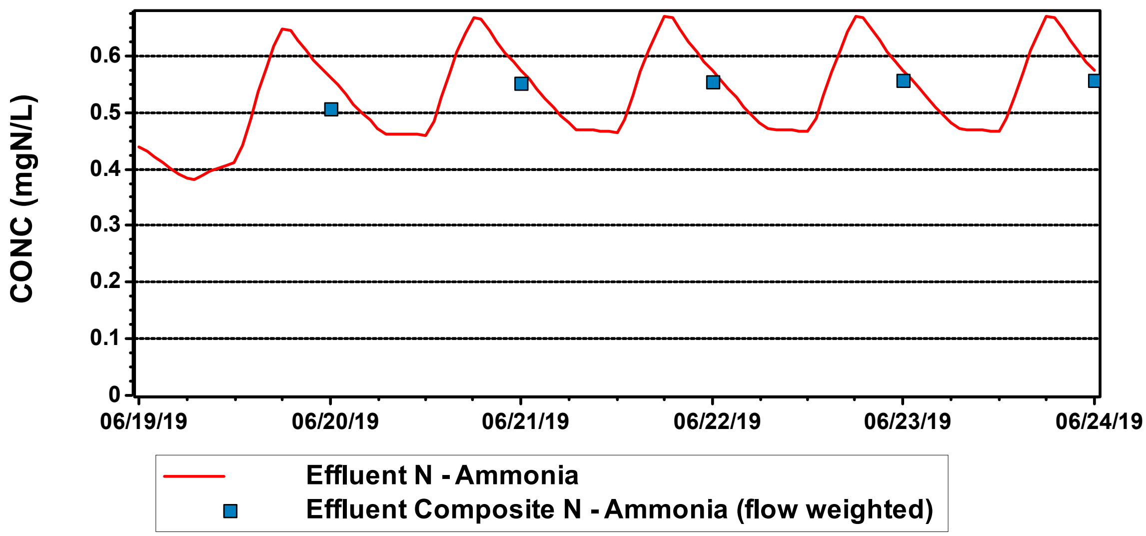

Figure 11-13 Effluent Ammonia-N Determined from Dynamic BioWin Simulation (1.36 Mgal/d, Aerobic MCRT = 16d, DO at Rotor = 3.0 mg/L)

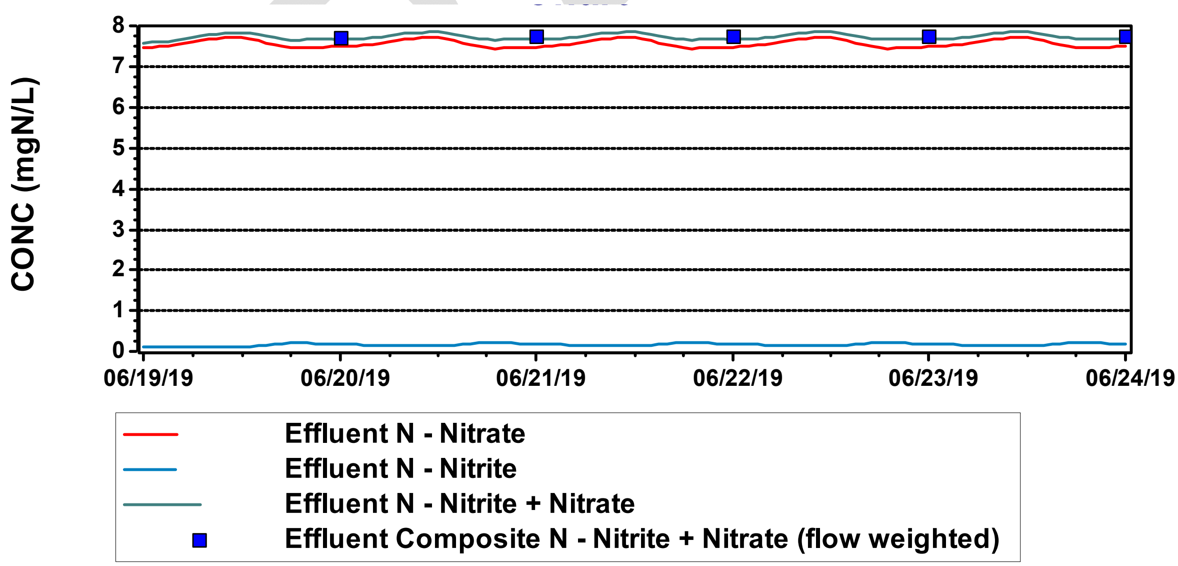

Figure 11-14 Effluent Nitrate and Nitrite Determined from Dynamic BioWin Simulation (1.36 Mgal/d, Aerobic MCRT = 16d, DO at Rotor = 3.0 mg/L)

11.7.2.2 Dynamic BioWin Simulations with Revised AOB Kinetics

Throughout the oxidation ditch ammonia-n concentrations always will be very low and near the effluent concentration (typically below 0.7 mg/L). With these low concentrations, it is likely that AOBs that can scavenge ammonia at very low concentrations will be selected and acclimated. These type of bacteria are referred to as “K-strategists” because the ammonia-n concentration at which their growth rate is reduced to 50 percent of maximum (this is the ammonia half saturation constant Kn) is much lower than for AOB that proliferate when ammonia concentrations are much higher (these are called μ-strategists [or r-strategists], where μ is the specific growth rate). For example, Kn values for K-strategists could be around 0.3 mg/L versus the 0.7 mg/L BioWin default for AOB. However, the maximum specific growth rate ($\mu_{max,20}$) for K-strategists are also believed to be lower than the BioWin default (perhaps 0.7 g/g-d versus 0.9 g/g-d), which partially offsets the decrease in Kn with regard to ammonia removal. The exact values for Kn and $\mu_{max,20}$ that will be applicable to the oxidation ditches in Discovery Bay is not well established in scientific literature, although it is generally recognized that values lower than BioWin defaults are appropriate. This topic was discussed with Dr. Christopher Bye, Senior Process Engineer and Director of Software Development at Envirosim, the developer of BioWin and with Dr. Imre Takacs, CEO of Dynamita and developer of the SUMO simulation software, which is similar to BioWin. Borth Drs. Bye and Takacs agree that it is entirely reasonable to use a lower Kn value for oxidation ditches and other nearly complete-mix reactors where the ammonia concentration is always and everywhere very low.

Based on the above, the dynamic BioWin simulation based on an average Plant 2 flow of 1.45 Mgal/d, an aerobic MCRT of 14 days, and a dissolved oxygen concentration of 2.5 mg/L at the rotors was repeated with a Kn value of 0.3 mg/L and a $\mu_{max,20}$ value of 0.7 g/g-d. The ammonia-n and nitrate+nitrite-n results are shown in Figures 11-15 and 11-16, respectively. As shown in the figures, the composite ammonia-n concentration was reduced to about 0.52 mg/L, compared to 0.64 mg/L when default AOB kinetics were used (Figure 11-9). The effluent nitrate+nitrite-n concentrations were not impacted by the change in AOB kinetics and remained under good control.

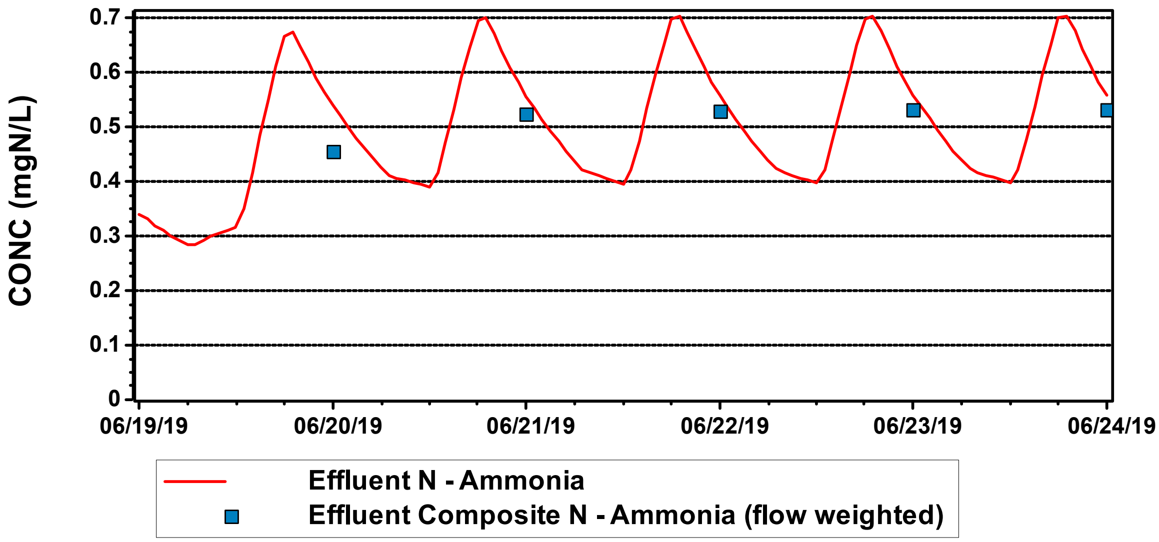

Figure 11-15 Effluent Ammonia-N Determined from Dynamic BioWin Simulation with Revised AOB Kinetics (1.45 Mgal/d, Aerobic MCRT = 14d, DO at Rotor = 2.5 mg/L)

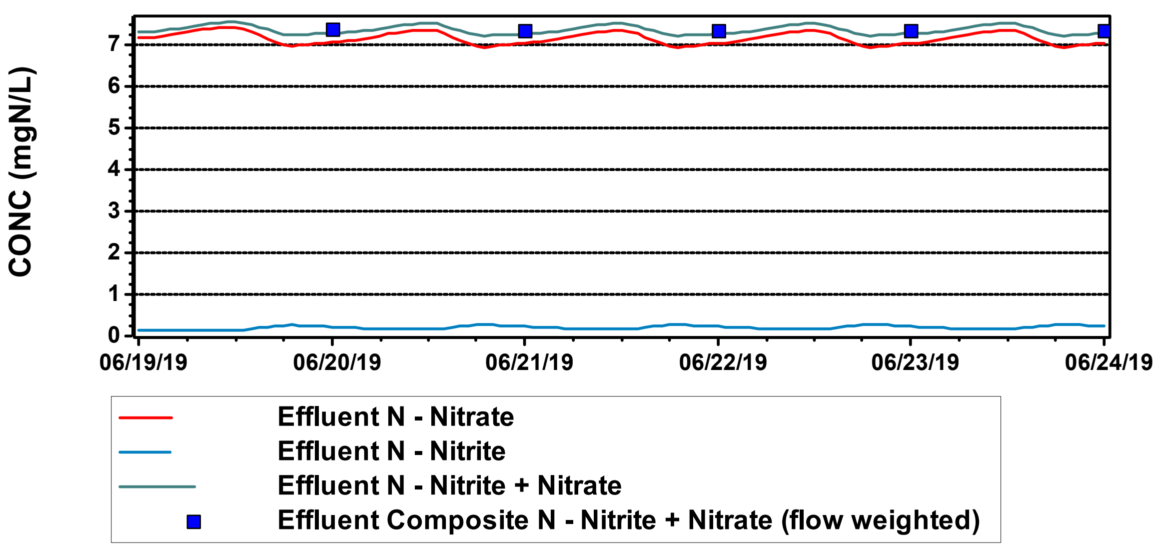

Figure 11-16 Effluent Nitrate and Nitrite Determined from Dynamic BioWin Simulation with Revised AOB Kinetics (1.45 Mgal/d, Aerobic MCRT = 14d, DO at Rotor = 2.5 mg/L)

11.7.2.3 Conclusions from Dynamic Simulations

As discussed in the foregoing subsections, Plant 2 would be expected to easily meet effluent nitrate+nitrite-n requirements and just meet effluent ammonia-n requirements when operated at a capacity of 1.45 Mgal/d, an anoxic volume of 0.35 Mgal at each ditch, aerobic MCRT of 14 days, and a dissolved oxygen concentration at the rotors of 2.5 mg/L, when using BioWin default AOB kinetics. The effluent ammonia-n can be lowered by operating at a higher aerobic MCRT (for example, 16 days, which would lower Plant 2 capacity to 1.36 Mgal/d) and/or a higher dissolved oxygen concentration at the rotors (for example, 3.0 mg/L, which would require additional aeration capacity and would result in higher power costs compared to 2.5 mg/L). However, it is unlikely that it would be necessary to increase the aerobic MCRT or the dissolved oxygen concentration to attain ammonia-n concentrations safely below permit requirements, based on revised kinetics for K-strategist AOB.

The recommended approach is to base the Master Plan on a Plant 2 capacity of 1.45 Mgal/d AAF (and corresponding capacity for Plant 1), with an anoxic volume of 0.35 Mgal at each ditch, an aerobic MCRT of 14 days, and dissolved oxygen concentrations of 2.5 mg/L at the rotors (2.0 mg/L average within the entire oxidation ditch volume). This determination should be confirmed during preliminary and detailed design when the plant influent characteristics database is updated based on revised influent sampling and after additional monitoring is completed to confirm the actual diurnal load pattern and fraction of readily biodegradable COD (F_{bs}). In the worst-case scenario, if a lower capacity is then established for Plant 2 (this is considered unlikely), more use of Plant 1 might be appropriate under critical worst-case operating conditions (peak month load combined with design peak hour flow, temperature of 13°C, and SVI of 175 mL/g).

11.8 PLANT 1 AND PLANT 2 CAPACITY ASSESSMENTS UNDER VARIOUS SCENARIOS

Capacity assessments for Plant 1 and Plant 2, each with an anoxic volume of 0.35 Mgal/d at each oxidation ditch, were completed using the spreadsheet capacity model for various scenarios. Two main flow and load conditions were evaluated: 1) cold temperatures with peak flows and loads, and 2) warm temperatures with average flows and peak loads. The cold temperatures with peak flows and loads scenarios correspond to the to the critical design conditions investigated previously and are based on a temperature of 13°C and an aerobic MCRT of 14 days. The warm temperatures with average flows scenarios are intended to represent conditions in the spring, summer, and fall months when oxidation ditches or clarifiers might be taken out of service for maintenance or repair. For these warm conditions, a temperature of 18°C was presumed (most representative of early spring and late fall) and the aerobic MCRT was set to 10 days. The highest diurnal influent peak flow associated with warm conditions and average flows was set at 1.7 times the average annual flow (compared to 3.0 used for the critical peak month). Results of the capacity analyses are shown in Table11-4.

Based on the results shown in Table 11-4, and as discussed previously, Plant 2 alone has a capacity of 1.45 Mgal/d annual average flow (AAF) under critical cold temperature design conditions and is not theoretically able to handle the full future design flow of 1.63 Mgal/d AAF. However, this is based on a combination of worst-case conditions for wastewater flows and loads, sludge settleability, and temperature. In actual practice, Plant 2 alone may be adequate to handle the entire future design flow for most of the year and perhaps throughout the year when conditions are more favorable than those assumed for this analysis.

Under the worst-case conditions discussed above, the capacity of Plant 1 with anoxic basin improvements is estimated to be 0.79 Mgal/d AAF. Therefore, the combined capacity of Plants 1 and 2 (2.24 Mgal/d AAF) would far exceed the future design flow (1.63 Mgal/d AAF).

In warm weather conditions, Plant 2 has a capacity of 1.86 Mgal/d AAF with one clarifier out of service and 1.37 Mgal/d with one oxidation ditch out of service. Therefore, at the future design flow of 1.63 Mgal/d, Plant 2 alone would be adequate with a clarifier out of service, but not with an oxidation ditch out of service.

The statement above are based on basin volumes and do not consider aeration capacity, which is discussed below.

Table 11-4 Secondary Treatment System Capacity Assessment Results

Scenario	Description	Mixed Liquor Temp, °C	Aerobic MCRT, days	Total MCRT, days	AAF(a) Capac., Mgal/d	Max Month MLSS, mg/L	Max Month WAS, lb/d
1	Plant 2, Cold, Peak Flows and Loads, All Units in Service	13	14	18.9	1.45	3,606	4,297
2	Plant 2, Warm, Average Flows, Peak Loads, All Units in Service	18	10	13.5	2.17	3,983	6,645
3	Plant 2, Warm, Average Flows, Peak Loads, One Clarifier Out of Service	18	10	13.5	1.86	3,417	5,700
4	Plant 2, Warm, Average Flows, Peak Loads, One Oxidation Ditch Out of Service	18	10	13.5	1.37	5,028	4,194
5	Plant 1, Cold, Peak Flows and Loads, All Units in Service	13	14	18.9	0.79	3,903	2,236
6	Plant 1, Warm, Average Flows, Peak Loads, All Units in Service	18	10	13.5	1.17	4,310	3,595
7	Plant 1, Warm, Average Flows, Peak Loads, One Clarifier Out of Service	18	10	13.5	0.90	3,307	2,759

(a) AAF = Average Annual Flow

(b) SOR = Standard Oxygen Requirement

11.9 EVALUATION OF AERATION CAPACITY AND SUPPLEMENTAL AERATION

The same spreadsheet model described previously in this section and used to generate Table 11-4 was used to determine standard oxygen requirements (SORs) for the ditches in Plant 1 and Plant 2 under various critical operating conditions with and without units out of service. In all cases, peak month and peak hour loads were presumed. As indicated in the Table 11-5, the worst case design condition occurs with peak summer temperatures and results in a maximum SOR of 8,574 lb/d per oxidation ditch in both Plant 1 and Plant 2.

As indicated in Section 11.1, in the worst-case scenario with one inside rotor out of service, the total existing aeration capacity in each ditch (with one inside rotor and two outside rotors running) is estimated to be 5,110 lb/d, indicating a deficit of 3,468 lb/d. If this deficit were to be met with two new rotors added to each ditch, the required capacity of each rotor would be 1,734 lb/d, which is between the capacities of the inside and outside rotors when all rotors are running (1,480 lb/d and 2,150 lb/d, respectively). However, it is currently unknown how hydrodynamic conditions in the ditches would be impacted by the new rotors and how the capacities of all rotors (existing and added) would be impacted by those conditions. For the purposes of this Master Plan, it is assumed that two 30 horsepower floating portable rotors would be added to two operating ditches (a total of four portable rotors).

If all three oxidation ditches were in service in the critical winter design condition and the flow split was 35% to Plant 1 and 65% to Plant 2 (the second row in Table 11-5), the required SOR in the Plant 1 ditch would be 5,996 lb/d, while the required SOR in each of the Plant 2 Ditches would be 5,576 lb/d. These are both less than the worst-case condition with one existing rotor out of service; therefore, one portable rotor would be required in each ditch (three rotors total, exceeding the required SOR capacity).

It is understood that use of portable rotors in the existing ditches was possible but problematic since the existing portable rotors have blunt pontoons and the front of the pontoons tend to be pushed downward due to the water velocity in the ditch. It may be possible to get revised pontoons with pointed ends, such as used in pontoon boats, to overcome this problem. Alternatively, other supplemental aeration alternatives such as fine bubble diffusers and blowers or jet aeration systems could be considered, while also accounting for the impacts of these supplemental aeration systems on the existing rotors.

As previously mentioned in Section 11-1, the true capacities of the existing rotors under various operating scenarios are uncertain and would require various field tests to confirm. These tests and the evaluation of supplemental aeration systems, which would depend on the tests, are beyond the scope of this Master Plan. For the purposes of this Master Plan, it is assumed that four portable rotors with improved pontoons will be needed. Since X portable rotors are existing, these would have to be modified and Y new rotors purchased.

Table 11-5 Oxidation Ditch Standard Oxygen Requirements Under Various Scenarios

Units Out of Service	Temp, °C	Aerobic MCRT, days	Total MCRT, days	Total Flow, Mgal/d	% Flow to Plant 1	% Flow to Plant 2	Plant 1 SOR (a), lb/d	Plant 2 SOR (a), lb/d	Plant 2 SOR (a) per Ditch, lb/d
None	13	14	18.9	1.63	35	65	6,135	11,468	5,734
None	25	10	13.5	1.63	35	65	5,996	11,152	5,576
Plant 1	13	14	18.9	1.45	0	100	0	15,696	7,848
Plant 1	25	10	13.5	1.63	0	100	0	17,148	8,574
Plant 2 Ditch	25	10	13.5	1.63	50 (b)	50 (b)	8,574	8,574	8,574

(a) Peak hour standard oxygen requirement (SOR) based on a dissolved oxygen concentration of 2.5 mg/L at the rotors, 2.0 mg/L average in ditch.

(b) Although Plant 2 with one ditch and three clarifiers in service would theoretically have more capacity than Plant 1 with one ditch and two clarifiers, a 50/50 flow split is selected to limit the oxygen requirement at Plant 2 to the value indicated in order to minimize standby aeration requirements in the oxidation ditch at Plant 2.

11.10 EVALUATION OF IN-GROUND CONCRETE BASINS VERSUS ABOVE-GRADE STEEL TANKS FOR ANOXIC VOLUME

Based on the analysis presented above, the recommended improvements include the construction of a 350,000-gallon anoxic basin ahead of each oxidation ditch, or the equivalent. Two alternatives are considered in this section: 1) in-ground concrete anoxic basins at each oxidation ditch, and 2) above-grade steel tanks at or near the oxidation ditches. Each of these alternatives is discussed below.

11.10.1 In-Ground Concrete Anoxic Basins

This alternative was recommended in the previous Master Plan Amendment 2 completed in 2015. At that time, the anoxic volume was to be 400,000 gallons (subdivided into two compartments) at each oxidation ditch. To fit within available site space, suggested inside dimensions for each of the 200,000-gallon compartments were approximately 41 feet square and 16 feet deep (liquid depth), subject to adjustment in detail design. With the reduction in anoxic volume to 350,000 gallons at each ditch (two 175,000-gallon compartments), the basin depth can be reduced from 16 feet to 14 feet, while maintaining the same footprint. However, compared to the previous estimated structural configuration, it is now recognized that a thicker slab will likely be required to resist groundwater buoyant forces. This results in increased concrete requirements, even though the basin depth is reduced. The final structural configuration is subject to verification in detail design. The proposed locations for the anoxic basins are shown in Figures 11-17 and 11-18, presented later in this document.

The desired internal mixed liquor recirculation (IMLR) flow from each oxidation ditch to its adjacent anoxic basin is 500% of the influent flow to that ditch. It is desirable to design the Plant 2 anoxic facilities to allow for the flexibility to treat the entire future design flow with Plant 1 out of service. In that case, the design average day maximum monthly flow to Plant 2 would be 1.96 Mgal/d, or 0.98 Mgal/d to each ditch. The corresponding diurnal peak flow is estimated at 1.5 x 0.98 Mgal/d = 1.47 Mgal/d, indicating a design IMLR flow rate of 7.35 Mgal/d at each ditch (500% of the influent flow). Two IMLR pumps, each with a capacity of 3.7 Mgal/d are suggested. It is considered adequate to have a spare pump stored on-site for reliability, rather than have three installed pumps per ditch. Each IMLR pump would be connected through a separate 16-inch pipeline with a magnetic flow meter. The IMLR pumps would be variable speed and controlled to obtain the desired ratio of flow to the plant influent flow. The return flow from each anoxic basin to the corresponding oxidation ditch would be accomplished with a new 36-inch pipeline to replace the existing 24-inch ditch influent pipeline.

For maximum operational flexibility and to have identical components, the improvements at Oxidation Ditch 1 in Plant 1 would be essentially the same as those at Oxidation Ditches 2 and 3 in Plant 2, except that the anoxic basins would be located to the side of the oxidation ditch (see Figure 11-18), instead of at the end, resulting in additional piping lengths.

A cost estimate for the proposed improvements is shown in Table 11-6.

Table 11-6 Cost Estimate for Concrete Anoxic Basins and Related Facilities

	Cost, $ (a)			
Item	Ditch 1 Anoxic	Ditch 2 Anoxic	Ditch 3 Anoxic	Total
Dewatering	165,000	165,000	165,000	495,000
Shoring	0	243,000	121,500	364,500
Excavation and Backfill	189,000	115,500	152,250	456,750
Concrete Structure and Guardrails	689,880	689,880	689,880	2,069,640
Pumps and Mixers	110,000	110,000	110,000	330,000
Piping and Appurtenances	251,800	120,600	120,600	493,000
Sitework	60,000	60,000	60,000	180,000
Electrical and Instrumentation	280,000	280,000	280,000	840,000
Subtotal 1	1,745,680	1,783,980	1,699,230	5,228,890
Subtotal 1, Rounded	1,746,000	1,784,000	1,699,000	5,229,000
Contingencies @ 20%	349,000	357,000	340,000	1,046,000
Subtotal 2	2,095,000	2,141,000	2,039,000	6,275,000
Engineering, Admin, and Environmental @ 25%	524,000	535,000	510,000	1,569,000
Total	2,619,000	2,676,000	2,549,000	7,844,000

(a) Mid 2019 cost level, ENR 20-Cities CCI = 11,300.

11.10.2 Steel Tank Anoxic Basins

Under this alternative, the anoxic volume per ditch and the IMLR flow per ditch would be the same as the concrete basin alternative. However, circular steel tanks above grade would be used instead of in-ground concrete basins. Additionally, for Plant 2, a single set of anoxic tanks would be used in conjunction with Oxidation Ditches 1 and 2. Therefore, for Plant 1, there would be two 175,000-gallon steel tanks, whereas for Plant 2, there would be two 350,000-gallon steel tanks. The tanks at each plant normally would be operated in series; however, piping would be provided to allow either one of the two tanks to be taken out of service while the other tank remains in service.

For this study, it is assumed that the water level in each tank would be 12 ft above grade. Although other configurations are possible, it is desirable to keep the water surface elevation somewhat low to minimize pumping requirements.

Currently, the influent and return activated sludge flows from the headworks into the oxidation ditches at each plant by gravity. Since it would be necessary to re-route these flows into the elevated tanks, a new pump station is required at each plant. Furthermore, since the IMLR flow from each ditch must also be pumped to the anoxic tanks, it would be cost-effective to combine the IMLR flow with the influent and RAS flow for combined pumping, avoiding separate IMLR flow pump stations at each ditch. The IMLR flow into the pump station from each oxidation ditch would be controlled by a motorized gate in the pump station. Providing flexibility for Plant 2 to take the entire influent flow (Plant 1 out of service), the required capacity of the pump station at Plant 2 would be as follows:

Peak Hour Influent Flow	4.89 Mgal/d
Maximum RAS Flow	3.0 Mgal/d
Maximum IMLR Flow	14.7 Mgal/d (from two ditches)
Total Pumped Flow	22.59 Mgal/d

The pump station at Plant 1 would have approximately half the capacity of that at Plant 2.

At each plant, a 24-inch influent pipe would be extended from the existing headworks to the new pump station. IMLR feed piping from each oxidation ditch to the pump station and IMLR return piping from the anoxic tanks back to the oxidation ditches would be 24 inches in diameter. A splitter box would be required at Plant 2 to split the return flows to Oxidation Ditches 2 and 3.

A cost estimate for the steel tank alternative is shown in Table 11-7. By comparing Tables 11-6 and 11-7, it is seen that the capital cost of the steel tank alternative is much higher than that for the concrete basin alternative. Additionally, the steel tank alternative would have higher power costs due to pumping into the anoxic basins. Therefore, the steel tank alternative is rejected.

Table 11-7 Cost Estimate for Concrete Anoxic Basins and Related Facilities

Item	Cost, $ (a)		
	Plant 1	Plant 2	Total
Combined Pump Station (b)	1,400,000	2,200,000	3,600,000
Anoxic Tanks with Mixers (b)	800,000	1,250,000	2,050,000
Site Piping	485,000	1,010,000	1,495,000
Mixed Liquor Splitter Box	0	120,000	120,000
Sitework	50,000	100,000	150,000
Subtotal 1	2,735,000	4,680,000	7,415,000
Contingencies @ 20%	547,000	936,000	1,483,000
Subtotal 2	3,282,000	5,616,000	8,898,000
Engineering, Admin, Environmental @ 25%	821,000	1,404,000	2,225,000
Total	4,103,000	7,020,000	11,123,000

(a) Mid-2019 cost level, ENR 20-Cities CCI = 11,300.
(b) Electrical and instrumentation included.

11.11 RECOMMENDED IMPROVEMENTS

Based on the evaluations presented in this section, the tentatively recommended secondary treatment improvements (to be verified during preliminary design) include the following:

- 350,000-gallon concrete anoxic basin with two compartments and mixers at each oxidation ditch.
- Two 3.7 Mgal/d submersible IMLR pumps in each oxidation ditch.
- Magnetic flow meter for each IMLR pump discharge in a concrete vault.
- Provide additional portable or permanent standby aeration capacity approximately equivalent to two 30 horsepower brush rotors (to be verified during preliminary design) in each oxidation ditch. If portable systems are implemented, only four total units would be required at the same time, to be located in any two ditches. If the existing portable brush rotors can be modified to be more stable with the velocities in the ditches, only two additional units would be needed.

Proposed layouts for the anoxic basins at Plant 1 and Plant 2 are shown in Figures 11-17 and 11-18.

The total capital cost for the anoxic basins and associated improvements is estimated to be approximately $7.8 million (from Table 11-6). At this time, an allowance of $X is suggested for aeration improvements, resulting in a total estimated capital cost of $Y.

While the improvements described above and the associated costs are believed to be reasonably accurate and are appropriate in the context of a Master Plan document, the following additional investigations should be completed to confirm recommended improvements prior to or during preliminary design:

1. As soon as possible, make improvements to the influent sampling systems and methods to assure representative results and accumulate a reliable database to be evaluated for design (this topic is discussed in more detail in Section 5).
2. After the new sampling system is implemented, complete special monitoring effort to determine diurnal load pattern and fraction of readily biodegradable COD.
3. Conduct investigations to confirm the oxygen delivery capacities of the existing brush rotors under various combinations of inside and outside rotors running.
4. After the capacities of the existing brush rotors are confirmed, investigate alternatives for providing any additional supplemental oxygen as may be required, noting that supplemental oxygen supply methods may impact the performance of the existing brush rotors. Alternative supplemental oxygen supply methods could include modified portable brush rotors, aeration diffusers (with blowers), jet aeration, and others.

Town of Discovery Bay Community Services District
Wastewater Master Plan

Chapter 11 Pre-Screen Memorandum

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Reviewed By: Jeff Hauser, P.E.

Date: August 2, 2019

BACKGROUND AND PURPOSE

The Town of Discovery Bay Community Services District contracted with Stantec Consulting Engineers to prepare a wastewater master plan update for the Town wastewater facilities in Discovery Bay, California. As part of this master plan, Stantec has prepared an alternatives and cost analysis for the selection of the most appropriate denitrification process for the Town. The results of this analysis are presented in Chapter 11 of the master plan. This analysis only considered, in detail, viable processes carried forward from an initial screening. There were several alternatives suggested by plant staff and others that were considered and eliminated for various reasons prior to preparation of Chapter 11. The purpose of this memorandum is list these suggested options and discuss why they were not analyzed in further detail as part of Chapter 11.

Denitrification Alternatives Not Carried Forward in Chapter 11 of the Master Plan

Locate Anoxic Basins at Plant No. 1

Under this alternative, the anoxic basins used to denitrify the wastewater would be located at Plant No. 1, with the existing oxidation ditch at Plant No.1 being used as the anoxic basin. Preliminary review of this concept showed that there would be a massive pump station required and very large piping systems installed between Plant No. 1 and Plant No. 2 to accommodate the required mixed liquor and recycle flows for the denitrificaiton process. The cost and complexity of this alternative was clearly well beyond the other viable alternatives. This alternative was therefore dropped from consideration.

Use Earthen basins at Plant No. 2

Under this alternative, the anoxic basins used to denitrify the wastewater would be located above grade in earthen basins at Plant No. 2. For construction reasons, these basins would have to be shallow. Given the anoxic volume needed, these basins would then require a much larger foot print than steel or concrete tanks which are considered in Chapter 11 of the master plan. As a result, the foot print of the earthen basins is to large to fit at Plant No. 2. This alternative was therefore dropped from further consideration.

A secondary alternative to this was to use one of the sludge lagoons or a portion of one of the sludge lagoons at Plant No. 2 . For the anoxic basins. The locations of these lagoons puts them in a poor location relative to the process and their elevation would require a massive pump station and piping to accommodate the required mixed liquor and recycle flows for the denitrificaiton process. The cost and complexity of this alternative was clearly well beyond the other viable alternatives. This alternative was therefore dropped from consideration.

Change the Effluent Discharge From Old River to On-Site Percolation Ponds

Under this alternative, instead of discharge to Old River, a pond would be constructed on existing property behind Treatment Plant No. 2 and water would percolate into the ground. This would fall under different disposal criteria than the current NPDES permit. It might provide relief from the denitrification requirement in the current NPDES permit. Investigation of this alternative showed the existing property owned by the Town is peat soil underlain by clay with ground water at less than 3 feet. This soil and ground water combination is not suitable for percolation of water into the ground water. This alternative was therefore dropped from consideration.

The Town is separately looking into other property in the area to see if there might be a suitable location for percolation discharge. Even if such a site is identified, the Town would have to purchase the property and the final effluent would have to be pumped to that location. This alternative would also be a complete-rewrite of the current NPDES permit and would likely take several years of engineering analysis and permitting to get approval with n guarantee if having the denitrification criteria in the current NODES permit relaxed.