Draft for Review

This document is in draft form. A final version of this document may differ from this draft. As such, the contents of this draft document shall not be relied upon. GHD disclaims any responsibility or liability arising from decisions made based on this draft document.

Needs Assessment Report - DRAFT

Town of Oak Bluffs, MA

GHD | 1545 Iyannough Road Hyannis MA 02601

11144140 | Phase 02 | August 2018

September 12, 2018

Mr. Matthew A. Beaton, Secretary
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: Oak Bluffs Comprehensive Wastewater Management Planning Study (Project)
Notice of Project Change (NPC) and Draft Needs Assessment Report (NAR)
GHD File No.: 11144140
EEA Number: 15768

Dear Secretary Beaton,

On behalf of the Town of Oak Bluffs Board of Selectmen and Sewer Commissioners (Applicant), GHD is pleased to submit the Draft Needs Assessment Report (NAR) for the above referenced Project. As outlined in the ENR Certificate for this project, the NAR is being submitted as a Notice of Project Change (NPC).

The Project is a Comprehensive Wastewater Management Planning Project designed to develop a Town-wide plan for wastewater management. The Project Area is the Town of Oak Bluffs, MA. Because the Project is a study, there is no facility or construction project planned at this time. Therefore, this NPC/NAR is submitted for the planning process that is expected to lead to improved wastewater management facilities.

Please feel free to contact GHD with any question regarding this document or Project.

Sincerely,

GHD Inc.

Anastasia Rudenko, P.E., BCEE, ENV SP
Project Engineer

AR/lm

Attachment

Commonwealth of Massachusetts

Executive Office of Energy and Environmental Affairs ■ MEPA Office

For Office Use Only *Executive Office of Environmental Affairs*
MEPA Analyst:
Phone: 617-626-

Notice of Project Change

The information requested on this form must be completed to begin MEPA Review of a NPC in accordance with the provisions of the Massachusetts Environmental Policy Act and its implementing regulations (see 301 CMR 11.10(1)).

EEA # 15768		
Project Name: Oak Bluffs Comprehensive Wastewater Management Planning Project		
Street Address: Oak Bluffs, Massachusetts		
Municipality: Oak Bluffs, Massachusetts	Watershed:	
Universal Transverse Mercator Coordinates: UTM Zone 19; 4588754; 368191	Latitude: 41°26' (approx) Longitude: 70°34' (approx)	
Estimated commencement date: Sept. 2017	Estimated completion date: April 2019	
Project Type: Planning Study	Status of project design: 0 %complete	
Proponent: Oak Bluffs Wastewater Commissioners and Board of Selectmen		
Street Address: 17 Pennsylvania Ave		
Municipality: Oak Bluffs	State: MA	Zip Code: 02557
Name of Contact Person: Anastasia Rudenko, PE		
Firm/Agency: GHD	Street Address: 1545 Iyannough Road	
Municipality: Hyannis	State: MA	Zip Code: 02601
Phone: 774-470-1637	Fax: 774-470-1631	E-mail: anastasia.rudenko@ghd.com

With this Notice of Project Change, are you requesting:

a Single EIR? (see 301 CMR 11.06(8)) ☐Yes ☒No

a Special Review Procedure? (see 301CMR 11.09) ☐Yes ☒No

a Waiver of mandatory EIR? (see 301 CMR 11.11) ☐Yes ☒No

a Phase I Waiver? (see 301 CMR 11.11) ☐Yes ☒No

Note 1: The Project is a Planning Study and no construction is currently planned. The Project is scoped to identify all permitting needs, environmental impacts, and other possible changes. (This note is referred to throughout the remainder of this document).

Which MEPA review threshold(s) does the project meet or exceed (see 301 CMR 11.03)?

No thresholds are currently exceeded. The Project is expected to recommend nitrogen management facilities that may exceed thresholds.

Which State Agency Permits will the project require? N/A

Identify any financial assistance or land transfer from an Agency of the Commonwealth, including the Agency name and the amount of funding or land area in acres: N/A

PROJECT INFORMATION

In 25 words or less, what is the project change? The project change involves . . .

In accordance with the ENF Certificate, dated November 22, 2017, for this Project the Needs Assessment is being filed as a Notice of Project Change (NPC).

See full project change description beginning on page 3.

Date of publication of availability of the ENF in the Environmental Monitor: (Date:)

Was an EIR required? [x] Yes [ ] No; if yes,
was a Draft EIR filed? [ ] Yes (Date:) [x] No
was a Final EIR filed? [ ] Yes (Date:) [x] No
was a Single EIR filed? [ ] Yes (Date:) [x] No

Per the ENF Certificate dated November 22, 2017 the Draft and Final EIR will be filed as separate submittals in future phases of the project.

Have other NPCs been filed? [ ] Yes (Date(s):) [x] No

If this is a NPC solely for lapse of time (see 301 CMR 11.10(2)) proceed directly to **ATTACHMENTS & SIGNATURES**.

PERMITS / FINANCIAL ASSISTANCE / LAND TRANSFER

List or describe all new or modified state permits, financial assistance, or land transfers not previously reviewed: **dd w/ list of State Agency Actions (e.g., Agency Project, Financial Assistance, Land Transfer, List of Permits)** N/A

Are you requesting a finding that this project change is insignificant? A change in a Project is ordinarily insignificant if it results solely in an increase in square footage, linear footage, height, depth or other relevant measures of the physical dimensions of the Project of less than 10% over estimates previously reviewed, provided the increase does not meet or exceed any review thresholds. A change in a Project is also ordinarily insignificant if it results solely in an increase in impacts of less than 25% of the level specified in any review threshold, provided that cumulative impacts of the Project do not meet or exceed any review thresholds that were not previously met or exceeded. (see 301 CMR 11.10(6)) [ ] **Yes** [x] **No; if yes, provide an explanation of this request in the Project Change Description below.**

FOR PROJECTS SUBJECT TO AN EIR

If the project requires the submission of an EIR, are you requesting that a Scope in a previously issued Certificate be rescinded?
[ ] **Yes** [x] **No; if yes, provide an explanation of this request_____.**

If the project requires the submission of an EIR, are you requesting a change to a Scope in a previously issued Certificate?
[ ] **Yes** [x] **No; if yes, provide an explanation of this request_____.**

SUMMARY OF PROJECT CHANGE PARAMETERS AND IMPACTS

Summary of Project Size & Environmental Impacts	Previously reviewed	Net Change	Currently Proposed
LAND			
Total site acreage		N/A	
Acres of land altered		N/A	
Acres of impervious area		N/A	
Square feet of bordering vegetated wetlands alteration		N/A	
Square feet of other wetland alteration		N/A	
Acres of non-water dependent use of tidelands or waterways		N/A	
STRUCTURES			
Gross square footage		N/A	
Number of housing units		N/A	
Maximum height (in feet)		N/A	
TRANSPORTATION			
Vehicle trips per day		N/A	
Parking spaces		N/A	
WATER/WASTEWATER			
Gallons/day (GPD) of water use		N/A	
GPD water withdrawal		N/A	
GPD wastewater generation/ treatment		N/A	
Length of water/sewer mains (in miles)		N/A	

Does the project change involve any new or modified:

1. conversion of public parkland or other Article 97 public natural resources to any purpose not in accordance with Article 97? ☐ **Yes** ☒ **No**
2. release of any conservation restriction, preservation restriction, agricultural preservation restriction, or watershed preservation restriction? ☐ **Yes** ☒ **No**
3. impacts on Rare Species**?** ☐ **Yes** ☒ **No**
4. demolition of all or part of any structure, site or district listed in the State Register of Historic Place or the inventory of Historic and Archaeological Assets of the Commonwealth? ☐ **Yes** ☒ **No**
5. impact upon an Area of Critical Environmental Concern? ☐ **Yes** ☒ **No**

If you answered 'Yes' to any of these 5 questions, explain below:

PROJECT CHANGE DESCRIPTION (attach additional pages as necessary). The project change description should include:

(a) a brief description of the project as most recently reviewed

(b) a description of material changes to the project as previously reviewed,

(c) if applicable, the significance of the proposed changes, with specific reference to the factors listed 301 CMR 11.10(6), and

(d) measures that the project is taking to avoid damage to the environment or to minimize and mitigate unavoidable environmental impacts. If the change will involve modification of any previously issued Section 61 Finding, include a draft of the modified Section 61 Finding (or it will be required in a Supplemental EIR).

In accordance with the ENF Certificate, dated November 22, 2017, for this Project the Needs Assessment is being filed as a Notice of Project Changes (NPC).

Copies of the Notice of Project Change and Draft Needs Assessment Report are available electronically on the Town of Oak Bluffs website (oakbluffsma.gov). Hard copies of the document may be requested from Anastasia Rudenko, PE at 774-470-1637 or Anastasia.rudenko@ghd.com. A presentation on the draft Needs Assessment Report will be given at the Board of Selectmen meeting on Tuesday September 25th at 4:30 pm at the Oak Bluffs Library Meeting Room – 56 School Street Oak Bluffs, MA 02557.

A brief description of the Project is provided on the following pages.

1. Introduction

1.1 Project Identification and Purpose

The purpose of the Comprehensive Wastewater Management Plan (CWMP) Project is to provide an environmentally and economically sound plan for nitrogen reduction, wastewater treatment, and effluent recharge in the Project Planning Area (Planning Area). The Planning Area is defined as the entire Town of Oak Bluffs, MA (Town).

The Town initiated wastewater planning efforts in the mid-1970's. After several planning effort proposals failed at Town meeting, the "Town of Oak Bluffs Massachusetts Draft Phase III Wastewater Facilities Plan and Environmental Impact Report EOEA #10456", prepared by Horsley & Witten, Inc. and Wright-Pierce, and dated January 20, 1998, was accepted by the Town at Special Town Meetings in 1998. Comments received from State reviewing agencies and Town citizens were incorporated into the "Phase IV Final Facilities Plan – A Supplemental Appendix to the Draft Phase III Wastewater Facilities Plan and Environmental Impact Report", prepared by Horsley & Witten, Inc. and Wright-Pierce, dated May 26, 1999 (referred to as the '1999 Facilities Plan' for the remainder of this document).

The 1999 Facilities Plan recommended the construction of a centralized treatment facility to treat wastewater from 529 lots that were identified as requiring off-lot solutions, primarily due to small property lot size. Construction of the Oak Bluffs Wastewater Treatment Facility (WWTF) was completed in 2002. Process equipment at a municipal wastewater treatment facility is typically designed to operate for a 20 year design life. The majority of the process equipment at the facility is approaching the end of its design life and the facility is approaching maximum flow capacity.

In 2001 the Massachusetts Estuaries Project (MEP) was initiated through a partnership between the Massachusetts Department of Environmental Protection (DEP), the University of Massachusetts – Dartmouth School of Marine Science and Technology (SMAST), and regional partners including the Martha's Vineyard Commission (MVC). The purpose of the MEP was to quantify current nitrogen loads to Southeastern Massachusetts estuaries and to estimate the nitrogen reductions that would be required to support healthy ecosystems. Since the completion of the 1999 Facilities Plan, MEP reports have been completed for the watersheds within the Town that have coastal estuaries. Total Maximum Daily Loads (TMDLs) for Total Nitrogen have been issued for four of the major watersheds in the Town.

This CWMP will incorporate the MEP findings and the associated TMDLs for the five coastal estuaries within the Town. The CWMP will also identify other wastewater needs in the Planning Area, and ultimately develop a recommended plan to address wastewater needs and nitrogen impacts associated with wastewater.

The CWMP consists of three phases; this Needs Assessment Report is the first phase of the CWMP Project. It is designed to develop the understanding of existing and future conditions in the Planning Area that will be used through the entire CWMP project, and to complement the work of the MEP. The Needs Assessment provides the framework and necessary background information to complete the second phase of the Project where alternatives to remedy wastewater problems will

be developed and evaluated (screened) for overall feasibility. The final phase of the Project will consist of a cost evaluation, environmental impact analysis of feasible alternatives, and a recommended plan of action.

This Needs Assessment Report utilizes existing information and estimations of future land use as well as population and water usage data to project future wastewater flow and loadings for the planning period. Wastewater issues and specific problem areas of the Town are identified and evaluated. Regulatory requirements and the Town's goals related to wastewater management and growth management are also incorporated into the Project.

1.2 Project Scope

The CWMP Project Scope is divided into three (3) phases as follows:

- Phase I – Needs Assessment
- Phase II – Alternatives Screening Analysis
- Phase III – Recommended Plan, Completion of CWMP

1.3 Purpose and Organization of the Needs Assessment

The Needs Assessment Report is divided into 10 chapters:

Chapter 1 presents general introductory information about the Project.

Chapter 2 provides a project background and includes a discussion on the site location, population, demographics, and a summary of known regional wastewater planning efforts and nutrient removal related projects.

Chapter 3 provides a definition of the planning period, survey datum, and current and anticipated permit limits for the Oak Bluffs Wastewater Treatment Facility.

Chapter 4 discusses the Town's existing environmental resources.

Chapter 5 summarizes Federal, State, Regional, and Municipal regulatory issues.

Chapter 6 provides an outline of past wastewater planning studies and efforts.

Chapter 7 summarizes the Towns' existing water and wastewater infrastructure.

Chapter 8 evaluates wastewater flows and nitrogen loads.

Chapter 9 discusses environmental and sustainability considerations.

Chapter 10 summarizes the Needs Assessment.

ATTACHMENTS & SIGNATURES

Attachments:

1. Secretary's most recent Certificate on this project
2. Plan showing most recent previously-reviewed proposed build condition
3. Plan showing currently proposed build condition
4. Original U.S.G.S. map or good quality color copy (8-1/2 x 11 inches or larger) indicating the project location and boundaries
5. List of all agencies and persons to whom the proponent circulated the NPC, in accordance with 301 CMR 11.10(7)

Signatures:

	9/12/18		
Date	Signature of Responsible Officer or Proponent	Date	Signature of person preparing NPC (if different from above)
Hans von Steiger		Marc R. Drainville	
Name (print or type)		Name (print or type)	
Oak Bluffs Wastewater Commission, Chairman		GHD	
Firm/Agency		Firm/Agency	
17 Pennsylvania Avenue		1545 Iyannough Road	
Street		Street	
Oak Bluffs, MA 02557		Hyannis, MA 02601	
Municipality/State/Zip		Municipality/State/Zip	
508-693-0343		774-470-1634	
Phone		Phone	

COMPREHENSIVE WASTEWATER MANAGEMENT PLANNING PROJECT
TOWN OF OAK BLUFFS, MASSACHUSETTS
MEPA Unit Review Process

Draft Needs Assessment Report (NAR) Document Distribution List

A copy of the Draft Needs Assessment Report Document will be sent to the following:

Secretary of Energy and Environmental Affairs
251 Causeway Street, Suite 900
Boston, MA 02114
Attn: M. Beaton (2 Full Sets)

Massachusetts Department of Environmental Protection
One Winter Street
Boston, MA 02108
Attn: MEPA Coordinator (Full Set)

DEP/Southeastern Regional Office
20 Riverside Drive
Lakeville, MA 02347
Attn: MEPA Coordinator (Full Set)

Massachusetts Historical Commission
Archives Building
220 Morrissey Boulevard
Boston, MA 02125 (Full Set)

Department of Agricultural Resources
16 West Experiment Station
University of Massachusetts
Amherst, MA 01003
Attn: MEPA Coordinator (Full Set)

Department of Public Health (DPH)
Director of Environmental Health
250 Washington Street
Boston, MA 02115 (Full Set)

Energy Facilities Siting Board
Department of Public Utilities
1 South Station, 5th Floor
Boston, MA 02110 (Full Set)

Martha's Vineyard Commission
P.O. Box 1447
Oak Bluffs, MA 02557
Attn: MEPA Coordinator (Full Set)
(Full Set)

Division of Marine Fisheries
1213 Purchase Street
New Bedford, MA 02740
Attn: MEPA Coordinator (Full Set)

Coastal Zone Management
251 Causeway Street, Suite 800
Boston, MA 02202
Attn: MEPA Coordinator (Full Set)

Department of Conservation and Recreation
Division of State Parks and Recreation
251 Causeway Street, Suite 600
Boston, MA 02114-2104 (Full Set)

Natural Heritage and Endangered Species Program
Commonwealth of Massachusetts
Route 135
Westborough, MA 01581 (Full Set)

Massachusetts Department of Transportation
10 Park Plaza, Suite 4160
Boston, MA 02116 (Full Set)

Massachusetts Highway District 5
District #5
1000 County Street, Box 111
Taunton, MA 02780
Attn: MEPA Coordinator (Full Set)

Department of Energy Resources
100 Cambridge Street, Suite 1020
Boston, MA 02114 (Full Set)

Anastasia Rudenko, P.E.
GHD Inc.
1545 Iyannough Road; Route 132
Hyannis, MA 02601 (Full Set)

Town of Oak Bluffs
P.O. Box 1327
Oak Bluffs, MA 02557
5 copies with distribution to:

- Board of Selectmen
- Planning Board
- Conservation Commission
- Board of Health
- WWTF

Town of Edgartown
P.O. Box 5158
Edgartown, MA 02539
5 copies with distribution to:

- Board of Selectmen
- Planning Board
- Conservation Commission
- Board of Health
- WWTF

Town of West Tisbury
P.O. Box 278
West Tisbury, MA 02575
4 copies with distribution to:

- Board of Selectmen
- Planning Board
- Conservation Commission
- Board of Health

Town of Tisbury
P.O. Box 1239
Vineyard Haven, MA 02568
4 copies with distribution to:

- Board of Selectmen
- Planning Board
- Conservation Commission
- Board of Health

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Appendix C WWTF Facility Evaluation Final Draft Report

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List of Common Acronyms

ACEC	Areas of Critical Environmental Concern
ACS	American Community Survey
BOD_5	5-Day Biochemical Oxygen Demand
BOH	Board of Health
CFR	Code of Federal Regulations
CHP	Combined Heat and Power
CMR	Code of Massachusetts Regulations
CSP	Coastal Systems Program
CWA	Clean Water Act
CWMP	Comprehensive Wastewater Management Plan
DCPC	District of Critical Planning Concern
DCR	Department of Conservation and Recreation
DEIR	Draft Environmental Impact Report
DEP	Department of Environmental Protection
DO	Dissolved Oxygen
DRI	Development of Regional Impact
EIR	Environmental Impact Report
ENF	Environmental Notification Form
EOEEA	Executive Office of Energy and Environmental Affairs
FEIR	Final Environmental Impact Report
FEMA	Federal Emergency Management Agency
FIRM	Federal Insurance Rate Map
GIS	Geographic Information System
GWDP	Groundwater Discharge Permit
gpd	Gallons per Day
I/A	Innovative and Alternative
I/I	Infiltration and Inflow
IMA	Inter-Municipal Agreement
LEED	Leadership in Energy and Environmental Design
MASSGIS	Massachusetts Office of Geographic Information Systems
MCL	Maximum Contaminant Levels
MEP	Massachusetts Estuaries Project
MEPA	Massachusetts Environmental Policy Act
MESA	Massachusetts Endangered Species Act
mg/L	Milligrams per Liter
mL	Milliliters
mL/L	Milliliters per Liter
MVC	Martha's Vineyard Commission
NAVD88	North American Vertical Datum of 1988
NEIWPCC	New England Interstate Water Pollution Control Commission
NEPA	National Environmental Policy Act
NHESP	National Heritage and Endangered Species Program

NPC	Notice of Project Change
NREL	National Renewable Energy Laboratory
NTU	Nephelometric Turbidity Unit
POTW	Publicly Owned Treatment Work
PRB	Permeable Reactive Barrier
PSTF	Privately-owned Sewage Treatment Facility
PV	Photovoltaics
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
SMAST	University of Massachusetts-Dartmouth School of Marine Science and Technology
SRF	State Revolving Fund
SSO	Sanitary Sewer Overflow
STEP	Septic Tank Effluent Pumping
SWAP	Source Water Assessment and Protection
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TR-16	NEIWPCC Technical Report No. 16 – Guides for the Design of Wastewater Treatment Works
TSS	Total Suspended Solids
UMDI	University of Massachusetts Donahue Institute
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UV	Ultraviolet
WEF MOP 32	Water Environment Federation Manual of Practice No. 32 – Energy Conservation in Water and Wastewater Facilities
WPA	Wetlands Protection Act
WRPOD	Water Resources Protection Overlay District
WQS	Water Quality Standard
WWTF	Wastewater Treatment Facility

1. Introduction

1.1 Project Identification and Purpose

The purpose of the Comprehensive Wastewater Management Plan (CWMP) Project is to provide an environmentally and economically sound plan for nitrogen reduction, wastewater treatment, and effluent recharge in the Project Planning Area (Planning Area). The Planning Area is defined as the entire Town of Oak Bluffs, MA (Town).

The Town initiated wastewater planning efforts in the mid-1970's. After several planning effort proposals failed at Town meeting, the "Town of Oak Bluffs Massachusetts Draft Phase III Wastewater Facilities Plan and Environmental Impact Report EOEA #10456", prepared by Horsley & Witten, Inc. and Wright-Pierce, and dated January 20, 1998, was accepted by the Town at Special Town Meetings in 1998. Comments received from State reviewing agencies and Town citizens were incorporated into the "Phase IV Final Facilities Plan – A Supplemental Appendix to the Draft Phase III Wastewater Facilities Plan and Environmental Impact Report", prepared by Horsley & Witten, Inc. and Wright-Pierce, dated May 26, 1999 (referred to as the '1999 Facilities Plan' for the remainder of this document).

The 1999 Facilities Plan recommended the construction of a centralized treatment facility to treat wastewater from 529 lots that were identified as requiring off-lot solutions, primarily due to small property lot size. Construction of the Oak Bluffs Wastewater Treatment Facility (WWTF) was completed in 2002. Process equipment at a municipal wastewater treatment facility is typically designed to operate for a 20 year design life. The majority of the process equipment at the facility is approaching the end of its design life and the facility is approaching maximum flow capacity.

In 2001 the Massachusetts Estuaries Project (MEP) was initiated through a partnership between the Massachusetts Department of Environmental Protection (DEP), the University of Massachusetts – Dartmouth School of Marine Science and Technology (SMAST), and regional partners including the Martha's Vineyard Commission (MVC). The purpose of the MEP was to quantify current nitrogen loads to Southeastern Massachusetts estuaries and to estimate the nitrogen reductions that would be required to support healthy ecosystems. Since the completion of the 1999 Facilities Plan, MEP reports have been completed for the watersheds within the Town that have coastal estuaries. Total Maximum Daily Loads (TMDLs) for Total Nitrogen have been issued for four of the major watersheds in the Town.

This CWMP will incorporate the MEP findings and the associated TMDLs for the five coastal estuaries within the Town. The CWMP will also identify other wastewater needs in the Planning Area, and ultimately develop a recommended plan to address wastewater needs and nitrogen impacts associated with wastewater.

The CWMP consists of three phases; this Needs Assessment Report is the first phase of the CWMP Project. It is designed to develop the understanding of existing and future conditions in the Planning Area that will be used through the entire CWMP project, and to complement the work of the MEP. The Needs Assessment provides the framework and necessary background information to complete the second phase of the Project where alternatives to remedy wastewater problems will

be developed and evaluated (screened) for overall feasibility. The final phase of the Project will consist of a cost evaluation, environmental impact analysis of feasible alternatives, and a recommended plan of action.

This Needs Assessment Report utilizes existing information and estimations of future land use as well as population and water usage data to project future wastewater flow and loadings for the planning period. Wastewater issues and specific problem areas of the Town are identified and evaluated. Regulatory requirements and the Town's goals related to wastewater management and growth management are also incorporated into the Project.

1.2 Project Scope

The CWMP Project Scope is divided into three (3) phases as follows:

- Phase I – Needs Assessment
- Phase II – Alternatives Screening Analysis
- Phase III – Recommended Plan, Completion of CWMP

1.3 Purpose and Organization of the Needs Assessment

The Needs Assessment Report is divided into 10 chapters:

Chapter 1 presents general introductory information about the Project.

Chapter 2 provides a project background and includes a discussion on the site location, population, demographics, and a summary of known regional wastewater planning efforts and nutrient removal related projects.

Chapter 3 provides a definition of the planning period, survey datum, and current and anticipated permit limits for the Oak Bluffs Wastewater Treatment Facility.

Chapter 4 discusses the Town's existing environmental resources.

Chapter 5 summarizes Federal, State, Regional, and Municipal regulatory issues.

Chapter 6 provides an outline of past wastewater planning studies and efforts.

Chapter 7 summarizes the Towns' existing water and wastewater infrastructure.

Chapter 8 evaluates wastewater flows and nitrogen loads.

Chapter 9 discusses environmental and sustainability considerations.

Chapter 10 summarizes the Needs Assessment.

1.4 Summary of Prior Reports

The following documents were provided to GHD and were used in the development of this report:

- "Oak Bluffs Wastewater Facilities Plan – Phase 1: Needs Analysis", prepared by Horsley & Witten, Inc. with Wright-Pierce Engineers, dated May 1996 (1996 Needs Assessment Report).
- "Oak Bluffs Wastewater Facilities Plan – Phase II: Screening on Alternatives", prepared by Horsley & Witten, Inc. with Wright-Pierce Engineers, dated August 1996.
- "Town of Oak Bluffs Massachusetts Draft Phase III Wastewater Facilities Plan and Environmental Impact Report EOEA #10456", prepared by Horsley & Witten, Inc. and Wright-Pierce Engineers, dated January 20, 1998.
- "Phase IV – Final Facilities Plan – A Supplemental Appendix to the Draft Phase III Wastewater Facilities Plan and Environmental Impact Report", prepared by Horsley & Witten, Inc. and Wright-Pierce, dated May 26, 1999 (1999 Facilities Report).
- "Martha's Vineyard Wastewater Management Study Prepared for Martha's Vineyard Commission", prepared by Wright Pierce, dated May 2010.
- "Martha's Vineyard Wastewater Management Study Addendum – Case Studies for Lagoon Pond and Tashmoo Pond", prepared by Wright Pierce, dated June 2011.
- "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Farm Pond System, Town of Oak Bluffs, MA Final Report", dated November 2010.
- "Final Farm Pond Estuarine System Total Maximum Daily Load for Total Nitrogen (CN-391.1)", dated July 2015.
- "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Lagoon Pond System, Towns of Oak Bluffs and Tisbury, MA Draft Report", dated June 2010.
- "Long-Term Population Projections for Massachusetts Regions and Municipalities" prepared for the Office of the Secretary of the Commonwealth of Massachusetts by the UMass Donahue Institute, dated March 2015.
- "Final Lagoon Pond Estuarine System Total Maximum Daily Loads for Total Nitrogen (CN-390.1)", dated July 2015.
- "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Lake Tashmoo Estuary Towns of Tisbury, West Tisbury and Oak Bluffs, MA – Final Report", dated February 2015.
- "Final Lake Tashmoo Estuarine System Total Maximum Daily Load for Total Nitrogen (CN 353.0)", dated August 2017.

- “Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Oak Bluffs Harbor System, Town of Oak Bluffs, MA – Final Report”, dated May 2013.
- “Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Sengekontacket Pond System, Towns of Oak Bluffs and Edgartown, MA – Final Report”, dated January 2011.
- “Final Sengekontacket Pond Estuarine System Total Maximum Daily Loads for Total Nitrogen (CN-310.1)”, dated November 2015.
- “Sewering Scenarios Resulting for Lagoon Pond based on MEP Linked Model Technical Memorandum”, prepared by the University of Massachusetts Dartmouth School of Marine Science and Technology Coastal Systems Group, dated October 25, 2011.
- “Lagoon Pond PRB Evaluation Report” prepared for the Towns of Oak Bluffs and Tisbury, MA by Lombardo Associates, Inc., dated March 1, 2016.
- “Water Quality Monitoring and Assessment of the Martha’s Vineyard Island-Wide Estuaries and Salt Ponds Summary 2016 (year 1 of 3)”, prepared by the University of Massachusetts Dartmouth-School for Marine Science and Technology, dated February 28, 2017.
- “Draft Final – Town of Oak Bluffs/Tisbury – Partnership with the Coastal Systems Program for the Analysis of the Upper Lagoon Pond Nitrogen Attenuation as Potential Nitrogen Management Option”, prepared by Dr. David Schlezinger and Dr. Brian Howes – Coastal Systems Program School of Marine Science and Technology – UMD
- “Town of Oak Bluffs Wastewater Treatment Facility Evaluation Final Draft Report”, prepared by GHD, dated June 2017.

1.5 Environmental Review Process

An environmental review process by the Executive Office of Energy and Environmental Affairs (EOEEA) has been initiated for this project through the Massachusetts Environmental Policy Act (MEPA) process. The Plan of Study and Environmental Notification Form (ENF) was submitted for this project in October, 2017 (see Appendix A). A copy of the MEPA “Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form,” received on November 22, 2017, is attached in Appendix B.

As outlined in the MEPA ENF Certificate, the following additional documents will be submitted to MEPA for Review:

- Notice of Project Change (NPC) containing the Needs Assessment.
- Draft Environmental Impact Report (DEIR) with the Alternatives Screening Analysis and Draft Recommended Plan.
- Final Environmental Impact Report (FEIR) documenting the Final Recommended Plan.

All of the documents prepared under the MEPA process will be submitted to MassDEP, MEPA, and other interested parties for review and comment. The multiple submittal approach to the MEPA process was done to promote the public involvement and comment needed to build a consensus for implementation of the Recommended Plan.

2. Project Background

This chapter will review a number of items that are related to the background of the Town, its planning efforts, and efforts to address nutrient contamination.

2.1 Site Location

The Town of Oak Bluffs, Massachusetts is located on Martha's Vineyard and is bordered by the Towns of Tisbury, West Tisbury, and Edgartown, as shown in Figure 2.1. The Town has five major coastal estuary watersheds:

- Farm Pond is a coastal estuary entirely in the Town of Oak Bluffs.
- Lagoon Pond is a coastal estuary that extends into the Towns of Oak Bluffs, Tisbury, West Tisbury, and a small area in Edgartown.
- Lake Tashmoo is a coastal estuary that extends into the Towns of Tisbury, West Tisbury, and a small area in Oak Bluffs.
- Oak Bluffs Harbor is a coastal estuary entirely in the Town of Oak Bluffs.
- Sengekontacket Pond is a coastal estuary system that extends into the Towns of Oak Bluffs, Edgartown, and a small area in West Tisbury.

The Town also has one major freshwater watershed, Crystal Lake. The Planning Area is defined as the Town boundaries, and includes the portions of the five coastal estuaries within the Town boundaries. The Planning Area is designed to identify the wastewater and other nitrogen-related needs within the Town.

2.2 Planning Period

The planning period for this Project, which is the time span over which wastewater facility needs are forecasted, is 20 years – from 2020 through 2040. The Massachusetts Department of Environmental Protection's (MassDEP) *Guide to Comprehensive Wastewater Management Planning* (January 1996) requires a minimum planning period of 20 years.

2.3 Population and Demographic Information in the Planning Area

This section outlines the population and demographic data that was reviewed to characterize the current and anticipated future population in the Town for the planning period (2020 – 2040).

2.3.1 Current Population

Under an agreement with the Massachusetts Secretary of the Commonwealth, the University of Massachusetts Donahue Institute (UMDI) has produced population projections for all Massachusetts municipalities at 5-year intervals through the year 2030. The projections for the Town indicates an approximate 5% increase in year-round population every five years throughout the Planning Period.

The UMDI projections end in 2030, yet the Planning Period for this report extends to 2040. The same annual percentage increase in population from the UMDI 2015 through 2030 projection was used to estimate the growth from 2030 to 2040 to complete the population projection.

Figure 2.1 and Table 2.1 show the Town's historical and projected growth. Historical population data was obtained from the US Census Bureau. Growth projections were obtained as previously described.

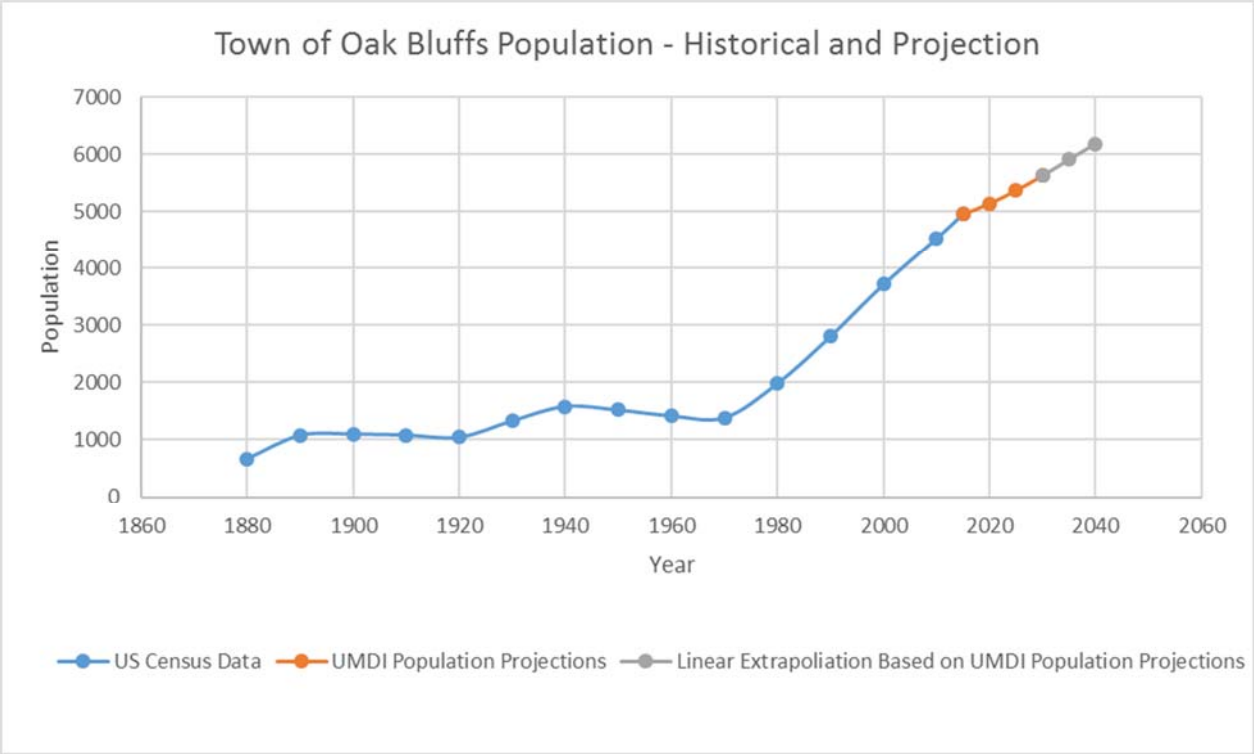


Figure 2.1 Town of Oak Bluffs Population – Historical and Projected

Table 2.1 Town of Oak Bluffs Population – Historical and Projected

Year	Population
1880	672
1890	1,080
1900	1,100
1910	1,084
1920	1,047
1930	1,333
1940	1,584
1950	1,521
1960	1,419

Year	Population
1970	1,385
1980	1,984
1990	2,804
2000	3,713
2010	4,527
2015	4,598*
2020	5,140*
2025	5,369*
2030	5,625*
2035	5,904**
2040	6,183**

Sources:

1. Years 1880 – 2010: US Census
2. Years 2015 – 2030: UMDI Population Projections (noted in table with an *)
3. Years 2035 – 2040: Linear extrapolation based on UMDI Population Projections (noted in table with a **)

The US Census classifies geographical areas into one of three categories, as follows:

- Urbanized areas of 50,000 people or more.
- Urban clusters between 2,500 and 50,000 people.
- Rural areas of less than 2,500 people.

According to the US Census, the Town is classified as a rural area. The 2010 US Census indicates that Dukes County has a very high seasonal population, with approximately 54% of all of the housing units in the county classified as vacant/seasonal units.

2.3.2 Resident Characteristics

The Town is a highly seasonal community, experiencing a large influx of summer visitors and seasonal residents during the summer months. The “Island Plan”, which was adopted by the Martha’s Vineyard Commission in December 2009, estimates that approximately 58% of the housing units in the Town are seasonal. The Town has the second highest population density on Martha’s Vineyard with an estimated 523 people per square mile.

The 2010 US Census listed the total population of the Town as 4,527 people. The 2016 American Community Survey (ACS) lists the Town’s income per capita as $57,773. The median age of the Town is 44. Figure 2.2 shows the breakdown of the Town’s employment by industry.

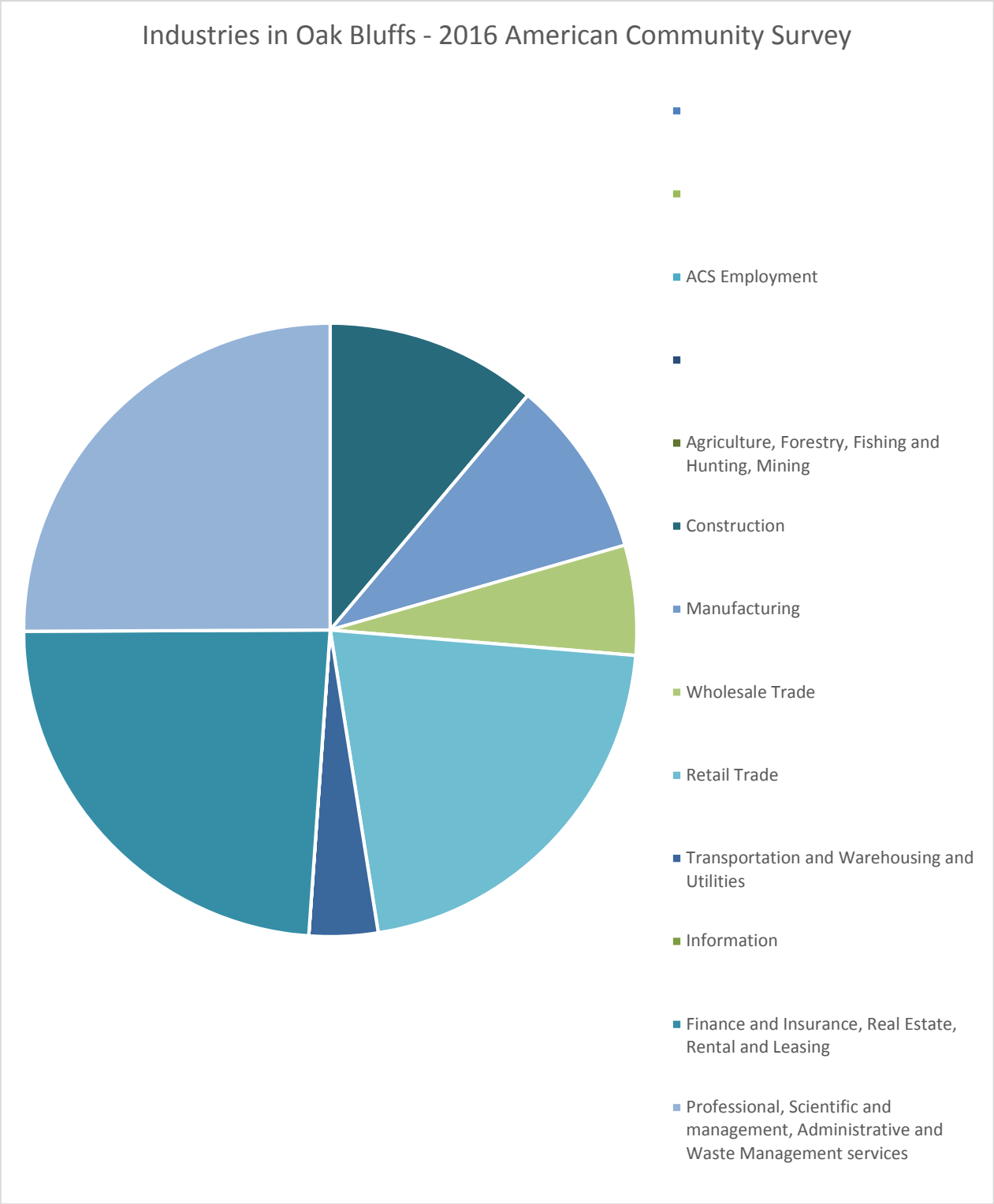


Figure 2.2 Industries in Oak Bluffs – 2016 American Community Survey

2.4 Town Wastewater Planning History

The Town initiated wastewater planning efforts in the mid-1970's. After several planning effort proposals failed at Town Meeting, the "Town of Oak Bluffs Massachusetts Draft Phase III Wastewater Facilities Plan and Environmental Impact Report EOEA #10456", prepared by Horsley & Witten, Inc. and Wright-Pierce, and dated January 20, 1998 was accepted by the Town at Special Town Meetings in 1998. Comments received from State reviewing agencies and Town citizens were incorporated into the "Phase IV Final Facilities Plan – A Supplemental Appendix to the Draft Phase III Wastewater Facilities Plan and Environmental Impact Report", prepared by Horsley & Witten, Inc. and Wright-Pierce, dated May 26, 1999 (referred to as the "1999 Facilities Plan" for the remainder of this document).

The 1999 Facilities Plan recommended the construction of a centralized treatment facility to treat wastewater from 529 lots that were identified as requiring off-lot wastewater disposal solutions. Construction of the Oak Bluffs WWTF was completed in 2002. The majority of the equipment at the facility is approaching the end of its design life and the facility is approaching design capacity.

Since the completion of the 1999 Facilities Plan, MEP reports have been completed for five of the watersheds in the Town. The MEP reports indicate that the majority of the coastal estuaries in the Town exhibit signs of degradation from excessive nitrogen. The primary source of nitrogen, as documented in the MEP reports, is the sub-surface disposal of domestic wastewater through septic systems and the migration of the nitrogen in the wastewater to the estuaries through groundwater. The MEP findings are discussed in further detail in Section 6.4.

2.5 Known Regional Wastewater Planning Efforts for Shared Watersheds

As presented above, the Town has five watersheds that contain coastal estuaries—Farm Pond, Lagoon Pond, Lake Tashmoo, Oak Bluffs Harbor, and Sengekontacket Pond. Three of these coastal estuaries—Lagoon Pond, Lake Tashmoo, and Sengekontacket Pond—are shared with neighboring Towns. This section documents known regional planning efforts to address nitrogen-related issues in the shared watersheds.

2.5.1 Lagoon Pond

Lagoon Pond is a shared watershed that extends into the Towns of Oak Bluffs, Tisbury, West Tisbury, and a small area in Edgartown. The Towns of Oak Bluffs and Tisbury have formed a joint watershed planning committee to develop recommendations for each community's response to the findings of the MEP for Lagoon Pond. The committee has been involved in several non-sewering alternative projects, including initiation of a proposed permeable reactive barrier pilot project and installation of several pilot innovative/alternative on-site wastewater treatment systems. The Town of Tisbury has adopted a Board of Health Regulation requiring "best available de-nitrification technology" be used for new septic system installations in the Lagoon Pond Watershed Nitrogen Management District. The Lagoon Pond Watershed Nitrogen Management District is defined as the portion of the Lagoon Pond watershed within the boundaries of the Town of Tisbury.

2.5.2 Lake Tashmoo

Lake Tashmoo is a shared watershed that extends into the Towns of Oak Bluffs, Tisbury, and West Tisbury. There are currently no known regional planning efforts for the watershed. The Town of Tisbury has adopted a Board of Health Regulation requiring “best available de-nitrification technology” be used for new septic system installations in the Lake Tashmoo Nitrogen Management District. The Lake Tashmoo Nitrogen Management District is defined as the portion of the Lake Tashmoo watershed within the boundaries of the Town of Tisbury.

2.5.3 Sengekontacket Pond

Sengekontacket Pond is a shared watershed that extends into the Towns of Oak Bluffs and Edgartown. In 2007 the Oak Bluffs and Edgartown Boards of Selectmen set up the “Joint Oak Bluffs/Edgartown Sengekontacket Pond Committee” to prepare recommendations to address the nitrogen issues in the watershed. In March 2013 the Joint Sengekontacket Pond Committee submitted a letter to the Board of Selectmen outlining three recommendations:

> *1. ‘Establish a working committee made up of Edgartown and Oak Bluffs representatives from the following departments: Wastewater, Board of Health, Shellfish Department, Conservation Commission, Planning Board, Finance Committee and Board of Selectmen.*
>
> *2. Charge the committee with developing the plan to meet the state’s requirements for meeting the TMDL. First, have the committee rank the top three priority actions for reducing nitrogen, then create a timeline for development of the TMDL reduction plan.*
>
> *3. Adopt the TMDL as part of the Town’s Bylaws.’*

These recommendations are currently still under review by the Board of Selectmen.

2.6 History of Nutrient Removal Related Projects

The Town has initiated several projects that focus on nutrient removal. These projects involve aquaculture, permeable reactive barriers, and coastal habitat restoration.

2.6.1 Water Quality Monitoring

An island-wide water quality monitoring program was initiated in the summer of 2016 with the goal of assessing the status of the ecological health of each system and nutrient-related trends in the waterbodies. The 3-year monitoring program, which is coordinated by the Martha’s Vineyard Commission in partnership with the Coastal Systems Program (CSP) at SMAST, focuses on summertime sampling when the lowest water quality conditions are typically experienced. Data collected through the monitoring program will be used to support the development of site-specific nutrient management plans. Findings of the 2016 sampling season are discussed in further detail in Section 6.5.3.

2.6.2 Aquaculture

An oyster mitigation program was initiated by the Towns of Oak Bluffs and Edgartown in Sengekontacket Pond. Each Town has committed to seeding 500,000 oysters annually. The project

estimates that each oyster utilizes up 3 to 5 mg of nitrogen during their growth. A sentinel monitoring site was established to evaluate the impact of the program. The project was initiated in 2013 and is ongoing. Ongoing monitoring will be used to determine the nitrogen uptake potential of the oyster seeding.

2.6.3 Permeable Reactive Barriers

A feasibility study for the use of permeable reactive barriers (PRBs) to aid in the restoration of water quality in the Lagoon Pond watershed was conducted in 2016. The findings of the study are discussed in further detail in Chapter 6.

2.6.4 Coastal Habitat Restoration

A salt marsh restoration “Living Shorelines” project was jointly developed by the Towns of Oak Bluffs and Edgartown. The project uses biodegradable coir logs (made of coconut fiber) and shell bags made with coir mats; and is intended to stabilize the shoreline, maintain or improve biodiversity in the marsh, and potentially improve water quality through facilitated nitrogen attenuation. Sediment trapped by the logs reduces the impact of erosion on the shoreline and creates a habitat for marsh grasses and other species. The logs, which are seeded with ribbed mussels, have been placed in Muddy Creek and the MVSG Dock in Lagoon Pond and in Trapps Pond, and Felix Neck in Sengekontacket Pond.

The project, which was initiated in 2014 and installed in 2016, is a collaboration between the Massachusetts Audubon Felix Neck Wildlife Sanctuary, Oak Bluffs and Edgartown Shellfish Departments, the US Environmental Protection Agency, and the University of Rhode Island. Ongoing monitoring will be used to assess the project’s potential for reducing nitrogen.

Additionally, the Martha’s Vineyard Shellfish Group has evaluated the use of manufactured floating treatment wetlands (“floating islands”) in coastal ponds.

2.6.5 Nitrogen Bioremediation with Phragmites

The Martha’s Vineyard Shellfish Group received funding through the Edey Foundation Grant in 2014 and EPA Healthy Communities Grant in 2015 to study the nitrogen uptake potential of Phragmites australis (Phragmites). Phragmites is an invasive species that currently exists in many of Martha’s Vineyards watersheds. The study focused on characterizing the impact of Phragmites on the nitrogen content of groundwater, the optimal time to harvest to capture the maximum amount of nitrogen in the plants biomass, and research into potential products that could be made with the harvested plants.

The groundwater analysis included monitoring of groundwater at four clusters of monitoring wells surrounding Lagoon Pond. Sampling data indicated that total nitrogen in groundwater decreases as it flows through Phragmites (as the plant take up the nutrients). The calculated nutrient uptake rate indicates that harvesting existing Phragmites plants around the west arm of Lagoon Pond could potentially meet approximately 7 to 23% of the MEP nitrogen reduction goals to restore this watershed (60 to 200 kg N/year of the 870 kg N/year reduction indicated in the MEP Reports). Since Phragmites is an invasive species, the analysis focused on existing plant and did not recommend new plantings.

3. Planning and Evaluation Data

3.1 Survey Datum and Maps Reviewed

3.1.1 Survey Datum

The project benchmark on the record drawings for the original WWTF and collection system construction is noted as being in the National Geodetic Vertical Datum of 1929. All elevations in the CWMP Project will be presented in the North American Vertical Datum of 1988 (NAVD88), unless otherwise noted.

3.1.2 Maps Reviewed

Many of the maps reviewed as part of this Project were developed by the Massachusetts Office of Geographic Information System (MassGIS). MassGIS is an official state agency assigned to collect, store, and disseminate geographic data. Maps reviewed include:

- MassGIS Soil Map
- MassGIS Geology Map
- MassGIS Title 5 Buffer Map
- MassGIS Water Resources Map
- MassGIS Habitat Maps

The following Federal Emergency Management Agency (FEMA) maps were reviewed as part of this project:

- FEMA FIRM Number 25007CIND0B, revised July 20, 2016
- FEMA FIRM Number 25007C0102J, revised July 20, 2016
- FEMA FIRM Number 25007C0103J, revised July 20, 2016
- FEMA FIRM Number 25007C0104J, revised July 20, 2016
- FEMA FIRM Number 25007C0106J, revised July 20, 2016
- FEMA FIRM Number 25007C0108J, revised July 20, 2016
- FEMA FIRM Number 25007C0111J, revised July 20, 2016
- FEMA FIRM Number 25007C0112J, revised July 20, 2016
- FEMA FIRM Number 25007C0116J, revised July 20, 2016

3.2 Current and Anticipated Future Permit Limits

Two types of permits are anticipated with regard to nutrient limits and wastewaster discharge. These include a groundwater discharge permit for the WWTF and watershed permits.

3.2.1 Groundwater Discharge Permits

The Oak Bluffs WWTF currently operates under MassDEP Groundwater Discharge Permit NO. #2-674M, dated July 20, 2015. On a maximum monthly average basis, the permit authorizes discharge of up to 340,000 gallons per day of treated wastewater to the Ocean Park Disposal Area and up to 250,000 gallons per day to the Leonardo Disposal Area. In total, the Oak Bluffs WWTF is currently authorized to treat and discharge up to 370,000 gallons per day on a maximum monthly average basis. Select conditions of the discharge permit are summarized in Table 3.1. The permit is included in this report as part of Appendix C.

Table 3.1 Oak Bluffs WWTF – Effluent Discharge Limitations

	Ocean Park Disposal Area	Leonardo Disposal Area
Flow[1]	340,000 gal/day	250,000 gal/day
Oil & Grease	15 mg/L	15 mg/L
Total Suspended Solids (TSS)[2]	30 mg/L	10 mg/L
5-day Biochemical Oxygen Demand (BOD_5)[2]	30 mg/L	30 mg/L
Total Nitrogen (Daily Maximum)	10 mg/L	10 mg/L
Nitrate-Nitrogen	10 mg/L	10 mg/L
Settleable Solids	0.1 mL/L	N/A
Fecal Coliform Bacteria	200/100 mL	200/100 mL
Total Dissolved Solids (TDS)	1,000 mg/L	N/A
Turbidity	N/A	5 NTU
pH (acceptable range)	6.5 – 8.5	6.5 – 8.5

Source:
MassDEP Groundwater Discharge Permit NO. #2-674M, dated July 20, 2015

Notes:
1. Oak Bluffs WWTF flow not to exceed 370,000 gallons per day.
2. Monthly average concentrations of BOD_5 and Total Suspended Solids (TSS) in the discharge shall not exceed 15% of monthly average concentrations of BOD_5 and TSS in the WWTF effluent.

The MEP and TMDL reports are expected to be a basis for future MassDEP effluent discharge permit requirements. It is anticipated that future permit requirements will have more stringent effluent nitrogen limits. The limit will depend upon the Recommended Plan, and will thus be reviewed in more detail in Phase III.

3.2.2 Watershed Permits

MassDEP has initiated a new voluntary program for watershed permitting in order to facilitate the removal of excess nitrogen loads impacting coastal embayments. The Watershed Permit is intended to provide a MassDEP accepted framework for nitrogen mitigation measures which recognizes community efforts to achieve compliance with the Clean Water Act through both traditional and non-traditional nitrogen management approaches. If a Watershed Permit is developed for a watershed that is located in multiple communities, an inter-municipal agreement (IMA) needs to be executed allocating nitrogen removal responsibilities to each community. The

Pleasant Bay Alliance (comprised of members from four towns located in the Pleasant Bay watershed) is currently participating in a Watershed Permit Pilot Project for Pleasant Bay, and is anticipated to receive the first draft Watershed Permit from MassDEP.

4. Existing Environmental Resources

4.1 Introduction

This chapter provides a summary of existing conditions, environmental resources, land use, zoning, and demographics in the Town. The Town's environmental resources are defined by the Town's topography, geology and soils, groundwater, surface waters, coastal embayments, wetlands, flood plains, and protected natural areas and habitats. Each of these existing conditions has been identified through review of existing Town documents and records, interviews, and site evaluations made by the project team.

4.1.1 Location and Neighboring Towns

The Town is located on a peninsula on Martha's Vineyard and has a total land area of approximately 7.37 square miles. The Town borders Lagoon Pond to the west, Nantucket Sound the north and east, and Sengekontacket Pond and the Manuel F. Correllus State Forest to the south. The Town is bordered by the Towns of Tisbury, West Tisbury, and Edgartown.

4.1.2 Climate and Sea Level Rise

Due to its island location, the climate on Martha's Vineyard is highly influenced by the surrounding Atlantic Ocean. According to the Western Regional Climate Center, the temperature range on Martha's Vineyard has an average annual low of 44.0 degrees Fahrenheit and average annual high of 59.9 degrees Fahrenheit. The island receives an average of 46.94 inches of rainfall and 25.3 inches of snowfall annually.

Martha's Vineyard is anticipated to be affected by sea level rise as a result of climate change. The "Dukes County Multi-Jurisdiction Hazard Mitigation Plan Update", dated October 2015, was prepared by The Martha's Vineyard Commission in conjunction with the emergency managers and planning teams of the seven Dukes County towns to assess the hazards likely to impact the seven towns on Martha's Vineyard. Through the development of the report, hazards and critical facilities were identified, vulnerabilities assessed, and actions recommended to mitigate the identified vulnerabilities. As noted in the report *'sea level fluctuates in response to natural processes such as glaciation and plate tectonics, and in response to man-made influences on the atmosphere. Sea level is rising in our area, with the result that erosion is increasing, and that development and infrastructure in flood-prone areas is more and more at risk.'* The report estimated a rise in sea level of 18.2 inches by 2050 and 59.4 inches by 2100. The report also noted that, due to acceleration of temperature increase, sea level is anticipated to rise about three times as much in the latter part of the century as in the first.

4.2 Natural Resources

4.2.1 Topography

As outlined in the 1996 Needs Assessment Report *'the majority of Oak Bluffs is characterized by very flat to undulating low rolling hills. In the area of East Chop and just northeast of Downtown, by the ferry pier, the land rises sharply from the sea, forming bluffs. There also are a number of low*

areas where the land elevation rises very gradually in the areas of the harbors for Vineyard Haven and Oak Bluffs, and Farm and Sengekontacket Ponds.'

4.2.2 Geology/Soils

As outlined in the 1996 Needs Assessment Report *'the surficial geology of Martha's Vineyard is the result of the last glaciation, approximately 15,000 years ago. It is characterized by the presence of terminal moraine and outwash plain. The area between Vineyard Haven and Edgartown, which is largely Oak Bluffs, consists mostly of outwash plain which is comprised of permeable sands and gravels capable of accepting wastewater discharges (Delaney, 1980).*

The Natural Resource Conservation Service in the Soil Survey for Dukes County, Massachusetts (USDA, 1986) classifies the majority of soils in Oak Bluffs as Carver Loamy coarse sands, which are characteristically very permeable, supporting rapid infiltration. Under Title 5, these soils are considered Class I, and are allotted the highest effluent loading rate. A limited number of areas within Oak Bluffs are underlain by less permeable mucks, peats and fine-grain material, which are primarily located in the vicinity of wetland areas.'

An interview with the Oak Bluffs Health Agent indicated that a small portion of the Town between Eastville Avenue and New York Avenue is known to have Class II soils. Under Title 5 Class II soils are defined as sandy loams and loams, and are allotted a lower effluent loading rate than Class I soils (Title 5 divides soils into four textural classes).

The soil series in the Town, as classified by the United States Department of Agriculture, is shown on Figure 4.1.

4.2.3 Groundwater

Martha's Vineyard is classified as a Sole Source Aquifer by the US Environmental Protection Agency (US EPA). The Town obtains its public drinking water from five sources within the Town:

- Lagoon Pond Well
- Farm Neck Well
- State Forest Well
- Madison Alwardt, Sr. Well
- John H. Randolph, Jr. Well

The Town's Zone I and Zone II protection areas are shown in Figure 4.2. A Zone I area is a protective radius around a public water supply well or wellhead. The protective radius is determined by the wells approved yield and has a minimum radius of 100 feet. For Public Water System wells with approved yields of 100,000 gpd or greater, the protective radius is 400 feet. The protective radius for wells with a smaller yield is determined by a formula outlined in 310 CMR 22.

A Zone II area is defined as the area of land that may contribute to a drinking water supply well after 180 days of pumping with no precipitation. In 310 CMR 22.02, a Public Water Supply is defined as a system that serves an average of at least 25 individuals daily for at least 60 days of the year.

As part of the Safe Drinking Water Act (SDWA), every state is required to create a Source Water Assessment Program for all of their public drinking water systems. The Zone II areas within the Town are described in the 2003 MassDEP Oak Bluffs Source Water Assessment and Protection (SWAP) Report as 'primarily a mixture of forested and residential land uses with small areas of recreation and commercial land uses'. The SWAP Report noted that the susceptibility of the system to contamination is high, due to the presence of at least one high threat land use within each of the water supply protection areas. High threat land uses include service station/auto repair shops, junk yards and salvage yards, industrial lagoons and pits, and landfills and dumps

The Oak Bluffs Water Department compiles an annual water report summarizing the results of groundwater sampling for the reported year. Samples are taken to determine the presence of radioactive, biological, inorganic, volatile organic, and synthetic organic contaminants. The US EPA sets Maximum Contaminant Limits (MCLs) for parameters of concern which establish a legal threshold limit for the parameter in a public water system. The MCL for nitrate is 10 mg/L.

Nitrogen compounds can be used as an indicator of groundwater degradation resulting from the use of onsite subsurface disposal systems. Typical sources on nitrates in groundwater include runoff from fertilizer use, leaching from septic tanks, erosion of natural deposits, and atmospheric deposition. A national analysis of nutrient concentrations in streams and groundwater from 1992 through 2004 by the United States Geological Survey (USGS) indicates a national background nitrogen concentration of 0.58 mg/L[1].

The Oak Bluffs Water Department samples nitrate concentrations at its water supply wellfields annually, as required by MassDEP. Nitrate levels from 2015 to 2017 are summarized in Table 4.1. Although the nitrate concentrations detected at Farm Neck Wellfield are slightly above background (indicating a possible human influence from septic systems, fertilizers, or other sources), all nitrate concentrations sampled during 2015 to 2017 are well below the MCL.

Table 4.1 2015 – 2017 Water Supply Nitrate Concentrations

	Lagoon Pond Well (mg/L)	Farm Neck Well (mg/L)	State Farm Well (mg/L)	Madison Alwardt, Sr. Well (mg/L)	John H. Randolph, Jr. Well (mg/L)
2015	0.46	1.92	0.03	0.06	0.14
2016	0.39	2.36	0.07	0.07	0.12
2017	0.39	1.97	0.11	0.15	0.15
Source: Oak Bluffs Water Department Sampling Data					

4.2.4 Surface Water

The Town is located entirely in the Martha's Vineyard Island Watershed, which is comprised of 89 square miles of drainage area, 13 named streams, 42 lakes, approximately 125 miles of coastline, and 8,777 acres of estuaries.

[1] 'Nutrients in the Nation's Streams and Groundwater: National Findings and Implications – Fact Sheet 2010-3078', prepared by the USGS, dated September 2010.

In Massachusetts, coastal and marine waters are classified by 314 CMR 4.00 into the following classifications:

- Class SA - waters designated as an excellent habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth, and other critical functions; and for primary and secondary contact recreation. Where designated in the regulations, the waters are suitable for shellfish harvesting without depuration.
- Class SB – waters designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth, and other critical functions; and for primary and secondary contact recreation. Where designated in the regulations, the waters are suitable for shellfish harvesting with depuration.
- Class SC – waters designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth, and other critical functions; and for secondary contact recreation.

The Islands Coastal Drainage Area, which contains the entirety of Martha's Vineyard, is designated as Class SA in the regulations, which were most recently updated in 2013.

Every two years the State of Massachusetts is required to submit a state-wide report describing the status of water quality in the Commonwealth to EPA. The "Massachusetts Year 2016 Integrated List of Waters" was prepared by the Massachusetts Division of Watershed Management through the Watershed Planning Program to fulfill this requirement. The document is commonly known as the "303(d)" list.

The Integrated List for 2016 divides water-bodies in Massachusetts into the following categories:

1. Waters attaining all designated uses.
2. Attaining some uses; other uses not assessed.
3. No uses assessed.

4a. TMDL is completed.

4b. Impairment controlled by alternative pollution control requirements.

4c. Impairment not caused by a pollutant – TMDL not required.

5. Waters requiring a TMDL.

Because of a state-wide Department of Public Health Advisory on the consumption of fish, no waters were listed as Category 1 in the 2016 report. Table 4.2 lists the water bodies in the Town that are listed in the Integrated List, their categorization, and causes of impairment.

Table 4.2 Oak Bluffs Water Bodies Listed on The Massachusetts Year 2016 Integrated List of Waters (303(d))

	Category	Nutrient Related Impairment?
Sunset Lake	2	N/A
Farm Pond	4a	Yes

Table 4.2 Oak Bluffs Water Bodies Listed on The Massachusetts Year 2016 Integrated List of Waters (303(d))

	Category	Nutrient Related Impairment?
Lagoon Pond	4a	Yes
Oak Bluffs Harbor[1]	5	No
Sengekontacket Pond	5	Yes
Vineyard Haven Harbor	5	No[2]
Lake Tashmoo	5	Yes

Source:

Massachusetts Year 2016 Integrated List of Waters – Proposed Listing of the Condition of Massachusetts Waters Pursuant to Sections 305(b), 314, and 303(d) of the Clean Water Act.

Notes:

1. TMDL not required (non-pollutant impairment).
2. Impaired for estuarine, bio-assessments, and fecal coliform.

The 2016 303(d) list indicates that four of the six listed waterbodies in the Town require a TMDL for a nutrient-related impairment. Since the publication of the 2016 report, a TMDL has been completed for all four waterbodies.

In the Massachusetts Department of Public Health's "Marine and Freshwater Beach Testing in Massachusetts Annual Report for the 2016 Season" eight locations were tested either weekly or monthly for enterococci. One single sample exceedance was detected at Pay Beach. No exceedances were detected at the other seven sampling points. The report indicates that bacteria exceedances could potentially occur from discharge of sewage by boats, re-suspension of sediment, or surface runoff from rainfall.

4.2.5 Wetlands and Vernal Pools

Wetlands result from both salt water and fresh water, and are valuable for flood protection, nutrient uptake and release, wildlife habitat and propagation, groundwater recharge, and open space for recreation and scenic beauty. The Wetlands Protection Act (WPA) is administered and enforced by MassDEP's Wetlands Program. The WPA imposes restrictions on the removal, filling, dredging, or alteration of any designated wetland. The Town has a Wetland Protection Bylaw, which is discussed further in Section 5.7.

Vernal pools are temporary bodies of freshwater that provide critical habitat for a number of vertebrate and invertebrate wildlife species.

Wetlands and vernal pools located in the Town are shown in Figure 4.3.

4.2.6 Floodplains

FEMA designated floodplains are shown in Figure 4.4.

4.2.7 Protected Natural Areas

The Areas of Critical Environmental Concern (ACEC) Program was formed in 1975 and is administered by the Department of Conservation and Recreation (DCR). The Program identified "areas of critical environmental concern to the Commonwealth." Areas are identified and nominated by a Community and designated by the Massachusetts Secretary of Environmental Affairs. The Town does not currently contain any ACECs.

4.2.8 Habitats

The Massachusetts Natural Heritage and Endangered Species Program (NHESP) maintains an atlas of estimated habitats and priority sites for rare plants and wildlife in Massachusetts. NHESP categorizes rare species into one of three categories:

1. **Endangered species** are in danger of extinction throughout all or a significant portion of their range or are in danger of extirpation from Massachusetts.
2. **Threatened species** are likely to become endangered in Massachusetts in the foreseeable future throughout all of a significant portion of their range.
3. **Special Concern species** have suffered a decline that could threaten the species if allowed to continue unchecked or occur in such small number or with such restricted distribution or specialized habitat requirements that they could easily become Threatened in Massachusetts.

Species within the Town noted by the NHESP as endangered, threatened, or of special concern are listed in Table 4.3.

Table 4.3 Endangered, Threatened, and Species of Special Concern in the Town of Oak Bluffs

Grouping	General Name	Scientific Name	Classification
Moths	Coastal Heathland Cutwork	Abagrotis nefascia	SC
Moths	Barrens Daggermoth	Acronicta albarufa	T
Moths	Gerhard's Underwing	Catocala herodias gerhardi	SC
Moths	Imperial Moth	Eacles imperialis	T
Moths	Barrens Buckmoth	Hemileuca maia	SC
Moths	Pink Sallow Moth	Psectraglaea carnosa	SC
Moths	Pine Barrens Zale	Zale lunifera	SC
Moths	Barrens Metarranthis	Metarranthis apiciaria	E
Moths	Dune Noctuid Moth	Sympistis riparia	SC
Moths	Faded Gray Geometer	Stenoporpia polygramaria	T
Moths	Sandplain Euchlaene	Euchlaena madusaria	SC
Moths	Unexpected Cycnia	Cycnia inopinatus	T
Butterflies	Oak Hairstreak	Satyrium favonius	SC
Beetles	Purple Tiger Beetle	Cicindela purpurea	SC

Table 4.3 Endangered, Threatened, and Species of Special Concern in the Town of Oak Bluffs

Grouping	General Name	Scientific Name	Classification
Birds	Piping Plover	Charadrius melodus	T
Birds	Common Tern	Sterna hirundo	SC
Birds	Roseate Tern	Sterna dougallii	E
Birds	Least Tern	Sternula antillarum	SC
Birds	Barn Owl	Tyto alba	SC
Birds	Eastern Whip-poor-will	Caprimulgus vociferus	SC
Plants	Purple Needlegrass	Aristida purpurascens	T
Plants	Sandplain Flax	Linum intercursum	SC
Plants	Papillose Nut-sedge	Scleria pauciflora	E
Plants	Bristly Foxtail	Setaria parviflora	SC
Plants	Sandplain Blue-eyed Grass	Sisyrinchium fuscatum	SC
Plants	Lion's Foot	Nabalus serpentarius	E
Plants	Nantucket Shadbush	Amelanchier nantucketensis	Recently de-listed
Plants	Northern Gama-grass	Tripsacum dacyuloides	E

Source:

"BioMap2: Conserving the Biodiversity of Massachusetts in a Changing World - Oak Bluffs Report", produced in 2012 by the Massachusetts Department of Fish & Game

Key:

E = Endangered
T = Threatened
SC = Special Concern
SWAP = State Wildlife Action Plan
S1 = Critically Imperiled Communities
S2 = Imperiled Communities
S3 = Vulnerable Communities

Figure 4.5 shows the areas in the Town designated as habitats for priority habitats and estimated habitats for rare wildlife. Priority habitats are defined as 'the geographical extent of habitat for all state-listed rare species, both plants and animals as codified under the Massachusetts Endangered Species Act (MESA).' Estimated habitats are a sub-set of Priority Habitats and show the geographical extent of state-listed rare wetland wildlife habitats as codified under the Wetland Protection Act.

4.3 Land Use and Zoning

4.3.1 Number of Oak Bluffs Properties and State Land Use Classifications

Analysis of the Town's Geographic Information System (GIS) database indicates a total of 4,929 parcels documented in the GIS database with a State Use Code. Properties are assigned a standard State land use code to allow for tax assessment of the properties. The properties and tax codes have been evaluated and summarized into groupings, as outlined in Table 4.4. The location of developable and potentially developable parcels are shown on Figure 4.7.

Table 4.4 Summary of Oak Bluffs Land Use

Land Use Grouping	State Use Codes	Total Number of Properties	Percentage of Total
Developed Properties			
Single-Family Residential	101, 103	3,328	68%
Multi-Family Residential	102, 104, 105, 109, 111	355	7%
Commercial	300, 301, 302, 303, 310, 316, 317, 318, 321, 322, 324, 325, 326, 332, 337, 338, 340, 341, 353, 355, 361, 362, 364, 370, 375, 383, 384	135	3%
Industrial	402, 4100, 424, 450	4	0%
Other – includes undevelopable, forest, agricultural, recreational, and exempt properties.	392, 712, 720, 803, 805, 900, 903, 905, 906, 910, 914, 921, 922, 930, 931, 932, 934, 935, 939, 940, 950, 951, 953, 954, 955, 957, 959, 960, 961, 962, 970, 972, 973, 980, 989, 991, 994, 995	613	12%
Developable Properties			
Residential	130, 131	493	10%
Commercial	390	1	0%
Industrial		0	0%
Total		**4,929**	

Note:
1. Seasonal properties are not differentiated in the Town's GIS database.

4.4 Town Zoning

Several zoning requirements have been established for the Town with respect to new development. These include minimum lot sizes, frontage, road setbacks, and maximum building heights. The requirements for these dimensions vary by zoning class and are identified in the Town's zoning bylaws.

The Town's zoning bylaws, as amended in April 2003, outline seven zoning districts. Minimum lot sizes for each type of parcel is listed in Table 4.5. The distribution of the Town's zoning districts is shown in Figure 4.6.

Table 4.5 Oak Bluffs Minimum Lot Sizes by Zone

Category	Minimum Lot Size (square feet)	Maximum Building Height (ft)
Residence 1 (R-1)	10,000	32
Residence 2 (R-2)	20,000	32
Residence 3 (R-3)	60,000	32
Residence 4 (R-4)	130,000	32
Business 1 (B-1)	N/A	35
Business 2 (B-2)	10,000	32
Health Care	10,000	35
Source: Town of Oak Bluffs Recodified Zoning Bylaws – April 2003 (Includes changes adopted through April, 2016)		

An accessory or guest apartment is permitted in the R1, R2, and R3 Districts if it meets conditions outlined in the bylaws.

Overlay districts are often used by Towns to establish alternative land development requirements within a specific portion of the community. The following overlay districts are outlined in the zoning bylaws:

- Water Protection Overlay District is defined by the area shown on the Oak Bluffs Water Resource Protection Map, dated January 24, 1986. The district was established to prevent contamination of the Town's groundwater resources.
- Flood Plain Overlay District includes all special flood hazard areas within the Town designated as Zone A, AE, AO, V, or VE on the Dukes County Federal Insurance Rate Map (FIRM) issued by the Federal Emergency Management Agency.
- Wireless Communication Overlay District establishes areas in which wireless facilities may be provided while protecting the Town's unique community character.
- Districts of Critical Planning Concern District establishes a Coastal District, Island Road District, Special Places District, Copeland Plan District, Oak Bluffs Harbor District, and Southern Woodlands District which are subject to overlay regulations in addition to the Town's zoning regulations.

5. Regulatory Issues

5.1 Introduction

This chapter presents a summary of environmental regulations affecting wastewater treatment facilities in Massachusetts and the Planning Area. Federal, state, regional, and town governments have enacted various environmental regulations, which relate to the collection, treatment, and discharge of wastewater. Federal regulations are contained in the Code of Federal Regulations (CFR) and are enforced by the US EPA. Massachusetts regulations are contained in the Code of Massachusetts Regulations (CMR) and are enforced by the MassDEP. Regionally the Martha's Vineyard Commission has adopted a Water Quality Policy to guide the review of Developments of Regional Impacts (DRIs). Locally, the Town has adopted Board of Health (BOH), conservation and zoning regulations, and Town Bylaws to protect the health of the citizens. These regulations, plans, bylaws, and guidance documents are intended to protect public health and the natural environment.

This chapter is intended to provide a brief summary of some of the regulations that are applicable to this project. This is not intended to be a comprehensive statement of everything that is involved in the various regulations. For details of any of the regulations, refer to the actual laws or regulations.

5.2 Federal Regulatory Issues

5.2.1 National Environmental Policy Act (NEPA)

The National Environmental Policy Act of 1970 (NEPA) provides the basis for the protection of the environment. This act ensures that environmental information is provided to the public for use in the decision-making process for projects that might affect the environment. According to the regulations, the "NEPA process is intended to help public officials make decisions that are based on an understanding of environmental consequences; and take actions to protect, restore and enhance the environment." This policy has been established to eliminate redundancy and combine NEPA requirements with other concerned agencies' requirements. The NEPA process is applicable to federal projects and is the forerunner of similar environmental review processes adopted by state and regional agencies; it allows for the assessment and identification of alternatives for projects concerning the environment.

The Town is not expected to enter into the NEPA process as the Project is regulated by the MEPA review process as described in the following sections.

5.3 State Regulatory Issues

5.3.1 On-Site Treatment and Discharge

Title 5 of the Massachusetts State Environmental Code provides minimum standards for the 'protection of public health, safety, welfare and the environment by requiring the proper location, construction, upgrade, and maintenance of on-site sewage disposal systems and appropriate means for the transport and disposal of septage." The regulations contained in 310 CMR 15.00 come under the jurisdiction of MassDEP and are enforced in conjunction with local health departments through permits, inspections, and financial penalties.

As defined by the regulations, an individual sewage disposal system is “a system or series of systems for the treatment and disposal of sanitary sewage below the ground surface.” Systems typically consist of a septic tank, a distribution box, and a soil absorption system. These systems may also include tight tanks, shared systems, or alternative systems if allowed by local and state regulations. The design considerations for Title 5 systems include minimum setbacks, minimum separation from groundwater, sizing guidance, and soil requirements.

The regulations are generally enforced by local health departments. The local BOH, due to specific problems or concerns, can and may impose more stringent requirements. Individuals and/or communities can receive a variance from the regulations; however, it must be in accordance with 310 CMR 15.00.

5.3.2 On-Site Treatment and Discharge in Nitrogen Sensitive Areas

310 CMR 15.214 outlines on-site wastewater treatment flow restrictions for new construction in Nitrogen Sensitive Areas. Nitrogen Sensitive Areas are defined as either “nitrogen sensitive embayments or other areas that have been designated as nitrogen sensitive”, interim wellhead protection areas, or department approved Zone II’s of public water systems.

System design flows in these areas are limited to 440 gallons design flow per day per acre (equivalent to four bedrooms per acre) unless an enhanced nitrogen removal system is installed. This restriction is also applicable for new construction with both an on-site wastewater disposal system and a drinking supply well.

5.3.3 Publicly Owned Treatment Works and Privately Owned Sewage Treatment Facilities

Publicly Owned Treatment Works (POTWs) are defined in 314 CMR 12.02 as “any device or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial waste of a liquid nature which is owned by a public entity. A POTW includes any sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.” Privately owned sewage treatment facilities (PSTFs) are the private version of the POTWs. In Massachusetts, there are detailed requirements at the State level, which apply stringent requirements on the location and operation of PSTFs.

Current MassDEP regulations require the use of a PSTF or POTW for any residential or commercial discharge greater than 10,000 gallons per day (gpd). MassDEP reviews the performance of these facilities under its Groundwater Discharge Permit (GWDP) Program (314 CMR 5.00). The Town has one Town-owned treatment facility in operation that is permitted to discharge over 10,000 gpd.

5.3.4 Effluent Discharge at an Ocean Outfall

The Massachusetts Ocean Sanctuaries Act (M.G.L. c132A) regulations establish state environmental policy to be enforced in the five Massachusetts Ocean Sanctuary areas, consisting of the Cape Cod Ocean Sanctuary, the Cape Cod Bay Ocean Sanctuary, the Cape and Islands Ocean Sanctuary, the North Shore Ocean Sanctuary, and the South Essex Ocean Sanctuary. These areas are special resources and the goal of the Act is to protect them from any “exploitation, development, or activity that would seriously alter or otherwise endanger their ecology or appearance.”

The Town is located in the Cape and Islands Ocean Sanctuary. Historically municipal wastewater discharges into ocean sanctuaries were specifically precluded under these regulations, unless the discharge was approved and licensed prior to December 1971. In 2014, M.G.L. c132A Section 16G was amended to outline the following prerequisites, which must be met for new or modified discharges into ocean sanctuaries. These requirements include:

> *"(1) The new or modified discharge shall be consistent with the intent and purpose of the act. Any discharge shall meet the water quality standards of the receiving water body and the standards of the act to protect the appearance, ecology and marine resources of the waters of the sanctuary.*
>
> *(2) The new or modified discharge shall meet the United States Environmental Protection Agency's approved TMDL, if any, on the receiving water body.*
>
> *(3) The applicant shall have adopted and implemented a plan approved by the department requiring the pretreatment of all commercial and industrial wastes discharged to the POTW.*
>
> *(4) The applicant shall have adopted and implemented a program for water conservation according to the guidelines established by the water resources commission.*
>
> *(5) The applicant shall have adopted and implemented a plan, approved by the department, to control and minimize inflow and infiltration.*
>
> *(6) The applicant shall have adopted and implemented a plan, approved by the department, to control any combined sewer overflows.*
>
> *(7) The new or modified discharge shall not significantly affect the quality or quantity of existing or proposed water supplies by reducing ground or surface water replenishment.*
>
> *(8) The new or modified discharge is consistent with the policies and plans of the Massachusetts coastal zone management program.*
>
> *(9) The new or modified discharge and treatment plans are consistent with all applicable federal, state and local laws, ordinances, by-laws, rules and regulations protecting the environment, including but not limited to, the requirements of chapters 21, 91, 130 and 131.*
>
> *(10) The proposed discharge and outfall structure will not adversely impact marine fisheries or interfere with fishing grounds or the normal operation of fishing vessels."*

Additionally, new discharges need to meet specified treatment requirements. An extensive permitting process is anticipated for the approval of a new municipal wastewater discharge into an ocean sanctuary.

5.3.5 Groundwater Discharge Permitting

The Massachusetts Groundwater Discharge Permit Program is contained in 314 CMR 5.00 and is the regulation which governs wastewater discharges over 10,000 gpd. The groundwater discharge regulations cover several types of discharge to groundwater, including discharges through

infiltration beds, percolations fields, lagoons, or injection wells. Application for a discharge permit requires a hydro-geologic evaluation, as well as an engineered design for the treatment and discharge facility.

The Town of Oak Bluffs Wastewater Treatment Facility is currently governed by the MassDEP Permit No. SD#2-674M dated July 2015. The date of expiration on the permit is 2019.

5.3.6 Surface Water Quality Standards

The Massachusetts Surface Water Quality Standards define activities that are prohibited in various class-designated surface water bodies. An additional summary of water quality is provided in the Integrated List of Waters, also known as the 303(d) list. The classification of waters within the Planning Area is discussed in Chapter 4.

5.3.7 Surface Water Discharge Permitting

The Massachusetts Surface Water Discharge Permit Program, described in 314 CMW 3.00, regulates all discharges of pollutants to surface waters located in Massachusetts. These include point discharges to surface waters from public and privately owned treatment works and stormwater discharges.

5.3.8 Wetlands Protection

The Wetland Protection Act (M.G.L. ch. 131, s. 40) and parallel State regulations (310 CMR 10.00) were enacted to safeguard wetlands, associated resource areas, and floodplains from over-development.

The Wetland Protection Act covers any wet area where the groundwater level is at or near the surface of the ground for a long enough period during the year to support a community of wetland-type vegetation. Wet areas may include salt or fresh-water marshes, meadow, swamp, or bog.

Areas subject to protection under the Wetlands Protection Act include banks, dunes, beaches, and flats. All of these protected areas are referred to as resource areas. Resource areas are protected by a surrounding 100-foot buffer zone in which landscape alterations are regulated. The Wetlands Protection Act also covers construction on land subject to flooding as well as land subject to coastal storm flowage. Generally, the regulations apply to two types of floodplain: those lands directly bordering on bodies of water, and those lands subject to flooding (called “Isolated Land Subject to Flooding”) which do not border bodies of water.

The State regulates activities that involve filling, dredging, or excavating in or near a wetland or water body. The regulations govern additional construction activities including site preparation, the removal of trees or buses, vista pruning, and the changing of land contours.

A Notice of Intent must be filed for work in any resource area. This Notice requires a detailed description of the planned activity, and the applicant must show that if the resource area will be altered, the benefits will outweigh the damage. For work outside the resource areas but within a 100-foot buffer zone around a bordering vegetated wetland, bank, dune or beach, the owner has the option of filing a “Request for Determination” in order to show that the work will not alter a resource area. If the Conservation Commission agrees, it will issue a “Negative Determination,”

permitting the work as presented. If the Conservation Commission decides that the work will alter a resource area, it will issue a “Positive Determination” and require a full hearing and the filing of a Notice of Intent.

5.3.9 Massachusetts River Protection Act

This law is an amendment to the WPA and establishes a Riverfront Area, which is included in the resource areas protected by the WPA. The law authorizes conservation commissioners to regulate activities that occur within the Riverfront Area and establishes protection of the natural integrity of rivers as a State priority.

Permits for work in Riverfront Areas will be denied if a significant adverse impact would result or if there is a “practicable and substantially equivalent economic alternative” that will have less impact on the resource area. Certain activities are exempt from the Rivers Protection Act, including renovation of abandoned cranberry bogs, and activities associated with wastewater treatment plants and their related structures, conveyance systems, and facilities.

5.3.10 Regulations for the Land Application of Sludge and Septage

The land application of sludge and septage is regulated by MassDEP in 310 CMR 32 and by USEPA in 40 CFR Part 503. The State regulations are more stringent.

Under the MassDEP regulations, sludge and septage are classified as Type I, II, or III depending on chemical, pathogen, organic content, and sludge stabilization processes used. The classification determines how the material can ultimately be used or disposed of. Type I material can be used on any site and requires no further MassDEP regulations, while Types II and III materials require additional regulation for their ultimate use, the application site, and allowable application rates.

5.3.11 Water Resources, Treatment, and Supply of Potable Water

The SDWA of 1974 is federal legislation which dictates the regulation of potable water in the United States. The law was amended in 1986 and 1996. States can apply to the EPA for “primacy” which gives the state the authority to implement the SDWA within its jurisdiction. The state needs to show they will adopt standards at least as stringent as the federal standards and ascertain that water systems within the state meet these standards. Massachusetts is a primacy state. Regulations contained in 310 CMR 21.00 closely parallel the federal regulations and establish the MCL of the regulated contaminants in drinking water.

The SDWA provides guidelines on the establishment of wellhead protection programs, which Massachusetts has established in Section 310 CMR 22.21. The program delineates three zones around each public water supply. The Zone I delineation is the area immediately around the well or wellfield which must be owned by, or in control of, the water purveyor. The Zone II delineation is the area of an aquifer which contributes water to a well under the “…most severe pumping and recharge conditions that can realistically be anticipated.” The regulations define the conditions as 180 days of pumping at safe yield with no recharge from precipitation. Zone II is bounded by the groundwater divide and by the contact of the aquifer with less permeable material. The Zone III delineation is the area beyond Zone II from which surface water and groundwater drain into a Zone II.

The allowed land use within each zone is regulated by the wellhead protection program. Land use activities within Zone I areas must be related to the water supply or have no significant adverse impact on water quality. The following land uses are prohibited from being sited in a Zone II area:

- Landfills or open dumps.
- Landfilling of sludge and septage.
- Automobile graveyards and junkyards.
- Stockpiling of contaminated snow or ice.
- Individual sewage disposal systems designed to receive more than 100 gallons of sewage per quarter acre under ownership every day.
- Wastewater treatment plants that are required to obtain groundwater discharge permits.
- Facilities that generate, treat, store, or dispose of hazardous materials.

There are exceptions to the prohibition of wastewater treatment plants listed above. These exceptions are reviewed by MassDEP on a case-by-case basis. As noted in the 2003 Oak Bluffs MassDEP SWAP Report, the Farm Neck Road Zone II area includes the Oak Bluffs Landfill, the Oak Bluffs/Tisbury Solid Waste Facility, and a former wastewater lagoon.

The Town has a Water Resource Protections Overlay District in its zoning bylaws in order to protect the groundwater resources from contamination. The Water Resource Protections Overlay District is discussed in further detail in Chapter 4.

5.3.12 MEPA Environmental Review

The MEPA environmental review process is governed by MEPA. In general, the MEPA process, as described in 301 CMR 11.00, establishes thresholds, procedures, and timetables for a multi-level review process. If a project exceeds review thresholds, the project proponent begins the review process by preparing and filing an ENF with the Secretary of Environmental Affairs. A 30-day review period follows, during which the Secretary receives agency and public comments and holds a site visit and consultation session. At the close of the ENF review period, the Secretary determines whether an Environmental Impact Report (EIR) is necessary and issues a MEPA certificate. If an EIR is required, it is prepared by the proponent and submitted to the Secretary. The EIR is reviewed at both draft and final stages by agencies and the public. After completion of the Secretary's review, state agencies may act on the project.

5.4 Regional Regulatory Issues

5.4.1 Interim Martha's Vineyard Commission Policy for Development of Regional Impact (DRI) Review – Water Quality Policy

Chapter 831 of the Martha's Vineyard Commission Act of 1977 as amended authorizes MVC to review developments on Martha's Vineyard that are "either so large or have such significant impacts on their surroundings that they would affect more than one town." These projects are labelled DRIs and must be approved by the MVC.

The MVC Policy for DRI Review Water Quality Policy was developed to provide guidance to DRI applicants to “ensure that new projects do not cause excessive nitrogen loading and further deterioration of water quality in the Vineyard’s fragile coastal ponds”. The policy also pertains to freshwater ponds, groundwater, and large water withdrawals. A draft policy was adopted in June 2006 and amended in February 2007.

MVC has calculated interim nitrogen-loading limits (on a per acre basis) for the majority of coastal ponds and watersheds based on a model developed by the Buzzard’s Bay National Estuaries Project. It is intended that the interim limits be modified based on the evaluations conducted through the Massachusetts Estuaries Project.

MVC has classified all five coastal estuaries in the Town as “impaired waters”. The policy for impaired waters states that the project must either meet the nitrogen-loading limit for the watershed or implement basic nitrogen-reduction techniques outlined in the policy, whichever is more restrictive. The document also provides nitrogen offset options that the Commission may consider. The policy also requires a 300 foot setback from the high-pond shoreline of fresh surface waters.

A draft Water Quality Management Policy was issued in March 2018. The draft policy notes that, due to the rapidly evolving nature of nitrogen mitigation technologies, the policy will be reviewed in approximately 2 to 3 years to assess technological and other changes. The policy, which is applicable to new developments that undergo the DRI process, requires that new developments be designed to operate at or below an Adjusted Nitrogen Load Limit which is outlined in the policy.

5.5 Martha’s Vineyard Island Plan

The Martha’s Vineyard Island Plan was developed to “chart a course to the kind of future the Vineyard community wants, and to outline series of actions to help us navigate that course.” The Island Plan was adopted by the Martha’s Vineyard Commission in 2009. The objectives and policies outlined in Table 5.1 were identified as applicable to the CWMP process in the Martha’s Vineyard Commissions staff comments submitted during the MEPA ENF review process. The CWMP will be developed in accordance with these objectives and policies.

Table 5.1 Martha's Vineyard Island Plan Policies and Objectives Applicable to the CWMP Project

	Objective	Strategy
Economic Development	Objective D1: Preserve and reinforce the traditional settlement pattern of the Island.	Strategy D1-1: Limit significant new development in outlying areas.
		Strategy D1-2: Restore and improve areas that were developed in problematic ways in the past.
	Objective L6: Locate commercial activities appropriately and ensure that there is sufficient commercial land for future needs.	Strategy L6-1: Keep retail activities and visitors services concentrated in vibrant, walkable, town centers.
		Strategy L6-2: Ensure that each town center has a full range of essential anchor businesses.
Adequacy of Infrastructure	Objective D2: Reduce the amount of future development, especially in environmentally sensitive areas.	Strategy D2-7: Extend and finance infrastructure in growth areas, and limit infrastructure connections in conservation areas.
	Objective D4: Ensure that development and redevelopment projects are better planned and designed.	Strategy D4-3: Set up an equitable and cost-effective system to finance community improvements.
		Strategy D4-4: Set up a system of mitigation fees.
	Objective H3: Increase funding for community housing and related infrastructure and services.	Strategy H3-4: Provide infrastructure for community housing.
	Objective H6: Increase the supply of housing for independent retirees, seniors and others needing assisted living housing.	Strategy H6-1: Quantify and plan for future housing needs for the elderly and those requiring specialized housing.
	Objective N10: Prepare for Climate Change	Strategy N10-1: Identify lands and infrastructure most at risk to sea level rise.
		Strategy N10-2: Limit construction in areas at greatest risk and adopt measures to limit impacts.
		Strategy N10-4: Carry out pre-disaster mitigation to reduce impacts from storms and flooding.
Open Space Impacts	Objective W2: Treat and dispose of wastewater in a manner that will support sustainable drinking water supplies and protect public health and surface water resources.	Strategy W2-1: Prepare a summary Wastewater Management Plan.
	Objective W3: Develop and implement nitrogen reduction on a watershed or Island-wide basis.	Strategy W3-1: Expand sewers and centralized or package wastewater treatment in higher density areas.
		Strategy W3-2: Facilitate the installation, monitoring, and operation of cluster and individual on-site systems with advanced nitrogen removal.
		Strategy W3-3: Set growth control regulations related to expansion of wastewater treatment.
	Objective W5: Ensure appropriate management of coastal ponds and their watersheds, including improvements to water circulation.	Strategy W5-1: Complete the Mass Estuaries Project (MEP) studies of coastal ponds.
		Strategy W5-4: Set regulations limiting nitrogen from new projects in sensitive watersheds.
Source: Martha's Vineyard Island Plan, adopted by MVC in 2009		

5.6 Regional Regulatory Design Guidance for Wastewater Facilities

5.6.1 TR-16 Guides for the Design of Wastewater Treatment Works; New England Interstate Water Pollution Control Commission, 2011 Edition as Revised in 2016

Technical Report Number 16 (TR-16) is a New England design standard for wastewater treatment works. The document provides guidance on collection system and treatment plant design and is used by MassDEP in its approval process for new and modified wastewater infrastructure.

5.7 Town of Oak Bluffs Regulations and Bylaws

The Code of Massachusetts Regulations allows for local authorities to establish stricter interpretations of the Title 5 regulations, with Title 5 being the minimum requirements allowed by the State. The Town has adopted regulations that pertain to treatment and discharge of sanitary wastewater. An overview of the Town's regulations that govern design, construction, and operation of septic systems are summarized below.

5.7.1 Coastal District

This regulation designates the Coastal District, which is defined as "lands generally within 500 feet of the mean high water mark of the ocean and coastal ponds, or below 10-feet elevation, or within 100-feet of streams and wetlands flowing into coastal great ponds, and the faces of coastal bluffs around East Chop. Coastal land between East Chop and Canonicus Avenue are excluded."

The regulations restrict the number of bedrooms for any lot in the Coastal District to six bedrooms. A total of three bedrooms are allowable on all lots up to 10,000 square feet and an additional 10,000 square feet of land is required for each additional bedroom. Additionally properties are required to:

- Install an enhanced nitrogen sewage disposal treatment system that produces an effluent of 25 mg/L total nitrogen (as measured at the distribution box) or less.
- Locate the sanitary disposal facility a minimum of two hundred feet from a salt water body.

The regulations outline additional requirements for the Lagoon Pond District and Sengekontacket Pond District.

5.7.2 Cesspool Regulations

These regulations require properties with an existing cesspool to convert to a Title 5 septic system or connect to Town sewer if the property is sold, a permit is filed for additional bedrooms, or the property is "pre-approved" by the Wastewater Commission to connect to the Town's collection system.

5.7.3 Fertilizer Regulations

These regulations aim is to reduce the quantity of nitrogen and phosphorus entering the Town's water resources through a combination of education, licensure requirements, regulation of practice,

and enforcement. The regulations place restrictions on the time of year that fertilizer can be applied, and mandates maximum loading rates for applications.

5.7.4 Water Resource Protection Overlay District

The Town's Zoning Bylaws outline the permitted uses within the Town's Water Resource Protection Overlay District (WRPOD), which is shown in Figure 5.1. Properties within the overlay district are limited to the standards outlined in 310 CMR 15,00 for nitrogen-sensitive areas. As outlined in Section 5.3.2, system design flows in these areas are limited to 440 gallons design flow per day per acre (equivalent to four bedrooms per acre) unless an enhanced nitrogen removal system is installed. This restriction is also applicable for new construction with both an on-site wastewater disposal system and a drinking supply well.

5.7.5 Wetland Bylaws

The Town of Oak Bluffs Wetlands Protection Act Regulations, dated August 1994, defines a resource area (which is subject to protection under the Bylaws) as any land that is within 100 feet of any bank, freshwater wetland, beach, dune, flat, marsh, meadow, bog, swamp, estuary, creek, river, stream, pond or lake, land subject to any tidal action, coastal storm flowage, flooding or inundation or the 100-year storm line. The Bylaw requires that a permit application be filed with the Conservation Commission prior to filling, dredging, or altering of a building on a resource area. Upon review of the application, the Commission may issue conditions which need to be met as the work proceeds.

5.8 Joint Federal/State Regulatory Efforts

5.8.1 Total Maximum Daily Loads (TMDL)

The Federal Clean Water Act (CWA) requires states to develop a list of impaired waters, which are waters that are unable to meet state-established water quality standards for their intended use (i.e. drinking water supply, fishing, recreational swimming and boating, or healthy ecosystems for plants and animals). States are then required to develop TMDLs for the impaired waters that are affected by pollutants. A TMDL is a determination of the maximum amount of pollutants that a body of water can withstand.

In 1998, the EPA required all states to submit strategies for completing TMDLs within eight to 13 years. Massachusetts submitted a two-stage strategy. The first stage would make use of existing studies and information by working to implement corrective actions where feasible; develop a pilot program to define data collection needs and procedures to be used for TMDL development; and develop and standardize TMDL determination methods for pollutants that did not have well-established protocols. The second stage focused on developing the TMDLs, beginning with the TMDLs for pollutants with well-established determination methods.

Once TMDLs are determined, MassDEP develops a draft TMDL Report, followed by a public review and comment period. After addressing public comments, MassDEP submits the TMDL Report to EPA for formal approval. The TMDL development process requires that communities develop plans to restore the health of water bodies and then make progress toward implementation of the plans.

MassDEP monitors the progress of communities in achieving TMDLs. Restoration of water bodies is an extended process, so MassDEP looks for reasonable progress. If no reasonable progress is being made, MassDEP can take enforcement action.

The CWA requires states to monitor the quality of their water resources to determine if the water meets the standards for intended uses. This information is reported to the EPA in the Integrated List of Waters. Category 5 of the Integrated List itemizes water bodies that are “impaired or threatened for one or more uses and requiring a TMDL.” Therefore, this list becomes the basis for determining the water bodies for which TMDLs will be established. Waterbodies on the Integrated List of Waters are reviewed in further detail in Section 4.2.4.

6. Technical Reports and Data

6.1 Introduction

This chapter provides an overview of information used in preparing the Needs Assessment. The chapter includes a brief summary of past plans, reports, studies, and planning documents associated with wastewater planning in the Town.

Nutrient-related wastewater planning efforts in the Town began prior to the completion of MEP Reports for the coastal estuaries in the Town. These reports were based on best available information. The MEP reports, once completed, provided an in-depth analysis of coastal pond water quality, nitrogen loading, and assimilative capacity for each coastal estuaries. The reports were used to develop TMDLs for each estuary. The reports also summarized one sewering scenario that could be used to meet the watershed TMDL. After the MEP reports were released several studies were conducted exploring alternative strategies to meet TMDL requirements. In addition, a number of reports and studies have been completed for the wastewater treatment, collection, and disposal system.

6.2 1999 Wastewater Facilities Plan

The Town initiated wastewater planning efforts in the mid-1970s. Following several planning effort proposals that failed at Town Meeting, the Town completed a four phase wastewater planning project, which was accepted by the Town at Special Town Meeting in 1998. The project is summarized in four reports, as follows:

- “Oak Bluffs Wastewater Facilities Plan – Phase 1: Needs Analysis”, prepared by Horsley & Witten, Inc. with Wright-Pierce Engineers, dated May 1996.
- “Oak Bluffs Wastewater Facilities Plan – Phase II: Screening on Alternatives”, prepared by Horsley & Witten, Inc. with Wright-Pierce Engineers, dated August 1996.
- “Town of Oak Bluffs Massachusetts Draft Phase III Wastewater Facilities Plan and Environmental Impact Report EOEA #10456”, prepared by Horsley & Witten, Inc. and Wright-Pierce Engineers, dated January 20, 1998.
- “Phase IV – Final Facilities Plan – A Supplemental Appendix to the Draft Phase III Wastewater Facilities Plan and Environmental Impact Report”, prepared by Horsley & Witten, Inc. and Wright-Pierce, dated May 26, 1999.

The 1999 Facilities Plan recommended that the majority of the 4,300 lots in the Town continue to utilize individual on-site wastewater disposal systems. 529 lots, in five geographic areas, were identified as not containing sufficient area to allow on-lot systems to be constructed in compliance with Title 5. The five geographic areas are described as follows:

- Area A-North is comprised of the commercial portion of the densely developed downtown area.

- Area A-South is comprised of the residential portion of the densely developed downtown area which lies between Ocean Park and Waban Park.
- MVCMA is comprised of the Martha's Vineyard Camp Meeting Association.
- Area C is comprised of the area south of the downtown area and north of Farm Pond.
- Area D is comprised of the area west of the harbor and Sunset Lake.

The Facilities Plan recommended that 10 cluster systems be constructed in areas C, D, and MVCMA utilizing a STEP (septic tank effluent pumping) system, pressure sewers, and subsurface disposal within designated Town parks. The cluster systems have not been constructed to date. The Facilities Plan also recommended a wastewater treatment facility be constructed to treat flow from Areas A-North, A-South, and the MVCMA as well as in-fill lots located adjacent to required lots. The WWTF construction was completed in 2002. The WWTF was designed to treat wastewater from small properties without adequate area for a Title 5 septic system only. No flow capacity was allocated for nutrient management.

6.3 Pre-MEP Wastewater Planning Studies

6.3.1 "Martha's Vineyard Wastewater Management Study Prepared for Martha's Vineyard Commission", prepared by Wright Pierce, dated May 2010

This report provided a broad assessment of wastewater management needs for the six towns on Martha's Vineyard. The report was prepared prior to the completion of the MEP reports and is based on assessor and water supply data available at the time of the study. An estimate of island-wide wastewater flows and wastewater needs are presented as well as an overview of wastewater treatment options and a generalized cost-estimating approach for wastewater infrastructure.

A nitrogen control case study was evaluated for each of the six towns. The Oak Bluffs Case Study focused on a 153-lot residential area, called Sengekontacket Properties, in the Sengekontacket Pond watershed with frontage on County Road and Edgartown-Vineyard Haven Road. The Case Study compared the cost of constructing a satellite treatment and disposal facility on a currently vacant parcel on County Road versus constructing a pumping station to transport collected wastewater to the Oak Bluffs WWTF. The report determined that connection to the WWTF was the more cost-effective option for this Case Study.

The report noted that the MEP will provide more detailed information on coastal pond nitrogen loading, assimilative capacity, and possible mitigation measures for the Vineyard watersheds.

6.3.2 "Martha's Vineyard Wastewater Management Study Addendum – Case Studies for Lagoon Pond and Tashmoo Pond" prepared by Wright Pierce, dated June 2011

An addendum was prepared to the 2010 Wright Pierce Wastewater Management Study with supplemental funding from the Towns of Tisbury and Oak Bluffs. The report outlines two additional case studies for Lagoon Pond and Tashmoo Pond.

The Lagoon Pond Case study provided an analysis of four options for addressing watershed nitrogen control needs based on different allocations of the quantity of flow collected and treated through centralized treatment by the Towns of Oak Bluffs, Tisbury, and West Tisbury. The document concludes that the analysis could be used as a starting point by Town officials in future wastewater planning efforts.

The Tashmoo Pond Case Study explored the sensitivity of flow estimates to growth projections for the watershed. Flow projections were compared to remaining capacity at the Tisbury Wastewater Treatment Facility. The study concluded that an expansion of the Tisbury facility would be required to treat estimated flows in all scenarios analyzed.

6.4 Massachusetts Estuaries Project Evaluations and Findings

6.4.1 Introduction

The Massachusetts Estuaries Project (MEP) was established to "provide water quality, nutrient loading, and hydrodynamic information for 89 estuaries in Southeastern Massachusetts" (MEP, 2003). The project has created a linked watershed/estuary model that is used to predict water quality changes in an estuary using nitrogen loading inputs from the embayment's watershed. The purpose of the project is to evaluate nutrient-impaired estuaries in southeastern Massachusetts, and establish nitrogen loading thresholds that can be used as management goals in the respective watersheds.

These thresholds become the basis for generating TMDLs that can be used in watershed permitting. As generally defined in the Clean Water Act, TMDLs establish the threshold value for a particular pollutant in a water body, and this threshold is to be consistent with State Water Quality Standards (WQS). The TMDLs developed by the MassDEP serve as a guide for implementation activities aimed at reducing nitrogen loadings. Due to the non-point source nature of nitrogen loadings, it is appropriate to base the TMDL on annual average loadings instead of on daily average loadings.

As part of the MEP, the health of the estuarine habitat is also evaluated and this information is used to establish the water-quality threshold to maintain or improve the habitat. Threshold nitrogen levels are defined by MEP as "the average water column concentration of nitrogen that will support the habitat quality being sought".

The MEP is a collaborative effort with the Executive Office of Energy and Environmental Affairs (EOEEA) through MassDEP and the University of Massachusetts Dartmouth's School of Marine Science and Technology (SMAST).

The following reports were produced for watersheds within the Town through the MEP:

Farm Pond

- "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Farm Pond System, Town of Oak Bluffs, MA Final Report", dated November 2010.

- "Final Farm Pond Estuarine System Total Maximum Daily Load for Total Nitrogen (CN-391.1)", dated July 2015.

Lagoon Pond

- "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Lagoon Pond System, Towns of Oak Bluffs and Tisbury, MA Draft Report", dated June 2010.
- "Final Lagoon Pond Estuarine System Total Maximum Daily Loads for Total Nitrogen (CN-390.1)", dated July 2015.

Lake Tashmoo

- "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Lake Tashmoo Estuary Towns of Tisbury, West Tisbury and Oak Bluffs, MA – Final Report", dated February 2015.
- "Final Lake Tashmoo Estuarine System Total Maximum Daily Load for Total Nitrogen (CN 353.0)", dated August 2017.

Oak Bluffs Harbor

- "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Oak Bluffs Harbor System, Town of Oak Bluffs, MA – Final Report", dated May 2013.

A TMDL has not yet been issued for Oak Bluffs Harbor.

Sengekontacket Pond

- "Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Sengekontacket Pond System, Towns of Oak Bluffs and Edgartown, MA – Final Report", dated January 2011.
- "Final Sengekontacket Pond Estuarine System Total Maximum Daily Loads for Total Nitrogen (CN-310.1)", dated November 2015.

6.4.2 Summary of MEP Approach for Estuaries in the Project Area

Nitrogen thresholds for sub-watersheds within each major watershed were developed to restore or maintain Class SA water quality or to support high habitat quality with the following basis:

- 314 CMR 4.05 defines SA waters as "suitable for shellfish harvesting without depuration; an excellent habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation," and having "excellent aesthetic value."
- MEP defines high habitat quality as "supportive of eelgrass and infaunal communities."

Watershed specific information was obtained to determine the nitrogen loads resulting from the various nitrogen sources within the watersheds—including wastewater, fertilizers, runoff from impervious surfaces, and atmospheric deposition. Natural attenuation and nitrogen recycling

estimates were obtained from previous regional studies and from measurements within each watershed. Existing and future nitrogen loadings were established for each sub-watershed. Nitrogen reductions were evaluated through the "Linked Watershed-Embayment Model," to see if the nitrogen thresholds could be met.

Current (at the time of the MEP Report) Septic Nitrogen Loads

Current (at the time of the MEP Report) estimated nitrogen loads to each watershed were estimated using water data (for properties with public water supply) from 2003 through 2006 for the MEP Reports. Average water use values were assigned to developed properties without water use accounts. Water use assumptions (which are based on average water use for similar land use categories) and the date of the land use information for each watershed are outlined in Table 6.1. The methodology used to update the water use data for this project is outlined in Chapter 8.

Table 6.1 MEP Water Use Assumptions by Watershed

	Average Water Use – Residential (gpd)	Average Water Use – Commercial (gpd/1,000 ft^2 of building)	Land Use Information Date
Farm Pond[1]	160	42	2008
Lagoon Pond[2]	160	21	2008
Sengekontacket[3]	227	21	2008
Oak Bluffs Harbor[4]	145	95	2012
Tashmoo[5]	190	66	2010

Sources:

1. "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Farm Pond System, Town of Oak Bluffs, MA Final Report", dated November 2010.
2. "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Lagoon Pond System, Towns of Oak Bluffs and Tisbury, MA Draft Report", dated June 2010.
3. "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Sengekontacket Pond System, Towns of Oak Bluffs and Edgartown, MA – Final Report", dated January 2011.
4. "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Oak Bluffs Harbor System, Town of Oak Bluffs, MA – Final Report", dated May 2013.
5. "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Lake Tashmoo Estuary Towns of Tisbury, West Tisbury and Oak Bluffs, MA – Final Report", dated February 2015.

The following assumptions were used to estimate a nitrogen load from septic systems:

- Wastewater generation = 90% of water consumption.
- Wastewater nitrogen concentration approximately equal to 35 mg/L (with approximately 25% nitrogen reduction within the septic tank and soil absorption zone).

Future Septic Nitrogen Loads (Buildout)

A build-out analysis was performed to estimate future wastewater nitrogen loading. For this analysis, assumptions similar to the existing use analysis were used, including average water use for residential and commercial properties. The buildout analysis, which was conducted by the Martha's Vineyard Commission with guidance from MEP staff, included an assessment of minimum lot sizes based on current zoning, potential additional development on existing developed lots, and a review of guesthouse provisions available under local regulations. It should be noted that a build-out analysis is used to estimate the maximum growth based on current zoning. Projected growth within the 20-year planning period of this project is discussed in Chapter 8.

6.4.3 Total Maximum Daily Load (TMDL) Development

TMDLs are typically developed as part of the Federal CWA. Compliance with section 303(d) of the CWA results in the identification of water bodies that do not meet the water quality standards for the designated uses, therefore requiring a TMDL.

The MEP work assessed the water quality and determined the loading capacity of the water body. The loading capacities were developed by setting water quality conditions that would:

- Restore the natural distribution of eelgrass because it provides valuable habitat for shellfish and finfish;
- Prevent algal blooms;
- Protect benthic communities from impairment or loss; and
- Maintain dissolved oxygen concentrations that are protective of the estuarine communities.

The TMDL was developed for current conditions.

6.4.4 Summary of Watershed Delineations

The Martha's Vineyard Commission's regional groundwater model was used by the MEP to delineate major watersheds into sub-watersheds. This section provides a summary of the coastal watersheds and sub-watersheds in the Planning Area.

6.4.4.1 Farm Pond

The Farm Pond Embayment System is a simple estuary entirely within the Town of Oak Bluffs. The estuary exchanges tidal waters with Nantucket Sound through two culverts on its eastern shore. The pond does not have any sub-watersheds.

6.4.4.2 Lagoon Pond

The Lagoon Pond Embayment System is located primarily within the Towns of Oak Bluffs and Tisbury with small portions in the Towns of Edgartown and West Tisbury. Tidal exchange between the system and Vineyard Sound occurs through a single inlet through a barrier beach. The system is comprised of three sub-watersheds, as listed below:

- Lagoon Pond East Arm sub-watershed which is located in the Towns of Oak Bluffs, Tisbury, West Tisbury, and Edgartown;
- Lagoon Pond West Arm Sub-watershed (also known as South End Basin) which is a small tributary basin whose watershed is located entirely in West Tisbury; and
- Upper Lagoon Pond sub-watershed which is located in the Towns of Oak Bluffs, Tisbury, West Tisbury, and Edgartown.

6.4.4.3 Lake Tashmoo

The Lake Tashmoo Embayment system is located primarily within the Towns of Tisbury and West Tisbury, with a small portion of the watershed located within the Town of Oak Bluffs. Tidal exchange between the system and Vineyard Sound occurs through a single inlet at a barrier beach. The system is comprised of three sub-watersheds, as listed below:

- Lake Tashmoo – Main Basin is located primarily in Tisbury and West Tisbury, with a small portion in Oak Bluffs.
- Drew Cove is located primarily in Tisbury, with a very small portion in Oak Bluffs.
- Lake Tashmoo Upper is located primarily in Tisbury and West Tisbury, with a small portion in Oak Bluffs.

6.4.4.4 Oak Bluffs Harbor

The Oak Bluffs Harbor and Sunset Lake Embayment System is a man-made open water embayment system, which has been altered significantly by human activity over the past century. Oak Bluffs Harbor was formerly a coastal pond (called Lake Anthony) which was opened to tidal flows and stabilized at the inlet to create a marine harbor. The Oak Bluffs Harbor estuary exchanges tidal waters with Vineyard/Nantucket Sound through the harbor inlet. Sunset Lake is small tidal basin, which is a sub-watershed to Oak Bluffs Harbor. Sunset Lake has nearly unrestricted tidal exchange from the main harbor basin through a box culvert under Lake Avenue. Both sub-watersheds (Oak Bluffs Harbor and Sunset Lake) are located entirely within the Town of Oak Bluffs.

6.4.4.5 Sengekontacket Pond

The Sengekontacket Pond embayment system is located within the Towns of Oak Bluffs and Edgartown. The eastern shore of the estuary is bounded by water from Vineyard/Nantucket Sound. The system is a coastal lagoonal type estuary with a smaller tributary salt pond called Trapps Pond. The estuarine system has two main basins (North Basin and South Basin) and two tributary sub-embayments (Majors Cove and Trapps Pond). The system is comprised of five sub-watersheds:

- The Farm Neck sub-watershed, which is located within the Towns of Oak Bluffs, Edgartown, and West Tisbury.
- The Majors Cove sub-watershed, which is located within the Towns of Oak Bluffs, Edgartown, and West Tisbury.

- The Ocean Heights sub-watershed, which is located within the Towns of Edgartown and West Tisbury.
- The Trapps Pond sub-watershed, which is located entirely within the Town of Edgartown.
- The State Beach sub-watershed, which is located within the Towns of Oak Bluffs and Edgartown.

6.4.5 Present (at the time of the MEP) Nitrogen Loadings to Subwatersheds

Table 6.2 outlines the present (at the time of the MEP) watershed load to each sub-watershed, in accordance with the MEP and TMDL reports. The table and Figure 6.1 also outlines each subwatershed's target threshold nitrogen load, which is the target nutrient level for restoration or protection of the watershed, and the percent load reduction that would be required to achieve the threshold nitrogen load.

Table 6.2 Present (at the time of the MEP) Nitrogen Loading to Subwatersheds

Watershed	Sub-watershed	Non-Wastewater Watershed Load (kg N/d)	Present Septic Load (kg N/d)	Present WWTF Load (kg N/d)	Present Watershed Load (kg N/d)	Target Threshold Load (kg N/d)	Watershed Load Reduction Needed to Achieve Threshold Loads[13]
Farm Pond	Farm Pond	1.55[1]	4.06[1]	0.36[1]	5.97[2]	4.394[2]	- 26.4%[2]
Lagoon Pond	Lagoon Pond	8.628[3]	27.580[4]	-[4]	36.21[5]	22.42[5]	- 38.1%[5]
Lagoon Pond	South End Basin	0.992[3]	4.770[4]	-[4]	5.76 [5]	3.38 [5]	- 41.4% [5]
Lagoon Pond	Upper Lagoon Pond	2,767[3]	2.060[4]	-[4]	4.83 [5]	4.83 [5]	0% [5]
Lake Tashmoo	Drew Cove	1.548 [6]	2.885 [6]	- [6]	4.433 [7]	4.144 [7]	-6.5% [7]
Lake Tashmoo	Tashmoo – Main Basin	4.490 [6]	15.416 [6]	0.294 [6]	19.907 [7]	12.199 [7]	-38.7% [7]
Lake Tashmoo	Tashmoo – Upper Basin	0.268 [6]	0.496 [6]	- [6]	0.764 [7]	0.764 [7]	0% [7]
Oak Bluffs Harbor	Oak Bluffs Harbor	0.800 [8]	4.307 [8]	0.433 [8]	5.54 [8]	6.386[9]	+15.3%[9]
Oak Bluffs Harbor	Sunset Lake	0.398 [8]	7.036 [8]	- [8]	7.704[8]	10.123[9]	+31.4%[9]
Sengekontacket	Farm Neck	3.70[10]	5.70[10]	-[11]	9.39[12]	9.39[12]	0%[12]

Table 6.2 Present (at the time of the MEP) Nitrogen Loading to Subwatersheds

Watershed	Sub-watershed	Non-Wastewater Watershed Load (kg N/d)	Present Septic Load (kg N/d)	Present WWTF Load (kg N/d)	Present Watershed Load (kg N/d)	Target Threshold Load (kg N/d)	Watershed Load Reduction Needed to Achieve Threshold Loads[13]
Sengekontacket	Majors Cove	2.24[10]	9.39[10]	-[11]	11.63[12]	6.37[12]	-45.2%[12]
Sengekontacket	Ocean Heights	2.32[10]	10.94[10]	-[11]	13.26[12]	13.26[12]	0%[12]
Sengekontacket	State Beach	0.12[10]	0.0[10]	-[11]	0.12[12]	0.12[12]	0%[12]
Sengekontacket	Trapps Pond	1.14[10]	2.04[10]	-[11]	3.18[12]	1.14[12]	-64.1%[12]

Notes:

1. Source – Table 4: Nitrogen Loading to Farm Pond from the "Final Farm Pond Estuarine System Total Maximum Daily Load for Total Nitrogen (CN-391.1)", dated July 2015.
2. Source – Table 5: Present Watershed Nitrogen Loading Rates, Calculated Loading Rates that are Necessary to Achieve Target Threshold Nitrogen Concentration and the Percent Reductions of the Existing Loads Necessary to Achieve the Target Threshold Loadings from the "Final Farm Pond Estuarine System Total Maximum Daily Load for Total Nitrogen (CN-391.1)", dated July 2015.
3. Non-Wastewater Watershed Load = Present Watershed Load – Present WWTF Load – Present Septic Load.
4. Source - Table ES-1 from the "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Lagoon Pond System, Towns of Oak Bluffs and Tisbury, MA Draft Report", dated June 2010.
5. Source – Table 5: Present Watershed Nitrogen Loading Rates, Calculated Loading Rates that are Necessary to Achieve Target Threshold Nitrogen Concentrations and the Percent Reductions of the Existing Loads Necessary to Achieve the Target Threshold Loadings, from the "Final Lagoon Pond Estuarine System Total Maximum Daily Loads for Total Nitrogen (CN-390.1)", dated July 2015.
6. Source – Table ES-1 from the "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Lake Tashmoo Estuary Towns of Tisbury, West Tisbury and Oak Bluffs, MA – Final Report", dated February 2015.
7. Source – Table 6: Present Watershed Nitrogen Loading Rates (Attenuated), Calculated Loading Rates that are Necessary to Achieve Target Threshold Nitrogen Concentrations the Percent Reductions of the Existing Loads Necessary to Achieve the Target Threshold Loadings
8. Source: Table ES-1 from the "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Oak Bluffs Harbor System, Town of Oak Bluffs, MA – Final Report", dated May 2013.
9. Source: Table VIII-3 from the "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Oak Bluffs Harbor System, Town of Oak Bluffs, MA – Final Report", dated May 2013.
10. Source: Table 4: Nitrogen Loadings to Sengekontacket Pond System Embayment from the "Final Sengekontacket Pond Estuarine System Total Maximum Daily Loads for Total Nitrogen (CN-310.1)", dated November 2015.
11. Present WWTF Load = Present Watershed Load – Non-Wastewater Watershed Load – Present Septic Load.
12. Source: Table 5: Present Watershed Nitrogen Loading Rates, Calculated Loading Rates that are Necessary to Achieve Target Threshold Nitrogen Concentrations and the Percent Reductions of the Existing Loads Necessary to Achieve the Target Threshold Loadings from the "Final Sengekontacket Pond Estuarine System Total Maximum Daily Loads for Total Nitrogen (CN-310.1)", dated November 2015.
13. A negative value indicates the reduction needed to achieve threshold loads. A positive value indicates remaining assimilative capacity in the system prior to reaching the threshold load.

The target threshold load for each sub-watershed can potentially be met through multiple alternatives. As part of the MEP project a scenario was developed outlining the amount of septic system nitrogen that would need to be removed from each sub-watershed to meet the target threshold load (Table 6.3). The scenario assumed that all nitrogen reduction would be accomplished through septic system load removal. As noted in the TMDL Report the scenario presented in Table 6.3 is one alternative loading scenario to achieve the threshold and other scenarios (utilizing non-sewering technologies) may also be possible. This scenario will be the starting point for evaluating the project areas and in the development of alternatives in the next phase of the Project.

Table 6.3 Threshold Septic System Load Reduction Required to Meet TMDLs—Existing Load Scenario

Watershed	Sub-Watershed	Present Septic System Load (kg N/d)	Threshold Septic System Load (kg N/d)	Threshold Septic System Load % Change
Farm Pond[1]	Farm Pond	4.06	2.484	- 38.8%
Lagoon Pond[2]	Lagoon Pond	27.58	13.79	- 50%
Lagoon Pond[2]	South End Basin	4.77	2.39	- 50%
Lagoon Pond[2]	Upper Lagoon Pond	2.06	2.06	0%
Lake Tashmoo[3]	Drew Cove	2.885	2.596	- 10%
Lake Tashmoo[3]	Tashmoo – Main Basin	15.416	7.708	- 50%
Lake Tashmoo[3]	Tashmoo – Upper Basin	0.496	0.496	0%
Oak Bluffs Harbor[4]	Oak Bluffs Harbor	4.307	5.153	+ 19.7%
Oak Bluffs Harbor[4]	Sunset Lake	7.036	9.453	+ 34.4%
Sengekontacket[5]	Farm Neck	5.696	5.696	0.0%
Sengekontacket[5]	Majors Cove	9.392	4.134	- 56.0%
Sengekontacket[5]	Ocean Heights	10.940	10.940	0.0%
Sengekontacket[5]	State Beach	2.036	0.000	-100%
Sengekontacket[5]	Trapps Pond	0.0	0.0	0.0%

Notes:

1. Source: Table 6: Summary of the Present Septic System Loads and the Loading Reductions that would be Necessary to achieve the TMDL by Reducing Septic System Load Alone from the "Final Farm Pond Estuarine System Total Maximum Daily Load for Total Nitrogen (CN-391.1)", dated July 2015.
2. Source: Table 6: Summary of the Present Septic System Loads and the Loading Reductions that would be Necessary to achieve the TMDL by Reducing Septic System Load Alone from the "Final Lagoon Pond Estuarine System Total Maximum Daily Loads for Total Nitrogen (CN-390.1)", dated July 2015.
3. Source: Table 8: Summary of the Present Septic System Loads (Attenuated) and the Loading Reductions that would be Necessary to Achieve the TMDL by Reducing Septic System Loads Alone from the "Final Lake Tashmoo Estuarine System Total Maximum Daily Load for Total Nitrogen (CN 353.0)", dated August 2017.
4. Source: Table VII-2 from the "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Oak Bluffs Harbor System, Town of Oak Bluffs, MA – Final Report", dated May 2013.
5. Source: Appendix B -Summary of the Present On-Site Subsurface Wastewater Disposal System Loads and the Loading Reductions Necessary to Achieve the TMDL by Reducing On-Site Subsurface Wastewater Disposal System Loads Only, from the "Final Sengekontacket Pond Estuarine System Total Maximum Daily Loads for Total Nitrogen (CN-310.1)", dated November 2015.

6.4.6 Build-Out Nitrogen Loadings to Sub-Watersheds

In the MEP Reports a "build-out" scenario was developed for each sub-watershed based on potential development. The build-out scenario is based on development potential based on the Town's current zoning. Future projections for the projects 20-year planning period are discussed in Chapter 8.

Table 6.4 Threshold Septic System Load Reduction Required to meet TMDLs—Build Out Scenario

Watershed	Sub-Watershed	Present Load (kg N/day)	Build-Out Load (kg N/d)	Build-Out Percent Change (%)
Farm Pond[1]	Farm Pond	5.970	7.151	19.8%
Lagoon Pond[2]	Lagoon Pond	36.208	52.808	45.8%
Lagoon Pond[2]	South End Basin	5.762	7.970	38.3%
Lagoon Pond[2]	Upper Lagoon Pond	4.827	5.145	6.6%
Lake Tashmoo[3]	Drew Cove	19.907	29.523	48.3%
Lake Tashmoo[3]	Tashmoo – Main Basin	4.433	5.742	29.5%
Lake Tashmoo[3]	Tashmoo – Upper Basin	0.764	0.907	18.6%
Oak Bluffs Harbor[4]	Oak Bluffs Harbor	5.540	6.386	15.3%
Oak Bluffs Harbor[4]	Sunset Lake	7.704	9.849	27.8%
Sengekontacket[5]	Farm Neck	9.392	10.926	16.3%
Sengekontacket[5]	Majors Cove	11.627	13.003	11.8%
Sengekontacket[5]	Ocean Heights	13.260	19.962	50.5%
Sengekontacket[5]	State Beach	3.175	6.148	93.6%
Sengekontacket[5]	Trapps Pond	0.115	0.115	0.0%

Notes:

1. Table VI-4 of the "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Farm Pond System, Town of Oak Bluffs, MA Final Report", dated November 2010.
2. Table VI-4 of the "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Lagoon Pond System, Towns of Oak Bluffs and Tisbury, MA Draft Report", dated June 2010.
3. Table IV-4 of the "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Lake Tashmoo Estuary Towns of Tisbury, West Tisbury and Oak Bluffs, MA – Final Report", dated February 2015.
4. Table VI-4 of the "Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Oak Bluffs Harbor System, Town of Oak Bluffs, MA – Final Report", dated May 2013.
5. Table VI-4 of the "Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Sengekontacket Pond System, Towns of Oak Bluffs and Edgartown, MA – Final Report", dated January 2011.

6.4.7 Additional Modeling Scenarios

6.4.7.1 Farm Pond

The MEP hydrodynamic model indicated that the existing 12-foot wide Farm Pond culvert is currently undersized, based on optimum velocities in the inlet channel. An additional modeling scenario was simulated with a larger 16-foot foot culvert to increase the pond's tidal flushing. The model indicated that the pond can likely be restored simply by increasing the size of the culvert from 12-feet to 16-feet (with no sewering).

6.4.7.2 Lagoon Pond

An additional modeling scenario was conducted to investigate whether the installation of culverts under Beach Road, between West Arm and Vineyard Haven, would positively increase the pond's tidal flushing. The model indicated that, while some improvement is seen in the West Arm (South End Basin), there is minimal improvement in the remainder of the pond, and that nitrogen threshold restoration goals cannot be met through culvert installation alone.

6.4.7.3 Lake Tashmoo

An additional analysis was conducted to evaluate nitrogen loading difference between the MEP model and a groundwater model that was developed by the Town of Tisbury's wastewater consultant to assess the potential impacts of developing a new effluent discharge site in Tisbury. The difference in nitrogen loading between the two models was concluded to be small and within the margin of the predictive ability of the water quality model.

6.4.7.4 Oak Bluffs Harbor

No additional modeling scenarios for Oak Bluffs Harbor are documented in the MEP Report.

6.4.7.5 Sengekontacket Pond

The Town of Edgartown requested that an additional modeling scenario be developed to assess the impact of collecting approximately 84,500 gallons per day of wastewater within the Ocean Heights/Arbutus Park sewer area (which is within the Ocean Heights sub-watershed), treating it at the existing Edgartown Wastewater Treatment Facility to an effluent nitrogen concentration of 2.97 mg/L, and returning the effluent to the same watershed. The model indicated that, although the threshold target at the sentinel stations would not be achieved through this project alone, the proposed sewering is anticipated to improve the water quality in many of the ponds basins, particularly in the sub-basin adjacent Ocean Heights and Trapps Pond.

6.5 Post MEP Wastewater Planning Studies

6.5.1 "Sewering Scenarios Resulting for Lagoon Pond based on MEP Linked Model Technical Memorandum", prepared by the University of Massachusetts Dartmouth School of Marine Science and Technology Coastal Systems Group", dated October 25, 2011

This memorandum was prepared to summarize the findings of two scenario evaluations using the MEP Linked Watershed-Embayment Model for the Lagoon Pond watershed.

The sewer area for Scenario 1 included the YMCA, Martha's Vineyard Hospital, the Windemere Nursing and Rehabilitation Center, and a portion of the Town near the Lagoon Pond inlet roughly bounded by County Road, Barnes Road, the Martha's Vineyard Hospital, and the shoreline of Lagoon Pond.

The sewer area for Scenario 2 included the YMCA, Martha's Vineyard Hospital, the Windemere Nursing and Rehabilitation Center, and a portion of the Town along the eastern side of Lagoon Pond roughly bounded by Barnes Road, the Lagoon Pond watershed delineation line, High Meadow Road, Tiffany Land, and the shoreline of Lagoon Pond.

The following parameters were established for both scenarios:

- Wastewater flows are collected from the two sewer areas in the Lagoon Pond watershed described above, conveyed and treated at the Oak Bluffs WWTF, and all of the flow is discharged at the infiltration beds adjacent to the WWTF (which is within the Lagoon Pond watershed) during July and August. For the remainder of the year the scenarios assumed effluent wastewater is discharged to the subsurface disposal beds at Ocean Park.
- Wastewater flow is treated to an effluent total nitrogen concentration of 3 mg/L.
- The model used the conservative assumption that there is no longitudinal dispersion of the plume and the entire July and August load reaches the estuary within two months.
- Current (not buildout) flows are used in the analysis.
- Scenarios are based on current Lagoon Pond inlet configuration (none of the proposed nitrogen reduction measures such as expanded culverts were considered).

Both scenarios failed to reach the TMDL threshold of 0.35 mg/L at the upper basin sentinel station. The report recommended that a more refined determination of likely effluent plume characteristics be established and incorporated into an additional scenario run. The report noted that alternative management actions, such as incorporating culvert openings and a more refined effluent plume estimate, could be used in a future scenario to potentially meet the TMDL threshold.

6.5.2 "Lagoon Pond PRB Evaluation Report Prepared for the Towns of Oak Bluffs and Tisbury, MA" by Lombardo Associates, Inc., dated March 1, 2016

This report evaluated the use of PRBs to aid in the restoration of water quality in the Lagoon Pond watershed. The report identified six recommended PRB locations in the Towns of Oak Bluffs and Tisbury and estimated that the Lagoon Pond TMDL could be achieved through the installation of approximately 8,000 feet of PRBs at the recommended locations under current nitrogen loading conditions. The report recommended the following next steps in the evaluation of PRBs for nitrogen remediation in the Lagoon Pond watershed:

1. Collect field data to verify the groundwater quality, flow, and depth to salt water interface estimates that were used in the development of the report.
2. Update the report with the collected field data.

3. Select PRB demonstration sites.
4. Conduct field review and groundwater testing of PRB demonstration sites and prepare preliminary site PRB conceptual designs.
5. Develop a preliminary design and budget for two demonstration sites.
6. Construct the PRB and perform evaluation studies.
7. Revise the report based on the findings of the demonstration sites and develop a program for full-scale PRB installation.

It should be noted that PRBs are not currently considered an approved technology by MassDEP.

6.5.3 "Water Quality Monitoring and Assessment of the Martha's Vineyard Island-Wide Estuaries and Salt Ponds Summary 2016 (year 1 of 3)", prepared by the University of Massachusetts Dartmouth School for Marine Science and Technology, dated February 28, 2017

This report summarized the results of the summer 2016 Martha's Vineyard Island-Wide Water Quality Monitoring Program. Water quality monitoring was completed as a collaboration between MVC and the Coastal Systems Program (CSP) at the University Dartmouth, SMAST; and 2010 Total Nitrogen concentrations were compared to historical values. The goals of the monitoring program are to:

"1. Determine the present ecological health of each of the main salt ponds and estuaries across the island of Martha's Vineyard.

2. Gauge (as historical data allows) the decline or recovery of various salt ponds and embayments over the long-term (also part of TMDL compliance).

3. Provide the foundation (and context) for detailed quantitative measures for proper nutrient and resource management, if needed, and to assess the success of implemented restoration alternatives.

4. Compliance monitoring to meet requirements of TMDLs as they are developed as towns across the island move into implementation of restoration approaches.

5. Provide a mechanism to easily compare present water quality data to MEP established nutrient thresholds."

The report described the water quality findings in each coastal estuary as follows:

*"**Farm Pond:** Farm Pond is a heavily altered coastal salt pond currently with a tidally restricted inlet. Coastal processes have damaged the culvert and it is slated to be replaced. The MEP determined that properly restoring tidal exchange with a new culvert/channel structure would be sufficient to restore Farm Pond water and habitat quality, without additional actions. The 2016 water quality is similar to that assessed by the MEP. Due to the reduced tidal exchange, Farm Pond water parameters are relatively uniformly distributed, with only a slightly higher quality water in the upper basin near the restricted tidal culvert (i.e. it is operating like Chilmark Pond or Edgartown Great*

Pond). Water quality is presently moderate being impaired by elevated nitrogen levels with associated periodic oxygen declines and reduced clarity. Restoring monitoring in 2016 will provide an excellent baseline for assessing restoration success related to the future installation of the new tidal inlet.

Lagoon Pond: *Lagoon Pond, like Lake Tashmoo, is a classic simple estuary with a single tidal inlet, a relatively linear basin to inland headwaters. Lagoon Pond has a headwater "stream" and pond with a direct discharge to the uppermost estuarine shore. As such its highest quality waters are near the tidal inlet, with a slight decline to the head water station. The innermost shallow region of South End Basin is highly nitrogen enriched with low oxygen and phytoplankton blooms, in a restricted area with limited flushing. The deeper waters in the upper pond, nitrogen loading and flushing differences result in the entire upper pond showing slight nutrient related impairment (i.e. High-Moderate water quality). Similarly, Lagoon Pond was found to be impaired by nitrogen in the MEP analysis, based mainly on declines in eelgrass coverage and benthic animal communities, with some periodic DO depletions. The present analysis of water quality parameters is consistent with the MEP water quality assessment. Except for the innermost region of South End Basin, Lagoon Pond currently supports only moderate impaired water quality, consistent with its remaining eelgrass areas and benthic animal communities. The water quality impairment is primarily due to modest nitrogen enrichment and periodic oxygen declines, but generally good water clarity and low phytoplankton biomass compared to other estuaries (e.g. Cape Cod and Buzzards Bay). These latter parameters are supporting the eelgrass beds that remain in the system. Eelgrass is typically associated with the highest quality waters and estuarine habitat, but as the coverage is declining, it appears that nitrogen levels remain above the threshold level for high quality estuarine habitat, in the 2016 TN measurements.*

Lake Tashmoo: *Lake Tashmoo is a classic simple estuary with a single tidal inlet, a linear basin to inland headwaters. As such it has highest quality waters near the tidal inlet with a slight decline in quality to the head water station. Lake Tashmoo was found to be impaired by nitrogen in the MEP analysis, based mainly on declines in eelgrass coverage and benthic animal communities, with some periodic DO depletions. The present analysis of water quality parameters is consistent with the MEP water quality assessment. There is modest nitrogen enrichment and some oxygen decline, but generally good water clarity and low phytoplankton biomass compared with other estuaries (e.g. Cape Cod and Buzzards Bay). These latter parameters are supporting the eelgrass beds that remain in the system. Eelgrass is typically associated with the highest quality waters and estuarine habitat, but as the coverage is declining and showing signs of stress (e.g. significant epiphytic growth), it appears that nitrogen is just above its threshold level, as was confirmed in the 2016 TN measurements.*

Oak Bluffs Harbor: *Oak Bluffs Harbor is a heavily altered coastal salt pond that has an engineered tidal inlet, which supports twice daily tidal exchange with the high quality waters of Vineyard Sound. The system consist of a main basin with a smaller basin (Sunset Lake) connected through a culvert. Given its small size and tidal exchange the main basin supports relatively high and uniform water quality, while enclosed Sunset Lake is showing some nutrient related impairment. The Sunset Lake moderate water quality (impairment) results from its elevated nitrogen levels, reduced water clarity and periodic oxygen depletion. Oak Bluffs Harbor was also found to be impaired by nitrogen in the MEP analysis, based mainly on declines in eelgrass coverage and benthic animal communities,*

with some periodic DO depletions. The present analysis of water quality parameters is consistent with the MEP water quality assessment. Sunset Lake is likely being impacted both by its local sub-watershed and its hydrodynamics, but a specific analysis needs to confirm if altering the tidal flows would be sufficient for its restoration. However, given its function as a harbor and its structure the main basin is currently supporting high water quality with some benthic animal impairment possibly due mainly to its structure and use.

Sengekontacket Pond: *Sengekontacket Pond is a permanently open coastal salt pond that has two engineered inlets that are periodically dredged to maintain tidal exchange with Nantucket Sound. Water quality within the Sengekontacket Pond System is heterogeneous, with high quality waters throughout the main basin and lower quality waters in its tributary basins. The main tributary basin of Majors Cover is less well flushed than the main basin, with a resulting slight decline in water quality due to nitrogen enrichment, lower water clarity and periodic oxygen depletion. The other major tributary basin, Trapps Pond, shows a greater reduction in water quality, being more nitrogen enriched, with lower clarity and greater oxygen depletion than Majors Cove. The Trapps Pond monitoring station is located at the tidal culvert between the main basin and Trapps Pond and is only monitored on the ebbing tide so that Trapps Pond waters are being evaluated. However, it is likely that water from the uppermost tidal reach in this tributary basin is of even lower water quality than the measured outflowing water."*

6.5.4 "Draft Final – Town of Oak Bluffs/Tisbury – Partnership with the Coastal Systems Program for the Analysis of the Upper Lagoon Pond Nitrogen Attenuation to Reduce Loading of Nutrients Flowing to the Lagoon Pond Estuary" prepared by Dr. David Schlezinger and Dr. Brian Howes – Coastal Systems Program School of Marine Science and Technology – UMD

This report summarizes fieldwork that was conducted for a proposed project with the goal of characterizing the nutrient dynamics of Upper Lagoon Pond. The report details the methodology and results of a bathymetric map and soft sediment survey that were conducted as part of this project.

6.5.5 "Town of Oak Bluffs Wastewater Treatment Facility Evaluation Final Draft Report", prepared by GHD, dated June 2017

An engineering study was completed to determine whether capital improvements and/or operational changes that may be necessary at the existing Oak Bluffs WWTF to achieve consistent and reliable performance in accordance with the conditions of the facility's discharge permit and the original design intent for the facility. The report noted that the majority of the process equipment at the facility is approaching its design life of 20 years; and recommended that a plan should be implemented to address this infrastructure as part of any plant expansion or to start a renewal and replacement progress of mechanical equipment within 5 years. The report recommended that the plan be developed through the CWMP process.

7. Existing Water and Wastewater Infrastructure

The purpose of this chapter is to review the existing wastewater infrastructure in the Planning Area. This includes both on-site and centralized disposal systems. The analysis of this infrastructure provides a basis for estimating the nitrogen load resulting from wastewater disposal and developing management plans in the future.

7.1 Existing On-Site Systems

7.1.1 Description of Systems

The majority of the residential properties in the Town handle their wastewater through the use of on-site systems. Wastewater flows for on-site systems less than 10,000 gpd are regulated by Title 5, while flows greater than 10,000 gpd require a State-issued groundwater discharge permit.

There are several types of on-site systems in the Town including Title 5 systems, Innovative and Alternative (I/A) systems, and cesspools.

Title 5 systems receive their name because they were designed based on Title 5 regulations. Title 5 of the Massachusetts State Environmental Code provides minimum standards for the "…protection of public health, safety, welfare and the environment by requiring the proper siting, construction, upgrade and maintenance of on-site wastewater disposal systems and appropriate means for the transport and disposal of septage." The regulations contained in 310 CMR 15.00 come under the jurisdiction of MassDEP and are enforced in conjunction with the local health department through permits, inspections, and financial fines. Title 5 systems are composed of three main elements; a septic tank, distribution box, and soil absorption system. Septic tanks remove floatable and settable solids from the waste stream, and can act as an anaerobic digester to digest (remove) solids, as well as a flow equalization tank. The tank is usually constructed of concrete and consists of a baffled chamber; or it has inlet and outlet tees designed to isolate the solids in the tank and eliminate short circuiting of floatables. The distribution box receives the effluent from the septic tank and distributes it evenly throughout the leaching system. The distribution box is typically a small watertight concrete structure with one inlet and several outlets. Soil absorption systems come in many forms including leaching trenches, leaching pits, leaching galleries, and leaching fields. The selection of a particular type of soil absorption system for a particular design will depend upon the specific site considerations and costs.

Cesspools are tanks with open joints or holes in the walls and bottom through which the wastewater percolates into the ground. Solids collect in the bottom of the tank where they decompose, or can be removed as septage. BOH records indicate that a small amount of properties in the Town utilize cesspools. As discussed in Chapter 5 the Town's BOH regulations required that existing cesspools be converted to a Title 5 system or connect to Town sewer if the property is sold, a permit is filed for additional bedrooms, or the property is pre-approved by the Wastewater Commission to connect to the Town's collection system.

I/A Systems are alternative systems that use advanced technology to provide a higher level of treatment than regular Title 5 systems. The Title 5 regulations allow a smaller soil absorption system when they are used. They can be used to reduce the BOD and nitrogen in the septic tank

effluent. These systems often have more monitoring requirements than a regular Title 5 system. Alternative systems are usually requested and approved when a property owner has minimal space for a soil absorption system, when the property is located in a nitrogen sensitive area, or as required by the Board of Health, Conservation Commission, Planning Board, or Martha's Vineyard Commission. The Oak Bluffs BOH is currently compiling a list of I/A systems within the Town based on paper records.

The Town has established Districts of Critical Planning Concern (DCPC) for its Coastal Districts. DCPC Regulations for the Town were adopted by the Martha's Vineyard Commission in December 1976 and were amended in 2009.

As discussed in Chapter 5, the Board of Health Coastal District Regulations require that an I/A system be installed for any new construction or additions to existing residences within the Coastal Districts. The regulations require the installation of nitrogen removal technologies that produce an effluent not greater than 25 mg/L total nitrogen (as measured at the distribution box) and are approved by MassDEP for remedial use, piloting, provisional use, or general use be used.

7.1.2 Description of Failed Septic Systems

Available septic system records were reviewed to determine if there are any areas of the Town with chronic on-site wastewater disposal system failure. Septic system failures are typically identified during a real estate transaction. If a septic system is pumped out four or more times in one year it is also considered a failed system. Available septic system records from 2014 through 2017 did not indicate concentrated areas of septic system failures.

7.1.3 Discussion of Properties with Large Wastewater Discharges

Properties with design flows greater than 10,000 gallons per day are required to obtain a groundwater discharge permit or to connect to a sewer. DEP reviews the performance of large wastewater discharges under its Groundwater Discharge Permit Program (314 CMR 5.00). There are no private properties with a groundwater discharge permit in the Town.

7.1.4 Properties with Minimal Land for Title 5 Systems

Minimum required land areas for a Title 5 septic system can be determined based on design guidelines outlined in the regulations. The regulations define minimum sizing criteria for a Title 5 system and minimum setback distance between the system and features such as property lines, private water supply wells, and surface water supplies. Title 5 requires a 100-foot radius be maintained between a private well and a septic system. The original WWTF service area was designed to provide centralized treatment to lots which require an offsite solution. The majority of the properties with minimal land for a Title 5 system have been connected to the WWTF.

7.1.5 Properties with Known High Groundwater or Ledge Conditions

Title 5 regulations require 4-feet of separation between the top of maximum high groundwater elevation and the bottom of the soil absorption system. This distance is increased to 5-feet when the soils have a percolation of less than 2 minutes per inch.

Properties that cannot meet the minimum separation threshold and properties within the 100-year flood zone require septic systems that must be elevated to provide sufficient separation between the top of the groundwater and the bottom of the soil absorption system.

7.2 Existing Centralized Wastewater Infrastructure

7.2.1 Existing Wastewater Treatment Facilities

7.2.1.1 Oak Bluffs WWTF

Identification and History

The Oak Bluffs WWTF, located at 17 Pennsylvania Avenue, was constructed and began operating in 2002 to serve the needs of residential, commercial, and minor industrial and institutional users located within the Town. The facility was designed to treat wastewater collected from 529 lots that were identified as requiring off-lot solutions. The sewer service area for the WWTF is shown in Figure 7.1. The majority of the Town's business and approximately fifteen percent of the Town's residential properties are currently connected to the system. Several additions and modifications have been made to the plant since its original construction. The equipment at the facility has a twenty year design life, which will be reached in 2022. The majority of the centralized wastewater infrastructure in the Town was constructed under six construction contracts, which are described below:

1. **Wastewater Treatment Facility Construction.** The Operations Building, Filter Building, preliminary treatment (raw sewage grinding and bypass coarse 1-inch manual screening), advanced secondary treatment for nitrogen removal using sequencing batch reactors, tertiary effluent filtration, and ultraviolet (UV) effluent disinfection processes were completed and placed in service in 2002.
2. **Wastewater Subsurface Effluent Bed Construction.** The Ocean Park wastewater disposal system was completed and placed in service in 2002.
3. **Influent Screening Addition.** A mechanical screen and primary clarifier were added to the treatment process in 2007.
4. **Effluent Sand Beds Addition.** Two effluent sand beds were constructed on a parcel adjacent to the WWTF after the Town purchased the property in 2011.
5. **Effluent Pumping Station and Other Plant Modifications.** An effluent pumping station for pumping filtered effluent to the sand beds and several WWTF modifications were added to the facility in 2014.
6. **Garage Addition.** A modular garage was constructed adjacent to the WWTF in 2016 to protect the portable generators and other equipment.

   It should be noted that the effluent sand beds adjacent to the WWTF, which are in the Lagoon Pond watershed, were constructed at the facility subsequent to the development of the MEP Report for Lagoon Pond.

Performance and Capacity

The Oak Bluffs WWTF operates under Individual Groundwater Discharge Permit NO. #2-674M, dated July 20, 2015. The permit authorizes discharge of up to 340,000 gpd of treated wastewater to the Ocean Park Subsurface Disposal Area and up to 250,000 gpd to the sand beds adjacent to the facility. In total, the Oak Bluffs WWTF is currently authorized to treat and discharge up to 370,000 gallons per day on a maximum monthly average basis. The "Town of Oak Bluffs Wastewater Treatment Facility Evaluation Final Draft Report", prepared by GHD and dated June 2017, provides a detailed performance and capacity evaluation of the facility and is attached as Appendix C.

Major findings of the report are summarized below:

- The existing facility is near capacity on a nutrient load basis.
- The facility does not meet current redundancy requirements for its effluent filtration system and requires process upgrades.
- Although the majority of the equipment is in good condition, the existing facility and related remote mechanical infrastructure is approaching its design life of 20 years. The process equipment is anticipated to reach its design life in 2022.
- TMDL compliance may require the facility to expand its flow capacity.
- Facility needs were identified in the report. It is recommended that the needs are addressed as part of the CMWP process.

7.2.2 Collection System and Pumping Stations

Identification and History

The Town's centralized collection system is a hybrid low pressure/gravity system; and was constructed and began operating in 2002. The gravity portion of the system is comprised of approximately 7,000 linear feet of 8-inch PVC. The low-pressure system piping material is high-density polyethylene. Wastewater discharged by the majority of users on the system is conveyed by gravity and/or pumping to the Dukes County Avenue Pumping Station and then pumped to the WWTF. Several small extensions have been added to the collection system since its original construction.

A sanitary sewer typically has a minimum rated design life of 50 years. However, with proper system maintenance and appropriate repairs, it is possible to extend the life of a sewer significantly. The age of all of the sewers in the Town is significantly less than 50 years. The earliest that any of the Town's collection system will reach the 50-year design life is 2052. The Town's wastewater department has not noted any condition issues with the existing collection piping.

The Town owns and operates five major raw wastewater pumping stations:

- Dukes County Avenue
- Lake Avenue
- Our Market (also called Bath House)

- Ice Rink (includes High School)
- Hospital

The pumping stations and how they are connected to each other is shown schematically in Figure 7.2.

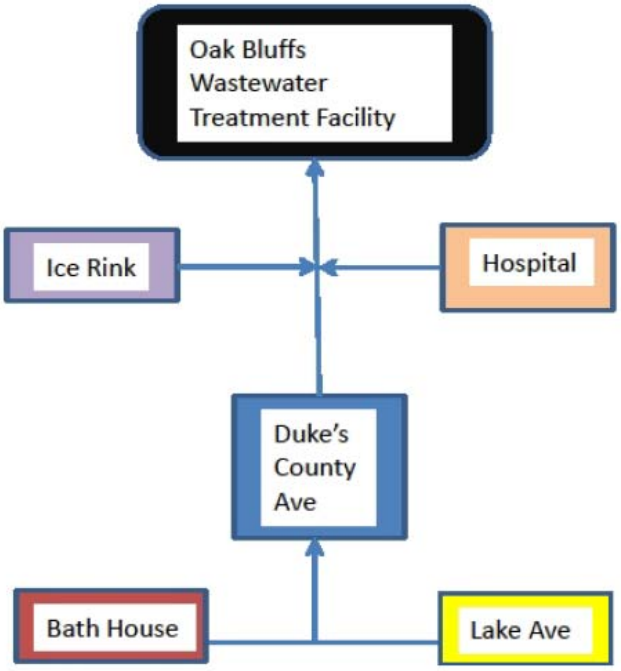


Figure 7.2 Oak Bluffs Raw Wastewater Pumping Stations

The Dukes County Avenue, Lake Avenue, and Bath House (a.k.a Our Market) pumping stations were all constructed around the year 2000. The lone modification to these stations was made in 2015 when an emergency generator and platform was constructed at Dukes County Avenue. This generator provides emergency power for both Dukes County Avenue and Lake Avenue pumping stations. The Hospital pumping station is approximately eight years old and the Ice Rink Pumping Station is approximately five years old.

A condition assessment of the pumping station is included in the "Town of Oak Bluffs Wastewater Treatment Facility Evaluation Final Draft Report", prepared by GHD and dated June 2017 (Appendix C).

The primary pumping station issues identified are summarized below:

- Dukes County Avenue Pumping Station, Lake Avenue Pumping Station, and Bath House Pumping Station are all located in the 100-year flood zone and are at risk for flooding.
- Dukes County Avenue Pumping Station, Lake Avenue Pumping Station, and Bath House Pumping Station are all within five years of their design life.

- None of the pumping stations are connected to the plant SCADA system.
- The Dukes County Avenue Pumping Station was originally slated to convey all of the sewage flow in the sewer service area. Additional pumping stations have been added to the system that pump directly to the WWTF resulting in Dukes County Avenue pumps being oversized based on current plant flows.

Sanitary Sewer Overflow (SSO) History

The system does not have a history of infiltration/inflow (I/I) and capacity-related overflows, bypasses, or surcharging.

Vulnerability to Anticipated Sea Level Rise

FEMA FIRM maps, most recently revised in 2016, indicate that the Dukes County Avenue Pumping Station, Lake Avenue Pumping Station, and Our Market Pumping Station are located within the 100-year flood zone, as shown in Figures 7.3, 7.4, and 7.5. The stations are also located within the Hurricane Surge Inundation Zone for a Category 1 hurricane, as shown in Figures 7.6, 7.7, and 7.8.

All three stations were designed when the previous revisions of the FEMA maps showed a much lower anticipated 100-year flood zone; they were not designed to withstand current flood projections. The electrical equipment at all three stations is vulnerable to inundation during a flood event. All three stations are identified as vulnerable infrastructure in the “Dukes County Multi-Jurisdictional Hazard Mitigation Plan Update”, dated 2015. The three stations serve over 90% of the Town’s sewered population, including many residences and the primary commercial district. Failure of these critical portions of the Town’s wastewater infrastructure would result in a large public health and environmental contamination risk in the most densely developed portions of the Town. The Town is already starting to see the effects of more severe weather events, such as when during Hurricane Sandy flooding prevented access to the controls at Lake Avenue Pumping Station.

Although the wastewater treatment facility is above the 100-year flood plain, salt water entering the collection system through manholes and wet well hatches of the stations in the flood plain could adversely affect the treatment process.

Infiltration and Inflow

I/I is rain or groundwater that seeps or flows into the gravity portion of a collection system and contributes to the total volume of wastewater treated by the Oak Bluffs WWTF. Infiltration is generally defined as a steady 24-hour flow that results from groundwater entering a sewer system through leaking pipe joints and manholes. The quantity of infiltration is therefore most affected by increases in the groundwater level during wet weather periods. Infiltration rates are normally measured in terms of gallons per day per inch-mile (gpd/in-mi).

Inflow is the direct discharge of runoff during rainfall events into the collection system. This can occur through the flow of rainwater into holes in manhole covers or through illegal direct connections of catch basins, roof drains, foundation drains, cellar drains, and sump pumps into the collection system.

The Town’s collection system, which was constructed in 2002, is a relatively young system. The system is primarily comprised of low pressure pipe (which does not typically experience I/I) and has

a very small length of gravity sewer (less than 10,000 linear feet). An “Infiltration and Inflow Analysis – Inventory of Existing Conditions” was prepared in December 2017 and submitted to MassDEP in accordance with the “Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation Survey”, prepared by MassDEP – dated May 2017 (Appendix D).

As documented in the report, an analysis of influent plant data indicates minimal evidence of wet weather flow impacts at the WWTF. Influent concentrations of Total Kjeldahl Nitrogen (TKN) and BOD are medium to strong, indicating minimal dilution from I/I. Plant data indicates minimal I/I in the existing collection system, which is corroborated by the water balance that was completed as part of this project and discussed further in Section 7.3.4.

7.2.3 Existing Effluent Disposal Facilities

The Town has two effluent disposal locations—Ocean Park Disposal Area and the Leonardo Disposal Area. Design criteria from the two disposal locations is summarized in Table 7.1.

Table 7.1 Oak Bluffs Effluent Disposal Design Criteria

Disposal Area	Ocean Park Subsurface Disposal Area	Leonardo Disposal Area
Type of Disposal	Subsurface	Surface (Sand Beds)
Design Capacity[1]	370,000	250,000
Capacity (permitted)[2]	340,000	250,000

Source:

“Town of Oak Bluffs Wastewater Treatment Facility Evaluation Final Draft Report”, prepared by GHD and dated June 2017

Notes:

1. Two effluent beds (approximately 30,000 gpd of capacity) have been shut off due to suspected failure, as documented in a September 23, 2009 letter from the Town of Oak Bluffs to MassDEP.
2. MassDEP Groundwater Discharge Permit NO. #2-674M, dated July 20, 2015.

Prior to 2009, a portion of the Ocean Park Disposal Area was suspected of failure. Wastewater from the disposal area was suspected to have risen to ground level due to wet ground being detected. A number of beds were suspected to have compromised capacity, but as more investigations were completed, only two beds (approximately 30,000 gpd of capacity) were ultimately taken out of service. The permitted capacity of the disposal area was reduced to 340,000 gpd.

Subsequent to the beds being taken off line, the Town discovered issues with a few valves at Ocean Park. The Town is currently exploring options to reactivate the off-line beds. This will require a subsurface soil evaluation by a certified soil scientist to confirm the suitability of the soil to percolate effluent and submission of these results to DEP along with a request to temporarily reactivate the off line beds to determine if they are suitable for continued operation.

7.2.4 Existing Sludge Management Facilities

Sludge produced by the wastewater treatment process is stored in four un-thickened sludge storage tanks. Sludge is thickened through decanting in two thickened sludge tanks prior to being pumped

to tanker trucks and hauled off-site to another municipal wastewater treatment facility on Martha's Vineyard for further processing and disposal.

7.2.5 Septage Treatment and Disposal

Septage is not accepted at the Oak Bluffs WWTF. Septage produced by on-site systems in the Town must be trucked to other municipalities on Martha's Vineyard which accept septage at the treatment facilities.

7.2.6 Operations and Maintenance

Staffing

The treatment facility currently has a four person staff. The "Town of Oak Bluffs Operations Manual for Wastewater Treatment Facility", produced by Wright Pierce and dated August 2001, outlines the maintenance procedures employed by the facility and operating procedures for emergencies. The O&M manual recommends that three full-time employees are required to operate the wastewater collection, treatment, and disposal facilities. However, since the manual was prepared, several additional processes have been added to the facility.

The New England Interstate Water Pollution Control Commission (NEIWPCC) has developed "The Northeast Guide for Estimating Staffing at Publicly Owned Wastewater Treatment Plants," which is a tool that can be used to estimate staffing needs based on the processes used by the facility and staff responsibilities. The tool estimates up to five staff members are required to operate the facility in its current configuration.

Annual operations are financed through an Enterprise Fund. Recommended plant improvements that have been identified as part of the facility evaluation are outlined in the Section 4.3.2 of the attached "Town of Oak Bluffs Wastewater Treatment Facility Evaluation Final Draft Report", prepared by GHD and dated June 2017 (Appendix C).

Asset Management

The existing WWTF and related remote mechanical infrastructure (pumping station) are approaching their design life of 20 years. This does not mean it will cease to function at 20 years, but a plan should be implemented to address this infrastructure as part of any plant expansion, or to start a renewal and replacement program of mechanical equipment when it reaches its design life. It is recommended that this is done through the implementation of an asset management system. Implementation of an asset management system is also a requirement for communities as part of any future projects funded by the State Revolving Fund (SRF).

7.2.7 Compliance History

The staff at the Oak Bluffs WWTF conducts routine sampling and laboratory analysis of the effluent discharged by the facility in accordance with the monitoring and reporting requirements specified by MassDEP in the discharge permit. Sampling and analysis of the WWTF effluent is performed twice per month for BOD_5, once per month for TSS, and twice per month for TKN, ammonia, nitrate, and total nitrogen. Daily effluent concentrations for these parameters are summarized in Figures 7.9, 7.10, 7.11, and 7.12 Observations based on analysis of the data are summarized as follows:

- As shown in Figure 7.9, the Oak Bluffs WWTF has generally been able to achieve effluent BOD_5 concentrations less than 10 milligrams per liter, well below the effluent limit of 30 milligrams per liter contained in the discharge permit. Effluent BOD_5 concentrations greater than 10 mg/L were reported on only six occasions over the 67-month period of record and an effluent concentration of greater than 30 milligrams per liter was only recorded on one occasion.
- As shown in Figure 7.10, the Oak Bluffs WWTF has generally been able to achieve effluent TSS concentrations less than 15 milligrams per liter. Review of data for the 67-month period of record identified no reported effluent TSS concentrations exceeding the maximum allowable concentration (30 mg/L) specified in the discharge permit for discharge to the Ocean Park Disposal Area. However, the maximum allowable effluent TSS concentration (10 mg/L) specified in the permit for discharge to the Leonardo Disposal Area was exceeded on nine occasions (20% of available data).
- As shown in Figure 7.11, the Oak Bluffs WWTF demonstrated consistent compliance with permit effluent limits for nitrate and total nitrogen. The effluent limit (10 mg/L) for total nitrogen was exceeded only once (in January 2010) and the effluent limit (also 10 mg/L) for nitrate-nitrogen was not exceeded for any of the sample data reported.
- Although the effluent limit for nitrate-nitrogen was never exceeded over the 67-month period of record, effluent nitrate-nitrogen concentrations did exhibit significant variability considering the sequencing batch reactor system at the plant was designed to provide nitrogen removal. As shown in Figure 7.12, effluent TKN and ammonia concentrations also exhibited significant variability. The variability in effluent ammonia and nitrate concentrations suggest the need for better control of operational adjustments to aerobic and anoxic conditions in the Sequencing Batch Reactor (SBR) system.

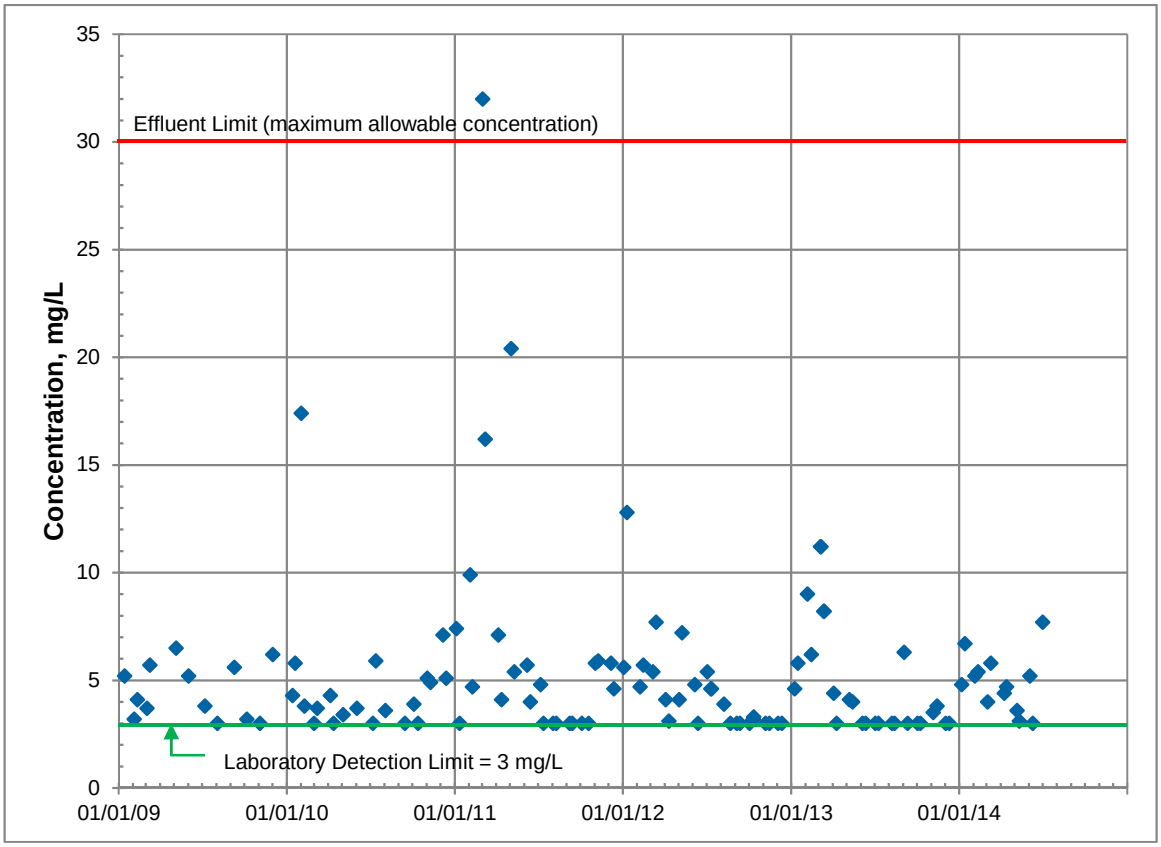


Figure 7.9 Effluent BOD_5 Concentration

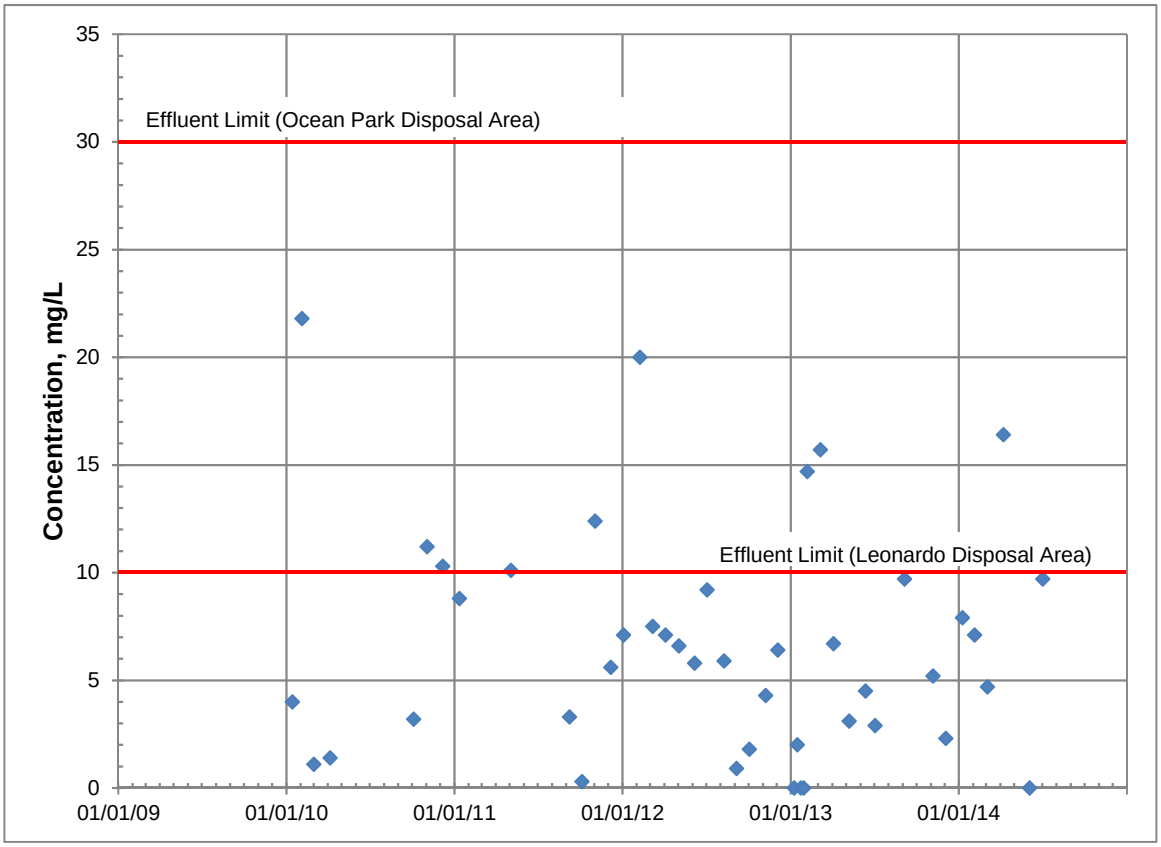


Figure 7.10 Effluent TSS Concentration

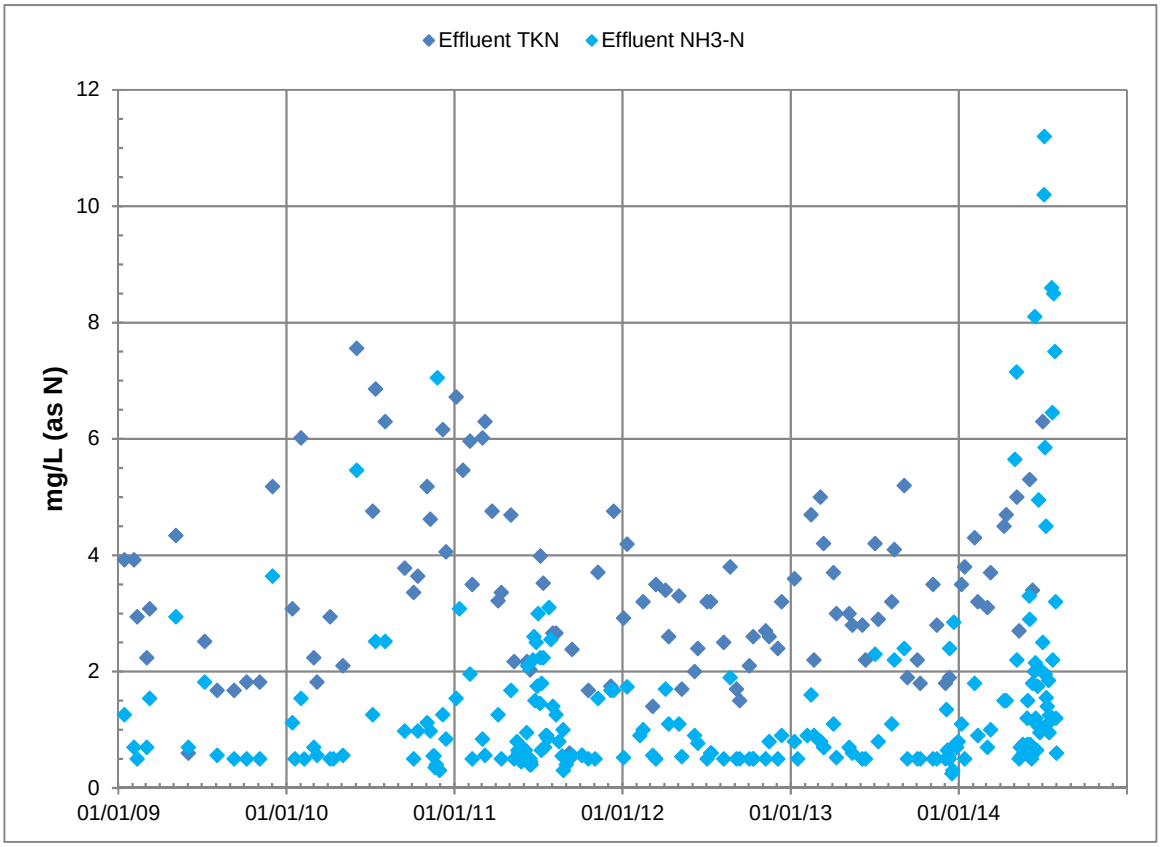


Figure 7.11 Effluent TKN and Ammonia Concentrations

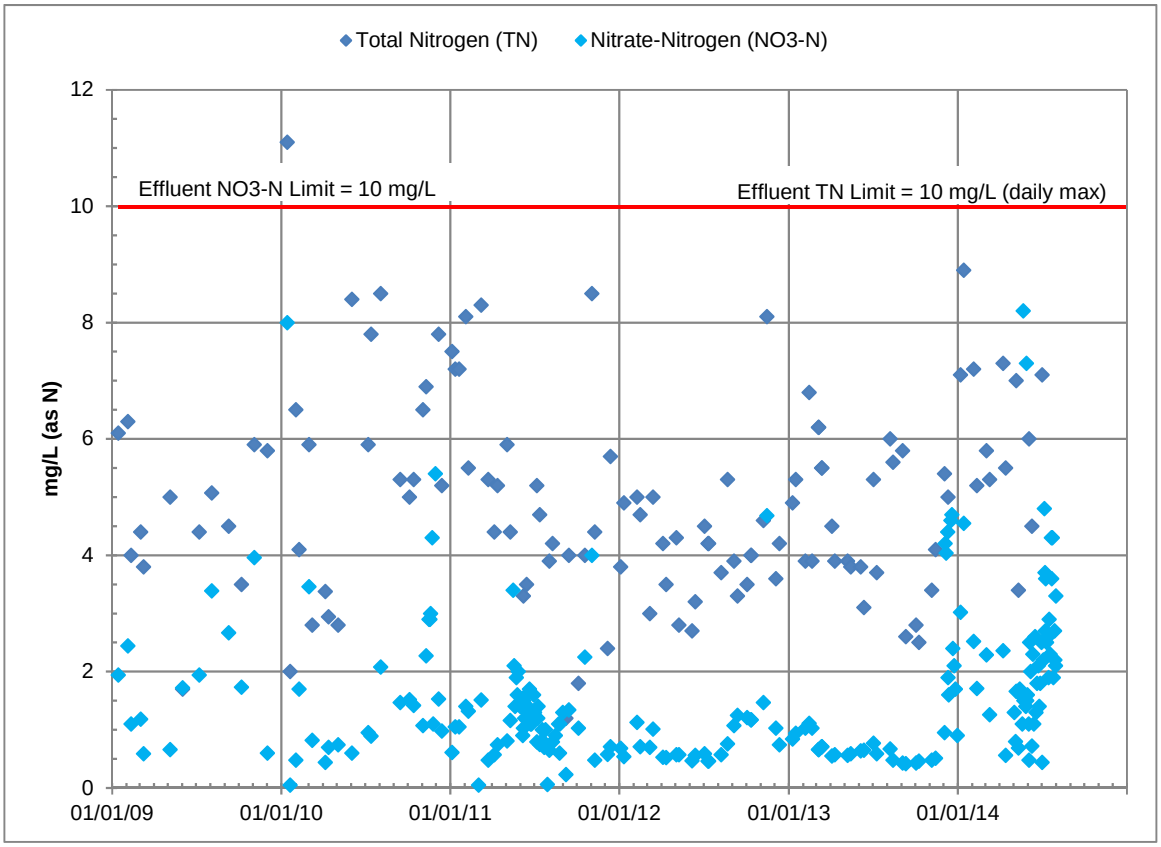


Figure 7.12 Effluent Nitrate and Total Nitrogen Concentrations

7.3 Water Supply and Usage

The Town utilizes five groundwater sources to supply water to public water supply users. The five sources are:

- Well 1: Lagoon Pond Well located off of Barnes Road.
- Well 2: Farm Neck Well located off of Tradewinds Road.
- Well 3: State Forest Well located off of Alwardt Way.
- Well 4: Madison Alwardt, Sr. Well located off of Alwardt Way.
- Well 5: John H. Randolph, Jr. Well located off of Alwardt Way.

The Oak Bluffs public water system is interconnected with the Edgartown and Tisbury water supply systems.

7.3.1 Analysis of Annual Pumpage and Consumption

Data describing monthly (2013-2016) and annual (2013-2016) volumes of water pumped from the five sources (pumpage) has been obtained and analyzed for this report. Water consumption data

(water metered for individual water accounts) has also been obtained and analyzed for this report. Total annual pumpage and consumption from 2013 through 2016 is presented below in Table 7.2.

Table 7.2 Annual Pumpage and Consumption

Year	2013	2014	2015	2016
Total Pumpage (MG)	341	371	418	405
Total Consumption (MG)[1]	322	346	398	384

Source:
1. Town of Oak Bluffs Public Water Supply Annual Statistical Reports prepared for DEP

Notes:
1. Total consumption calculated as Total Finished Water Available for Distribution minus Confidently Estimated Municipal Use (flushing, firefighting uses, etc.)

7.3.2 Analysis of Monthly Pumpage

Monthly pumpage was analyzed for 2013 through 2016 to investigate monthly trends. As shown in Table 7.3 and Figure 7.13, monthly flows have increased over the four year period during the summer months. Peak monthly flows ranged from 59 million gallons in 2014 to 74 million gallons in 2016. Peak pumpage rates occurred in July in 2013 and August for 2014, 2015, and 2016. Minimum pumpage rates occurred in the winter months and ranged from 12 million gallons in 2014 to 15 million gallons in 2015.

Table 7.3 Total Monthly Net Finished Water 2013 through 2016

Month	2013	2014	2015	2016
January	16.0	14.0	14.9	13.6
February	13.8	11.7	16.3	13.7
March	12.9	13.7	17.9	13.4
April	15.2	15.7	19.2	15.7
May	30.2	38.4	46.2	30.8
June	39.4	54.3	53.3	56.9
July	58.9	56.8	66.4	70.1
August	55.6	60.1	69.9	73.5
September	39.0	47.4	48.9	53.6
October	29.5	26.5	27.6	30.9
November	16.4	15.0	15.4	17.0
December	14.2	14.4	15.3	16.4

Source:
1. "Net Finished Water That Entered Your System" from the Town of Oak Bluffs Public Water Supply Annual Statistical Reports prepared for DEP.

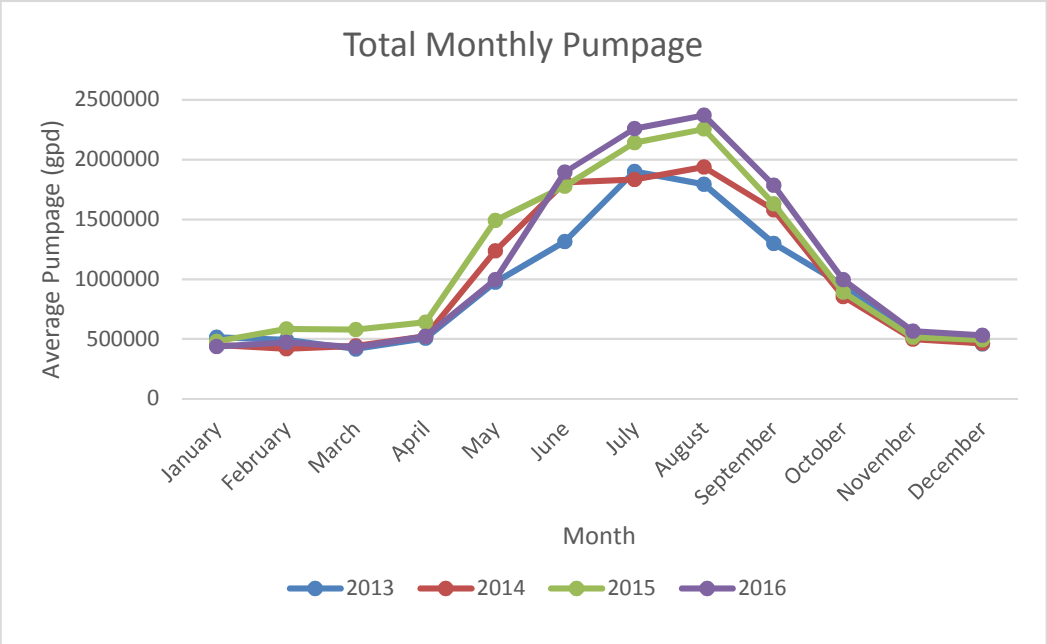


Figure 7.13 Total Monthly Pumpage

7.3.3 Analysis of Water Account Data

All of the properties in Town that are served by the public water supply have water meters and water accounts with the Oak Bluffs Water Department. Metered water consumption data for Fiscal Year 2015 through Fiscal Year 2017 was analyzed to estimate average water usage for five different types of properties, as shown in Table 7.4.

Table 7.4 Average Water Usage by Property Type

Property Type	Average Water Usage (gpd)
Single Family Residential[1]	160
Multi Family Residential[2]	243
Commercial[3]	452
Industrial[4]	69

Notes:

1. Calculated using FY15 - FY17 water consumption data from property type land use codes 101, 103.
2. Calculated using FY15 – FY17 water consumption data from property type land use codes 102, 104, 105, 109, 111.
3. Calculated using FY15 – FY17 water consumption data from property type land use codes 300, 301, 302, 303, 310, 316, 317, 318, 321, 322, 324, 325, 326, 332, 337, 338, 340, 341, 353, 355, 361, 362, 364, 370, 375, 383, 384.
4. Calculated using FY15 – FY17 water consumption data from property type land use codes 402, 410, 424, 450.

7.3.4 Development of Per Capita Water Consumption Values

A water balance analysis was developed to determine the percentage of water that enters the Town's collection system as wastewater. The water balance used the following equation:

(Water Usage) x (Water to Wastewater Conversion Factor) + (Sludge Wasting) + (I/I) + (Septage) = (Wastewater Effluent Flow)

Water usage flow and wastewater flow were obtained from the following data sets that were provided by the Town:

- Bi-annual water usage data for years 2014 through 2016 was used to calculate an average daily water usage flow rate for properties connected to the public water system and public sewer. Average water uses by land use type were calculated and used to estimate water usage for properties served by private wells and connected to the public sewer.
- WWTF wastewater effluent flow data for years 2014 through 2016 was used to calculate an average daily wastewater flow rate.
- Sludge flow data from 2015 was used to calculate an average daily sludge wasting flow rate.
- The Town does not accept septage at the WWTF so this value is zero.

The two unknown variables in the equations above were derived by iteration using the following initial assumptions:

- 80% of water consumption was assumed to be discharged as wastewater, in accordance with MassDEP "Guidelines for the Design, Construction, Operation and Maintenance of Small Wastewater Treatment Facilities with Land Disposal", dated November 2014.
- Due to the relatively young age of the collection system, the normal range of infiltration recommended in TR-16 (250 – 500 gpd/in-diameter/mile) was used as an initial estimate of infiltration.

The water balance, using the MassDEP-recommended water to wastewater conversion factor, indicates minimal infiltration and inflow in the existing collection system. As shown in Table 7.5 the two sides of the equation balance best when infiltration and inflow is minimized. This finding is consistent with the relatively young age of the system and small length of gravity sewer within the collection system.

Table 7.5 Oak Bluffs Water Balance

Parameter	Average Flow (gpd) – Infiltration Estimated at 500 gpd/in. dia/mile	Average Flow (gpd) – Infiltration Estimated at 250 gpd/in. dia/mile	Average Flow (gpd) – Infiltration Estimated at 0 gpd/in. dia/mile
Water to Wastewater Conversion Factor[1]	0.8	0.8	0.8
Septage[2]	0	0	0
Infiltration[3]	5,400	2,700	0
Sludge Wasting[4]	1,100	1,100	1,100
Water Usage – Properties on Public	124,400	124,400	124,400

Table 7.5 Oak Bluffs Water Balance

Parameter	Average Flow (gpd) – Infiltration Estimated at 500 gpd/in. dia/mile	Average Flow (gpd) – Infiltration Estimated at 250 gpd/in. dia/mile	Average Flow (gpd) – Infiltration Estimated at 0 gpd/in. dia/mile
Water System and Public Sewer[5]			
Water Usage – Properties on Private Wells and Public Sewer[6]	4,700	4,700	4,700
Effluent Wastewater Flow[7]	97,300	97,300	97,300
Influent Wastewater Flow[8]	**98,400**	**98,400**	**98,400**
WW Flow (Calculated Through the Water Balance)	**108,680**	**105,980**	**103,280**
Percent Difference	**10%**	**8%**	**5%**

Sources:

1. "Guidelines for the Design, Construction, Operation and Maintenance of Small Wastewater Treatment Facilities with Land Disposal", MassDEP – November 2014.
2. Facility does not accept septage.
3. Estimate
4. 2015 WWTF Data.
5. January 2014 – December 2016 Water Use Data (provided by the Oak Bluffs Water Department).
6. Estimate based on water use data for properties served by public water system.
7. January 2014 – December 2016 WWTF Effluent Data.
8. Effluent Flow + Sludge Wasting.

The relatively close correlation of the water balance indicates that existing water meter data is appropriate to use for developing future wastewater flow projections.

7.4 Flow and Load Reduction Opportunities

The purpose of this section is to identify and review alternatives for reducing wastewater flows and pollutant loadings. Water conservation is important because it reduces groundwater withdrawal and wastewater flow, and could potentially reduce the size of wastewater treatment facilities. The reduction of pollutant loadings could also potentially reduce the size of wastewater treatment facilities because there would be less waste in the water to treat. The following methods could be used by the Town to promote water conservation and reduce pollutant loadings:

- Modification of current water pricing policies.
- Use of low flow fixtures.
- Use of waterless toilets (composting and incinerating).
- Reuse of recycling of wastewater.

- Prohibited use of kitchen garbage grinders.
- Non-potable private wells for lawn watering.

7.4.1 Pricing Policies

The Town currently utilizes an increasing block rate structure, which increases conservation because the customer is charged a higher rate the more water they use. This pricing could be increased as a further economic incentive to reduce water consumption and wastewater generation.

7.4.2 Low Flow Fixtures

Approximately 70% of the total residential wastewater volume is estimated to be generated by toilet, laundry, and bath use. Water consumption (and subsequent wastewater generation) can be reduced by 15% to 20% through the use of household water saving devices and low flow fixtures in these areas. Commonly used low flow fixtures include low flow showerheads, toilet dams, faucet aerators, reduced flush toilets, vacuum flush toilets, flow limiting valves, and pressure reducing valves. Current state plumbing codes encourage and require the use of low flow fixtures in new residential and commercial construction. Plumbing codes also require the use of flow control devices for hot water showerheads and public lavatories. The use of low flow fixtures should be further encouraged in the Town.

7.4.3 Waterless Toilets

Water consumption, wastewater flow, and pollutant loadings can be reduced through the use of waterless toilets. Waterless toilet systems operate by separating black wastewater and gray wastewater. Black wastewater is toilet waste, and gray wastewater is generated from non-sanitary sources such as washing clothes and dishes, and bathtub and shower use. Black wastewater is treated in the waterless toilet unit, and gray wastewater is discharged to a septic system with potential size reductions. The two most common waterless toilet systems are composting toilets and incinerating toilets.

Composting toilets recirculate black wastewater over accumulated solids to promote a natural decomposition process. Incinerating toilets burn black wastewater and generate a small quantity of ash and gas. Composted material and ash are periodically removed from the respective systems, and air filters and exhaust units are used to minimize odors. Public acceptance of waterless toilet systems is often low due to the composting, incinerating, and handling of human waste within living spaces. A potential use of waterless toilets is in public restrooms and convenience stations.

Waterless toilets have the following advantages:

- Wastewater flows and loads are reduced if properly designed and installed.
- Water consumption is significantly reduced.
- Minimal environmental concerns occur when properly sited and designed.
- Composting toilets require minimal energy use.
- Size of standard septic system can be reduced to treat only gray wastewater.
- Routine maintenance is minimal and requires no special training.

- Nitrogen loading to the environment is greatly reduced.

Waterless toilets have the following disadvantages:

- Public acceptance is generally low.
- Some incinerating toilets require high energy use.
- Handling of composting toilet contents can be objectionable.
- Incineration units are likely to generate odors if not vented properly.
- Composting toilets are not well suited to high seasonal peak loading.

7.4.4 Wastewater Reuse and Recycling

Identifying wastewater reuse opportunities is important because such reuse can reduce both water consumption and the overall volume of wastewater that must be disposed. Wastewater sources that could be re-used include gray wastewater from individual homes and treated wastewater effluent from the Oak Bluffs WWTF or from a new wastewater treatment facility. The following wastewater reuse methods are considered:

- Watering lawns from household gray wastewater.
- Using treated effluent from a wastewater treatment facility as industrial boiler makeup water or process water.
- Irrigating golf courses and Town-owned property with treated effluent from a wastewater treatment facility.

The use of reclaimed water must meet guidelines developed by MassDEP (314 CMR 20.00) in addition to the requirements of the Groundwater Discharge Permitting Program.

Reuse of household gray wastewater for lawn watering would be expensive to individual homeowners because it requires the construction of a separate collection, storage, and pumping system. Reuse of treated wastewater effluent from the Oak Bluffs WWTF for an industry, golf course, or municipal property would also be expensive, difficult to administer, and require additional wastewater treatment due to the health risks associated with potential human contact.

There are several golf courses and municipal properties in Town that could potentially utilize irrigation with treated effluent. This type of irrigation would have a high cost for piping and protection against freezing, and it could only be used periodically.

7.4.5 Prohibition of Kitchen Garbage Grinders

Kitchen garbage grinders grind food scraps and send them down the drain to be treated in a septic tank or at a wastewater treatment plant. They are convenient because they reduce the handling of wet and messy food wastes and increase the organic and nitrogen loading on wastewater treatment systems.

Septic systems are typically designed with a larger capacity when a kitchen grinder is used and must be pumped out more frequently. A wastewater treatment plant must process a higher loading when

kitchen grinders are used, adding capital and operation costs to wastewater treatment processes. These grinders could be prohibited in a Board of Health regulation or bylaw.

7.4.6 Installation of Non-Potable Private Wells for Lawn Watering

Lawn watering in the summer uses a large quantity of potable water just to make the grass green. This water could be drawn from non-potable wells at the property and distributed to an irrigation system through a pump and pressure tank. These types of systems should be feasible in Town and would pay for themselves over a short period of time. Large water users who irrigate their lawns with the public water supply could be identified by the Water Department by reviewing seasonal water billing records and comparing them with Title 5 design flows.

This type of non-potable water supply for lawn irrigation would reduce Water Department revenues. Also, this water use would be outside the Town's control and may impact the groundwater level or quantity on which the public water supply depends.

7.5 Stormwater Discharges and Impacts

The state, town, and private roads in Town collect storm runoff (stormwater) which is then discharged to surface water bodies. The stormwater often contains dirt, fecal material from domestic and wild animals, nitrogen compounds, and phosphorus compounds. The fecal material and its associated coliform bacterial content can force beach closures in Town. Nitrogen and phosphorus can fertilize surface water bodies and promote production of algae and other aquatic plants. These aquatic plants can further impact surface water quality when they die and settle to the bottom.

Evaluation and recommendation of solutions to mitigate stormwater impacts is beyond the scope of this Project.

8. Wastewater Flows and Nitrogen Loadings

8.1 Introduction

The wastewater flows and nitrogen loads developed as part of the Needs Assessment and discussed in this chapter were developed to estimate the planning period wastewater flow and loads based on existing wastewater treatment facility flow data, the findings of the MEP reports, estimated growth in the planning area subsequent to the development of the MEP reports, estimated growth within the existing collection system, and population growth projections.

8.2 Establishment of Wastewater Flows

The following databases and assumptions were used to establish average wastewater flows for four types of properties within the Town:

- Metered water consumption data for Fiscal Year 2015 through Fiscal Year 2017, obtained from the Oak Bluffs Water Department, were used to establish average water usage for each type of property.
- 90% of a property's water use is estimated to become wastewater (consistent with the MEP reports[2]).

Average wastewater flows, which were used in the development of existing and future wastewater flows are outlined in Table 8.1.

Table 8.1 Average Wastewater Flow by Property Type

Property Type	Average Water Usage (gpd)	Average Wastewater Flow (gpd)[5]
Single Family Residential	160[1]	144
Multi-Family Residential	243[2]	219
Commercial	452[3]	407
Industrial	69[4]	62

Notes:

1. Calculated using FY15-FY17 water consumption data from property type land use codes 101, 103.
2. Calculated using FY15 – FY17 water consumption data from property type land use codes 102, 104, 105, 109, 111.
3. Calculated using FY15 – FY17 water consumption data from property type land use codes 300, 301, 302, 303, 310, 316,317, 318, 321, 322, 324, 325, 326, 332, 337, 338, 340, 341, 353, 355, 361, 362, 364, 370, 375, 383, 384.
4. Calculated using FY15 – FY17 water consumption data from property type land use codes 402, 410, 424, 450.
5. Wastewater flow calculated using the estimate that 90% of a properties water use is converted to wastewater (per MEP reports).

[2] Although an 80% conversion factor was used in the water balance, a water to wastewater conversion factor of 90% was used in the development of wastewater flows in order to maintain consistency with the MEP and to provide a more conservative flow estimate. It should be noted that the 80% water to wastewater conversion factor derived from the water balance may be adversely affected by errors in water and wastewater meter readings.

Maximum month and maximum day peaking factors, which were developed through an analysis of existing wastewater flows at the Oak Bluffs WWTF, are summarized in Table 8.2.

Table 8.2 Wastewater Peaking Factors

Parameter	Peaking Factor
Average Day	-
Maximum Month	2.6
Maximum Day	2.9

Notes:
1. Peaking factors developed through analysis of January 2014 through December 2016 Oak Bluffs WWTF effluent flow data.

8.3 Septic Flows Which Need to Be Removed From Planning Area Watersheds to Achieve TMDL Compliance (MEP Analysis)

As discussed previously, each MEP report includes a scenario that demonstrates how the TMDL can be met through sewering. This scenario will be used as the starting point to evaluate the project areas and establish the wastewater flows that would need to be removed to meet the nitrogen target thresholds for each watershed through sewering. Both sewering and non-sewering alternatives to meet the TMDLs will be evaluated in the next phase of this project (Alternatives Screening Analysis).

The analyses in the MEP Reports focuses on watersheds, which are not necessarily Town boundaries. Three of the watersheds in Oak Bluffs have shared boundaries with the neighboring Towns of Tisbury, West Tisbury, and/or Edgartown.

The MEP analyses identified one scenario with discrete nitrogen removal levels necessary to maintain estuary health. With those nitrogen removal levels as the target, the CWMP will evaluate various alternatives to meet the goals of the MEP and address the Town's needs (including areas that are not within the boundaries of the MEP watersheds, if a need is identified). The CWMP analysis will follow the general framework of the MEP analysis.

As discussed previously in this report, Title 5 septic systems make up a significant portion of the wastewater treatment in the Planning Area. These systems typically discharge effluent with total nitrogen (TN) concentrations in the neighborhood of 35 mg/L, of which approximately 75% reaches the groundwater (as identified by MEP). Innovative/ Alternative (I/A) technologies produce average effluent concentrations of 19 mg/L TN (approximately 75% of which reaches the groundwater table). Improvements to estuary health will require the concentration of nitrogen entering the watersheds to be reduced. The means for reducing these concentrations and ultimately the TN loadings to the coastal embayments will be discussed in subsequent phases of this project.

Table 8.3 outlines the present wastewater flow that would need to be collected from each watershed and estimated wastewater flow that would need to be collected from the Planning Area to meet TMDL requirements. For shared watersheds, initial estimates on the percentage of flow that is attributed to the Planning Area are summarized.

Table 8.3 Summary of MEP Analysis for Existing Wastewater Flows That Need to be Removed From Each Planning Area Watershed to Meet TMDL

Watershed	Subwatershed	Present Watershed Septic Load[1] (kg/d)	Threshold Watershed Septic Load[1] (kg/d)	Existing Watershed Septic Load that Needs to be Removed to Meet TMDL Requirements (kg/d)[1]	Existing Wastewater Flow that Needs to be Removed from Entire Watershed to Meet TMDL (gpd)[a]	Existing Wastewater Flow That Needs to be Removed from the Planning Area to Meet TMDL (gpd)
Farm Pond	Farm Pond	4.1	2.5	1.6	16,000	16,000
Lake Tashmoo	Lake Tashmoo – Main Basin	15.4	7.7	7.7	78,000	1,000[d]
	Drew Cove	2.9	2.6	0.3	3,000	0[d]
	Lake Tashmoo – Upper	0.5	0.5	0.0	0	0[d]
Lagoon Pond	Lagoon Pond (East Arm)	27.6	13.8	13.8	139,000	69,000[c]
	West Arm (South End)	4.8	2.4	2.4	24,000	0[b]
	Upper Lagoon Pond Stream	2.1	2.1	0.0	0	0
Oak Bluffs Harbor	Oak Bluffs Harbor	4.3	5.2	0.0	0	0
	Sunset Lake	7.0	9.5	0.0	0	0
Sengekont-acket Pond	Farm Neck	5.7	5.7	0.0	0	0
	Majors Cove	9.4	4.1	5.3	53,000	26,000[c]
	Ocean Heights	10.9	10.9	0.0	0	0
	Trapps Pond	2.0	0.0	2.0	21,000	0[b]
	State Beach	0.0	0.0	0.0	0	0
Oak Bluffs - Total		96.7		33.1	334,000	112,000

Sources:

1. Table VIII-2: Septic Loads from the MEP Report for each watershed. All values have been rounded to the nearest tenth.

Notes:

a. Wastewater flows derived based on MEP assumption that total nitrogen concentration of septic systems that reaches the groundwater is 26.25 mg/L.
b. Subwatershed entirely outside of Town boundaries
c. Assumption that Oak Bluffs is responsible for 50% of watershed septic load.
d. The total acreage of the Lake Tashmoo watershed in the Town of Oak Bluffs is less than 1%. Assumption that Oak Bluffs is responsible for 1% of watershed septic load.

8.4 Growth in Planning Area Subsequent to MEP Analysis (Through 2020)

The MEP Reports were developed using water data from 2003 to 2006. Growth in the Planning Area subsequent to the completion of the MEP reports through the beginning of the Planning Period (2020) was estimated using the following datasets and assumptions:

- Number of houses constructed between the year the MEP report for each watershed was completed and 2018, obtained through a review of 2018 Town Assessor data. The average number of houses constructed in this time period was extrapolated through 2020.
- Average wastewater flows for residential properties were used to estimate flows.

8.5 Growth Within the Existing Collection System

Allocations were established for growth within the existing collection, as follows:

1. Infill Lots - The original Sewer Service Area is defined in the 1999 CWMP. Wastewater treatment facility records indicate that approximately 64 properties within the original Sewer Service Area have not yet been connected to the system. These properties are considered infill lots and are expected to connect to the collection system in the future.
2. Development/Redevelopment – It is anticipated that a portion of the properties within the existing collection system will be redeveloped over the duration of the planning period, resulting in a change in the properties water usage and wastewater generation. An allocation of up to 20% was incorporated for potential growth and undesignated development in the collection system. The allocation for potential growth includes redevelopment of a portion of the business district into mixed use properties and an expansion allocation for the Vineyard Haven corridor and other large water users.

8.6 Population Growth

As discussed in Section 2.4, the population of the Town is projected to increase by approximately 1,050 persons over the 20-year planning period (2020 to 2040). An analysis of the Town's GIS database indicates that approximately 70% of Developable Residential Properties (State Use Code 130) are located within nutrient-sensitive watersheds. It was assumed that population distribution will be proportionate with the existing population distribution, with approximately 70% of the population growth settling in a nutrient-sensitive watershed.

8.7 Planning Period Wastewater Flow

Table 8.4 outlines planning period wastewater generation flows. Average flows are used as a basis for nutrient load analyses and to project peaking factors. Maximum month flows are used to size the majority of the processes at a wastewater treatment facility. Maximum day flows are used to size the wastewater treatment facility from a hydraulic basis.

Table 8.4 Planning Period Wastewater Flows

Parameter	Average Annual Flow (gpd)	Maximum Month Flow (gpd)	Maximum Day Flow (gpd)
Properties Within the Original Sewer Service Area Connected to the WWTF	97,000	244,000	277,000
Infill Properties and Development/Redevelopment Within the Existing Collection System	89,000	226,000	259,000
Wastewater Flow Which Needs to be Removed From Nitrogen Sensitive Watersheds to Meet TMDLs	122,000	308,000	349,000
Growth Within the Collection System (2020 – 2040)	47,000	118,000	134,000
Wastewater Flow - 2040	**355,000**	**896,000**	**1,019,000**

Notes:

1. Flow estimates include only flow from wastewater generation. An estimate for I/I will be incorporated into the flow estimate once a preliminary sewer layout has been established.
2. Flow estimate assumes that treated effluent is discharged outside of a nitrogen-sensitive estuary. Flow estimate will need to be revised once a preliminary sewer layout has been established.

This wastewater flow estimate represents a wastewater quantity that needs to be managed within the Planning Area.

9. Environmental and Sustainability Considerations

9.1 Introduction

This chapter outlines environmental and sustainability considerations to be considered during both the planning and design phases of the Project—including water conservation, energy efficiency, energy recovery, and alternative energy.

9.2 Background

The EPA estimates that water and wastewater treatment together represent approximately 3% of the total energy consumption in the United States. It is typically one of the largest energy users in a community, often accounting for 30 to 60% of a municipal government's energy usage (U.S. EPA, 2008). There are many opportunities to reduce the total energy usage at a facility; both to reduce the carbon footprint of the facility and to realize operational savings through the minimization of wasted power.

The Water Environment Federation Manual of Practice No. 32 – Energy Conservation in Water and Wastewater Facilities (WEF MOP 32) defines energy conservation measures as 'physical improvement, plant operation, or equipment maintenance practices that result in a reduction in utility or operating cost.' Several rating systems have been developed to help identify energy reduction measures and sustainability opportunities at facilities—including Leadership in Energy and Environmental Design (LEED) certification and the Envision Rating System. Additionally, many industry design standards including TR-16 (which is considered the New England design standard) incorporate sustainability considerations into their guidelines. The promotion of clean energy through the maximization of energy efficiency and renewable energy opportunities is encouraged by the Commonwealth of Massachusetts Sustainable Development Principles.

9.2.1 LEED Certification

LEED certification is a formal green building design process in which buildings are rated based on achievements in sustainable design and performance of buildings. Obtaining LEED certification for a building can be a large effort. However even if a building does not apply for certification, following the LEED process can help identify useful design features that in many cases can be no more costly than the standard type of construction, but offer a higher quality working environment and can be less costly to operate in the long run. At this time LEED certification can only be obtained for individual buildings, not for a wastewater treatment facility in its entirety.

9.2.2 Envision Rating System

The Envision Rating System is a rating system developed for rating infrastructure projects—including wastewater treatment plants. Envision focuses on the sustainability of infrastructure projects and their overall contribution to the communities they serve.

9.2.3 TR-16 Design Guidelines

Sustainability considerations are covered in the 2011 TR-16 Guides for the Design of Wastewater Treatment Works and include guidelines for the following topics:

- Water Conservation
- Energy Conservation
- Site Considerations
- Design Considerations for Non-Process Buildings

9.3 Water Conservation

The Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs and Water Resources Commission developed the "Massachusetts Water Conservation Standards" (last updated in 2012) to set state-wide goals for water conservation and water-use efficiency. The document discusses both the environmental benefits of water conservation and the potentially significant financial savings of water conservation through reduced operation and maintenance costs, reduced wastewater treatment costs, resulting increase in water and wastewater treatment plant capacities, and savings from avoiding having to find and develop new sources of water for the community. Water conservation efforts that can be undertaken by a wastewater treatment facility include installing reduced flow plumbing, reducing infiltration and inflow in the collection system, maximizing reuse of reclaimed wastewater, and implementing water conserving landscaping practices.

9.3.1 Reduced Flow Plumbing

Reduced flow plumbing should be considered in design whenever possible and permitted by the local plumbing code. Devices that can be installed in the facility to reduce water consumption include water-saving toilets, reduced flush devices, and restricted flow shower heads.

9.3.2 Reducing Infiltration and Inflow

Locating and repairing sources of I/I in the collection system helps minimize the amount of water which needs to be pumped to and treated by the facility.

The I/I analysis conducted by Beta Group Inc. in 2006, which is described in detail in Chapter 5 of the Draft Needs Assessment Report, recommended several sections of the existing collection system for further investigation to determine whether cost-effective I/I reduction measures could be implemented at these locations.

9.3.3 Reclaimed Wastewater Reuse

TR-16 recommends conducting an assessment to determine if there are any economic effluent reuse opportunities at a facility in order to minimize the use of potable water at the facility. Plant water is currently used for spray wash on the clarifiers, for the gravity thickener, grit washing, and pump seal systems. Increasing treated wastewater recharge and reuse is one of the 10 major recommendations of the 2004 Massachusetts Water Policy issued by the EOEEA.

9.3.4 Landscaping

Wherever possible, TR-16 recommends that native species be used in landscaping to eliminate supplementary watering needs. Landscaping features, such as open-grid pavers, should be considered to minimize stormwater runoff (and pollutant loading through runoff), and heat island effect from paved surfaces. Promoting stormwater recharge close to its site of origin is one of the 10 major recommendations of the 2004 Massachusetts Water Policy issued by the EOEEA.

9.4 Energy Efficiency

Because of their often small size, many energy efficiency projects have relatively low capital costs and a short payback period. Together the combination of many small projects designed to lower the amount of energy usage at a plant can lead to substantial overall energy savings. Regional utilities often offer financial incentives to complete energy efficiency upgrades.

9.4.1 Energy Audit

An energy audit is used to determine if the equipment at a facility is properly sized for a process. The audit might include motor sizing and analyzing the heating/lighting in existing buildings to see if their efficiency can be increased through better insulation, more efficient light bulbs, use of natural lighting, etc.

9.4.2 Optimizing Existing Infrastructure

During design, existing infrastructure should be evaluated to determine if anything that is scheduled to be demolished can be used in future construction.

9.4.3 Sub-Metering

Sub-metering tracks energy usage through the use of individual meters and other electrical consumption indicators. TR-16 recommends using separate meters to monitor areas of major energy use at the plant.

9.4.4 Energy Management System

Energy management systems are used to lock out specified process operations during periods of peak energy demand in order to minimize demand charges from the local utility.

9.4.5 Pump Considerations

Aeration system blowers can potentially be oversized if the expected population growth during the design phase has not yet occurred or if the organic loading entering the plant decreases due to a reduction in population. Energy savings can be realized by replacing larger blowers with one or more smaller units, installing variable frequency drives, or installing inlet throttling. TR-16 recommends installing dissolved oxygen (DO) probes in aeration systems in order to match air supplied by blowers to the systems need, to reduce energy consumption. Because of their age, the pumps should be tested to determine if they are operating at efficiencies near their original design points.

9.4.6 Ventilation Systems

Ventilation systems can add significant energy costs. Codes should be examined for provisions that allow for lower heating requirements and fewer air changes when an area is unoccupied. Both these changes will reduce energy requirements at the Facility.

9.4.7 Instrumentation and Control Systems

Instrumentation and control systems are used to help match supply with demand. Supervisory control and data acquisition (SCADA) software can be used to monitor and control large portions of a facility. SCADA can be configured to monitor energy usage trends and to remotely adjust the system to current conditions through the measurement of process variables such as liquid and gas flow rates, chemical residual, and DO concentrations.

9.4.8 Lighting

Energy efficiency measures to be considered for the lighting system include adding motion sensors on lights in non-process buildings, using high-efficiency fixtures, and maximizing the use of natural light through the use of windows, translucent panels, skylights, etc. to reduce reliance on artificial lighting. In order to limit light pollution, light sensors or light timers should be considered and exterior lighting should be limited to what is required by local codes or for safety.

9.5 Energy Recovery

Wastewater facilities have historically been treated as receivers of waste products that need to be handled as waste products. In reality, wastewater facilities receive waste products that can be recovered as valuable resources. These resources include potential energy from water elevations, energy rich by-products, and heat recovery.

9.5.1 Hydropower

Hydropower can be used to harvest potential energy in a pipeline or at the outfall of a plant. The differential elevation between the water surface leaving the final process and the invert of the effluent discharge pipe provides a static elevation head that can potentially be converted into kinetic energy through a small hydro-turbine. Several low head generation devices could be explored.

9.5.2 Anaerobic Sludge Digestion

During anaerobic digestion, microorganisms break down organic materials in the absence of oxygen. A by-product of this process is the production of methane gas, which can be harvested and used as a biogas.

If a facility has excess capacity in its anaerobic digester it can also consider co-digestion where additional energy-rich organic waste materials such as fats, oils, grease, and food scraps are added to the existing waste stream in order to increase methane production. The WEF MOP 32 estimates that the biogas produced by the digestion of biosolids is approximately 60% methane. It is also possible to use the methane gas from anaerobic digestion as a hydrogen source to fuel hydrogen fuel cells. The biogas can be used to power boilers, generators, pumps, or blowers. In a combined heat

and power (CHP) application the biogas can be used to power an engine or turbine and the waste heat can be recovered to heat the anaerobic digester.

Ideally a plant considering co-digestion should be located in close proximity to an industry or business that is a source of carbon-based waste. In addition to the increased energy production from accepting additional waste streams, co-generation can be a possible revenue stream for the facility.

9.5.3 Heat Recovery

Heat can be recovered from many areas at a WWTF. TR-16 recommends considering the following heat recovery applications:

- Heat recovery from blower rooms.
- Use of solar thermal heating units on south-facing walls with limited shade.
- Heat recovery units for ventilating rooms at high rates.
- Units that recover heat from effluent wastewater.

Typical wastewater effluent contains enough heat extractable through a heat exchanger to be considered as a building heating source. Heat is typically transferred through a water-to-refrigerant heat exchanger. Effluent characteristics that would need to be evaluated to determine the feasibility of an effluent heating system include temperature and total suspended solids.

9.6 Alternative Energy

Several potential sources of alternative energy production are present at a WWTF site. Depending on the amount of power produced and site conditions, the electricity generated from production can either be used on-site or fed back to the local utility in a net metering arrangement. In a net metering arrangement the facility sells back electricity produced in return for a predetermined credit towards its usage bill.

9.6.1 Solar

Solar photovoltaic (PV) arrays can be used by facilities with adequate space to produce renewable energy on-site. Arrays can be ground-mounted or roof-mounted depending on the orientation of the buildings and available roof space. South-facing roofs with minimal shadow interference provide the most ideal conditions for a roof-mounted solar array.

A shade analysis would need to be conducted at a potential site to determine the feasibility of a solar installation. On average, Massachusetts experiences 4.5 “sun hours per day” of solar energy. This means that over an entire year, direct sunlight hits an area for an average of 4.5 hours per day. In comparison Phoenix, Arizona experiences 6.4 sun hours per day. For an equivalent amount of power output from a PV panel in Massachusetts, the module area would be designed to be approximately 40% larger than in Phoenix.

9.6.2 Wind

Wind turbines can be used to harvest wind energy from sites with ideal conditions. According to the 50m Wind Power map produced by the National Renewable Energy Laboratory (NREL) the wind potential in the Oak Bluffs area is fair to good. If wind energy is to be considered at the Oak Bluffs WWTF an evaluation should be done at the specific area of interest. Wind resources can vary significantly at the micro level. WEF MOP 32 recommends that a potential site is monitored for wind potential for at least a year to determine its suitability for a wind turbine installation.

In addition to wind potential, several other factors need to be considered when assessing a potential turbine location including sound impact, shadow flicker, visual impact, and potential environmental permitting. Massachusetts State regulations (Massachusetts Air Pollution Control Regulation, Regulation 310 CMR 7.10) do not allow a rise of 10 decibels (db) or greater above background levels at a property boundary. Environmental considerations include whether the site is within a state designation of NHESP Open Space, Wetland, or other land-use designations or restrictions.

9.6.3 Geothermal

Geothermal systems use the nearly constant temperature of the earth to act as a heat source and a heat sink to heat and cool buildings through a heat pump. A heat exchanger is a system of pipes buried in the shallow ground near the building. A fluid, usually water or a mixture or water and antifreeze, circulates through the pipes and absorbs or gives off heat to the ground. In the winter the heat pump removes heat from the heat exchanger and pumps it through an air delivery system to heat a building's interior. In the summer the system runs in reverse removing heat from the building and using the ground as a heat sink. Heat removed from the building during the summer can also be used to heat water.

9.7 Summary

The sustainability considerations discussed in Chapter 9 are summarized in Table 9.1. All of the considerations discussed in this chapter will be taken into consideration during the development of this Project.

Table 9.1 Sustainability Considerations

Water Conservation	Energy Efficiency	Energy Recovery	Alternative Energy
Reduced Flow Plumbing	Energy Audit	Hydropower	Solar
Reducing I/I	Optimizing Existing Infrastructure	Anaerobic Sludge Digestion	Wind
Reclaimed WW Reuse	Sub Metering	Heat Recovery	Geothermal
Landscaping	Energy Management Systems		

Table 9.1 Sustainability Considerations

Water Conservation	Energy Efficiency	Energy Recovery	Alternative Energy
	Pump Considerations		
	Ventilation Systems		
	Instrumentation and Control Systems		
	Lighting		

10. Needs Assessment Summary

10.1 Introduction

The purpose of the CWMP Project is to address wastewater issues and problems (Needs) in the Planning Area, which includes the following coastal ponds/waterbodies:

- Farm Pond
- Lagoon Pond
- Lake Tashmoo
- Oak Bluffs Harbor
- Sengekontacket Pond

Watershed delineations for these areas are shown on Figure 2.1.

The MEP has shown that these watershed are being negatively impacted by excessive nitrogen loading from the watershed into the coastal ponds. The excessive loading has caused nutrient enrichment conditions in the ponds, created water quality problems, and impacted the environmental health of the water bodies.

The primary purpose of this Needs Assessment Report is to clearly define the wastewater and nitrogen-related Needs of the Planning Area so that recommendations for these Needs can be proposed in the subsequent phases of the Project. A second purpose of this Report is to review the wastewater planning history of the Town and the previous documents that have been developed for the Planning Area. A full understanding of the past (and ongoing) wastewater and nitrogen management efforts will allow for efficient development of a comprehensive management plan.

10.2 Wastewater Problems in the Planning Area

The MEP Reports have evaluated nitrogen limitations for the five coastal estuaries in the Town. The nitrogen limitations of these marine estuaries have been clearly identified in the technical reports and have been documented in subsequent MassDEP reports on the TMDLs for these areas. The technical reports and the TMDL reports indicate that these marine water bodies have exceeded their nitrogen limits, and significant amounts of nitrogen must be removed from the watersheds. These reports have also documented that most of the nitrogen is coming from individual septic systems in the watershed, and have identified the percentage of wastewater nitrogen that needs to be removed to meet the nitrogen limits. The wastewater nitrogen removal targets are illustrated in Figure 6.1

10.3 Centralized Wastewater Treatment Facility (Oak Bluffs WWTF)

The Oak Bluffs WWTF is located at 17 Pennsylvania Road. On average, it receives and treats 100,000 gpd (0.1 mgd) of wastewater from the centralized collection system. The facility does not accept septage. It utilizes preliminary treatment (raw sewage grinding and bypass coarse 1-inch manual screening), advanced secondary treatment for nitrogen removal using sequencing batch

reactors, tertiary effluent filtration, UV effluent disinfection, and a sub-surface wastewater disposal system at Ocean Park for treated water recharge into the ground. The WWTF also has the option to utilize two sand beds, located adjacent to the facility, for additional wastewater disposal capacity. The WWTF was originally constructed in 2002 and has demonstrated consistent compliance with permit effluent limits for nitrate and total nitrogen.

Treated water recharged at Ocean Park is recharged to the groundwater and flows with the groundwater to Farm Pond, Oak Bluffs Harbor, and Vineyard/Nantucket Sound. Treated water recharged at the sand beds flows with groundwater to Lagoon Pond. The MEP Reports and TMDLs for these waterbodies are expected to be a basis for a future MassDEP effluent discharge permit.

The following needs and issues have been identified for the Oak Bluffs WWTF:

- The existing facility is near capacity.
- The facility does not meet current redundancy requirements and requires process upgrades.
- Although the majority of the equipment is in good condition, the existing facility and related remote mechanical infrastructure is approaching its design life of 20 years.
- TMDL compliance may require flow capacity expansion.

10.4 Centralized Wastewater Collection System

The centralized wastewater collection system is a hybrid low pressure/gravity system. The system has five major municipally operated pumping stations. The areas served by the existing collection system is shown in Figure 7.1. The majority of the collection system was constructed in 2002, with several small extensions connecting in subsequent years.

The existing collection system is working well. Analysis of water supply and sewage flow data indicates very limited flow entering the collection system as groundwater infiltration into gravity collection pipes and manholes, and/or inflow to the system from building sump pumps or roof leaders.

The following needs and issues have been identified for the centralized collection system:

- Dukes County Avenue Pumping Station, Lake Avenue Pumping Station, and Bath House Pumping Station are all located in the 100-year flood zone and are at risk for flooding.
- Dukes County Avenue Pumping Station, Lake Avenue Pumping Station, and Bath House Pumping Station are all within five years of their design life.
- None of the pumping stations are connected to the plant SCADA system.
- The Dukes County Avenue Pumping Station was originally slated to convey all of the sewage flow in the sewer service area. Additional pumping stations have been added to the system that pump directly to the WWTF resulting in Dukes Avenue pumps being oversized based on current plant flows.

10.5 Wastewater Flows and Nitrogen Loads

Wastewater flows and nitrogen loads were developed as part of the Needs Assessment Report based on existing wastewater flow data, the findings of the MEP reports, estimated growth in the planning area subsequent to the development of the MEP reports, estimated growth within the existing collection system and population growth projections. Planning Period Wastewater flows are summarized in Table 10.1

Table 10.1 Planning Period Wastewater Flows

Parameter	Average Annual Flow (gpd)	Maximum Month Flow (gpd)	Maximum Day Flow (gpd)
Properties Within the Original Sewer Service Area Connected to the WWTF	97,000	244,000	277,000
Infill Properties and Development/Redevelopment Within the Existing Collection System	89,000	226,000	259,000
Wastewater Flow Which Needs to be Removed From Nitrogen Sensitive Watersheds to Meet TMDLS	122,000	308,000	349,000
Growth Within the Collection System (2020 – 2040)	47,000	118,000	134,000
Wastewater Flow - 2040	**355,000**	**896,000**	**1,019,000**

Notes:

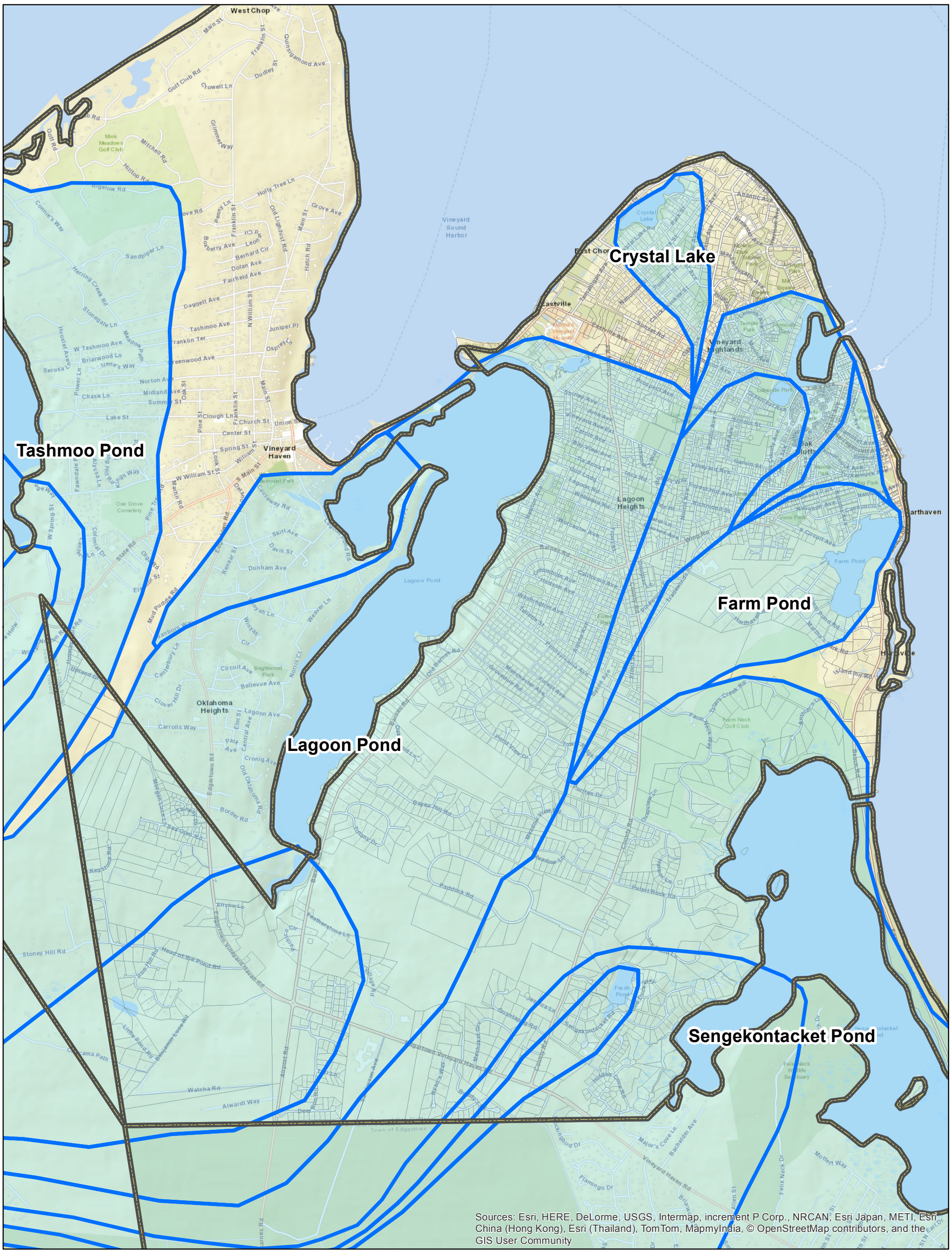
1. Flow estimates include only flow from wastewater generation. An estimate for I/I will be incorporated into the flow estimate once a preliminary sewer layout has been established.
2. Flow estimate assumes that treated effluent is discharged outside of a nitrogen-sensitive estuary. Flow estimate will need to be revised once a preliminary sewer layout has been established.

This wastewater flow estimate represents a wastewater quantity that needs to be managed within the Planning Area.

10.6 Next Steps to Identify Solutions for Wastewater Needs

The Needs Assessment Report documents the first phase of the Comprehensive Wastewater Management Planning Project. The next phase of the Project will identify and screen decentralized treatment, on-site wastewater technologies, centralized treatment, and non-sewering alternatives for the Areas of Concern and existing centralized facilities. These technologies and solutions will be described, and advantages and disadvantages will be summarized. Infeasible technologies and solutions will be eliminated from further evaluation. The third phase will evaluate the feasible technologies and solutions in detail, and present the Recommended Wastewater Management Plan.

Figures



LEGEND

- Town Boundary
- Major Watersheds as Delineated by the Massachusetts Estuaries Project

Paper Size ANSI B

0 1,000 2,000 4,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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GHD

TOWN OF OAK BLUFFS
CWMP

Locus Map

Job Number	111-44140
Revision	A
Date	04 Jun 2018

Figure 2-1

1545 Iyannough Road, Hyannis Massachusetts 02601 USA T 1 508 362 5680 F 1 508 362 5684 E hyamail@ghd.com W www.ghd.com

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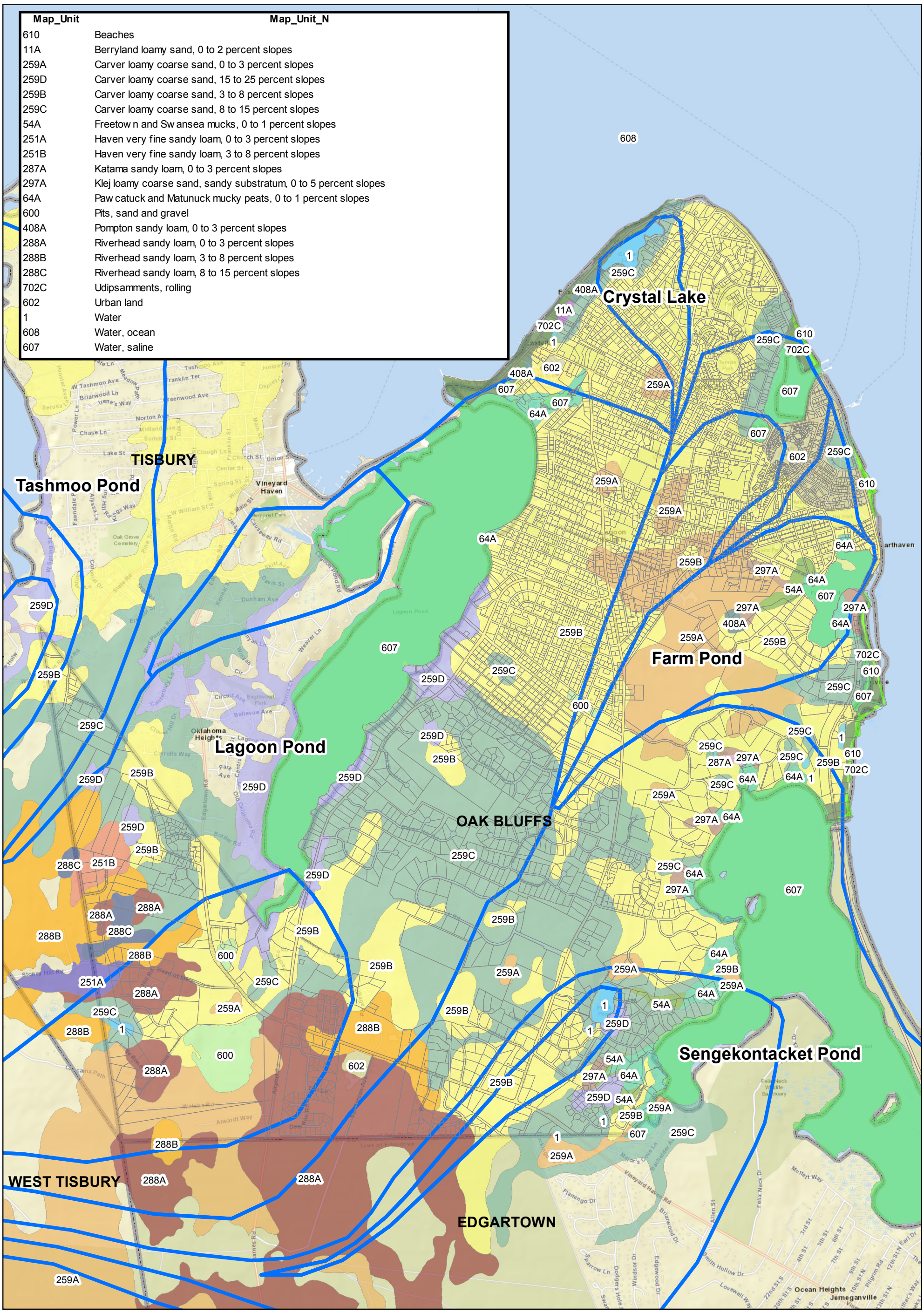
Map_Unit	Map_Unit_N
610	Beaches
11A	Berryland loamy sand, 0 to 2 percent slopes
259A	Carver loamy coarse sand, 0 to 3 percent slopes
259D	Carver loamy coarse sand, 15 to 25 percent slopes
259B	Carver loamy coarse sand, 3 to 8 percent slopes
259C	Carver loamy coarse sand, 8 to 15 percent slopes
54A	Freetown and Swansea mucks, 0 to 1 percent slopes
251A	Haven very fine sandy loam, 0 to 3 percent slopes
251B	Haven very fine sandy loam, 3 to 8 percent slopes
287A	Katama sandy loam, 0 to 3 percent slopes
297A	Klej loamy coarse sand, sandy substratum, 0 to 5 percent slopes
64A	Pawcatuck and Matunuck mucky peats, 0 to 1 percent slopes
600	Pits, sand and gravel
408A	Pompton sandy loam, 0 to 3 percent slopes
288A	Riverhead sandy loam, 0 to 3 percent slopes
288B	Riverhead sandy loam, 3 to 8 percent slopes
288C	Riverhead sandy loam, 8 to 15 percent slopes
702C	Udipsamments, rolling
602	Urban land
1	Water
608	Water, ocean
607	Water, saline



Paper Size ANSI B

0 1,000 2,000 4,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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GHD

TOWN OF OAK BLUFFS
CWMP

Soils Series Map

Job Number	111-44140
Revision	A
Date	04 Jun 2018

Figure 4-1

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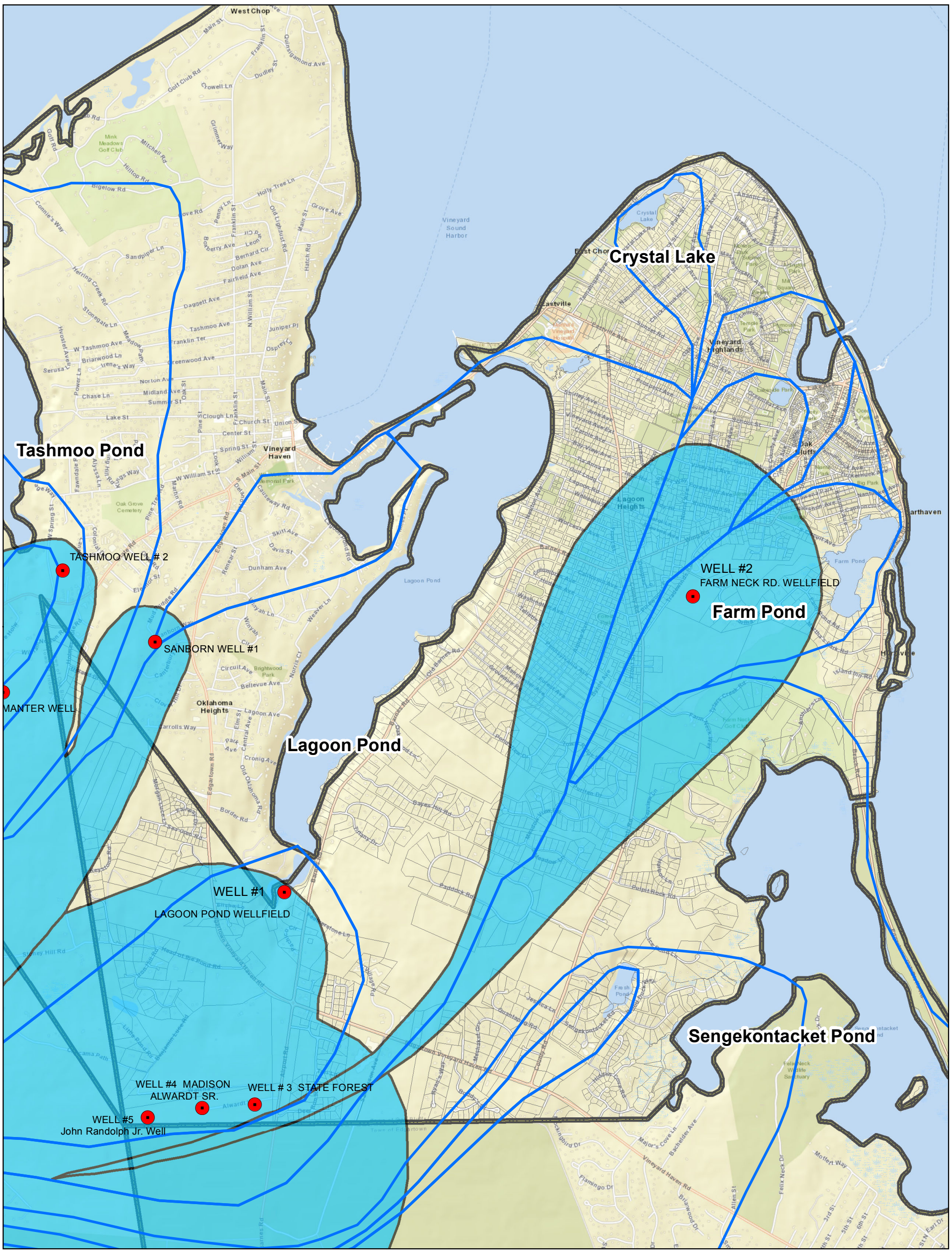

LEGEND

- Public Water Supply Well
- Zone II
- Major Watershed
- Town Boundary

Paper Size ANSI B

0 1,000 2,000 4,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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TOWN OF OAK BLUFFS
CWMP

Zone 1 Protection Areas

Job Number	111-44140
Revision	A
Date	04 Jun 2018

Figure 4-2

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Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:jjobrien

LEGEND

- MEP Watershed Boundary
- Town Boundary
- BARRIER BEACH
- BARRIER BEACH SYSTEM
- BARRIER BEACH-COASTAL BEACH
- BARRIER BEACH-COASTAL DUNE
- BARRIER BEACH-DEEP MARSH
- BARRIER BEACH-MARSH
- BARRIER BEACH-OPEN WATER
- BARRIER BEACH-SALT MARSH
- BARRIER BEACH-SHRUB SWAMP
- BARRIER BEACH-WOODED SWAMP CONIFEROUS
- BARRIER BEACH-WOODED SWAMP DECIDUOUS
- BARRIER BEACH-WOODED SWAMP MIXED TREES
- BOG
- COASTAL BANK BLUFF OR SEA CLIFF
- COASTAL BEACH
- COASTAL DUNE
- CRANBERRY BOG
- DEEP MARSH
- ROCKY INTERTIDAL SHORE
- SALT MARSH
- SHALLOW MARSH MEADOW OR FEN
- SHRUB SWAMP
- TIDAL FLAT
- WOODED SWAMP CONIFEROUS
- WOODED SWAMP DECIDUOUS
- WOODED SWAMP MIXED TREES
- MEP Watershed Boundary

Paper Size ANSI B

0 1,000 2,000 4,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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TOWN OF OAK BLUFFS
CWMP

Job Number 111-44140
Revision A
Date 04 Jun 2018

DEP Wetlands and Vernal Pools

Figure 4-3

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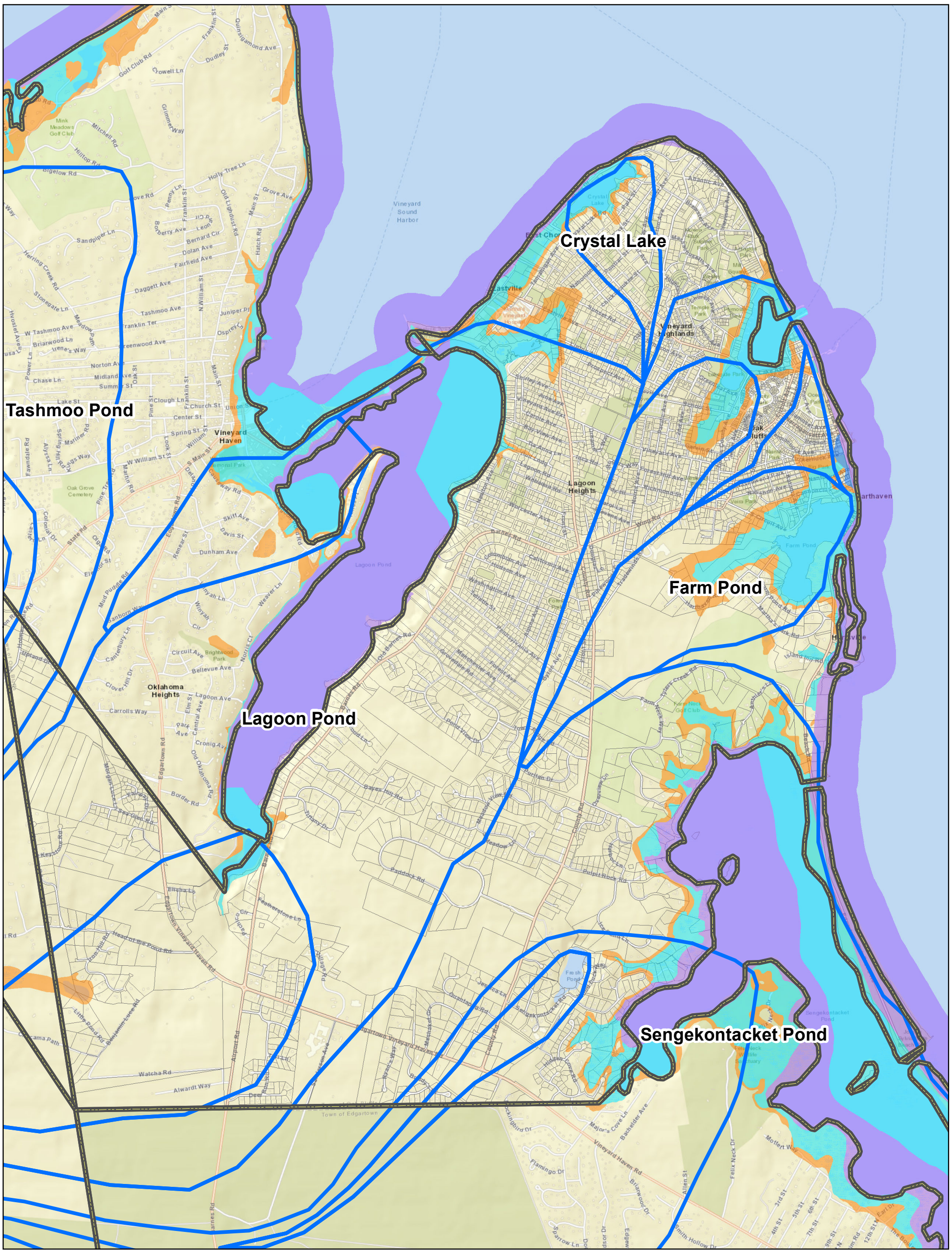

LEGEND

FEMA National Flood Hazard Layer

Flood Zone Designations

- A: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- AH: 1% Annual Chance of 1-3ft Ponding, with BFE
- AO: 1% Annual Chance of 1-3ft Sheet Flow Flooding, with Depth
- VE: High Risk Coastal Area
- D: Possible But Undetermined Hazard
- X: 0.2% Annual Chance of Flooding
- X: Reduced Flood Risk due to Levee
- Area Not Included
- Area with no DFIRM - Paper FIRMs in Effect
- Town Boundary
- MEP Watershed Boundary

Paper Size ANSI B

0 1,000 2,000 4,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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TOWN OF OAK BLUFFS
CWMP

FEMA Flood Hazards

Job Number	111-44140
Revision	A
Date	04 Jun 2018

Figure 4-4

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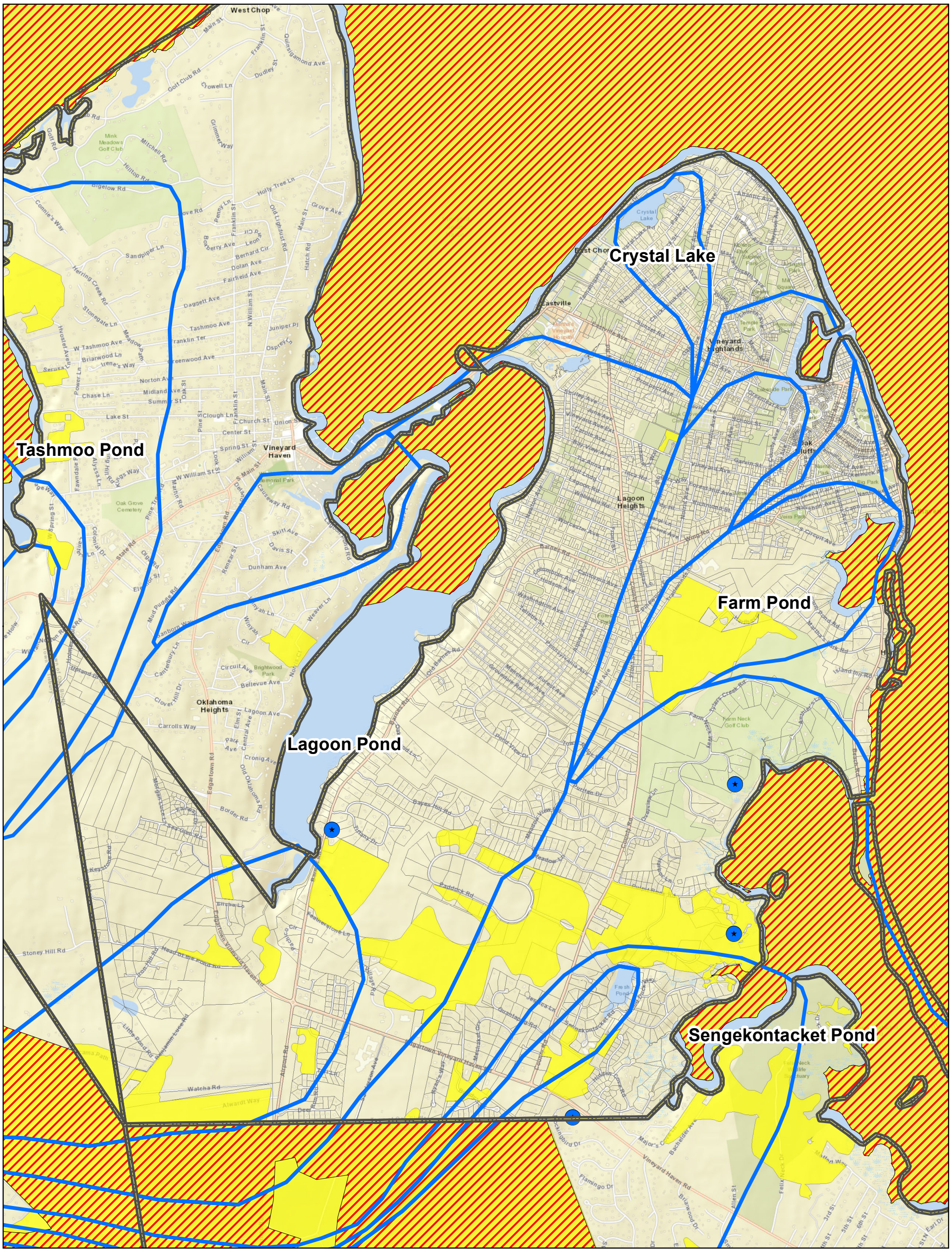

LEGEND

- Town Boundary
- MEP Watershed
- Vernal Pool
- Estimated Rare Species Habitat
- Priority Rare Species Habitat

Paper Size ANSI B

0 1,000 2,000 4,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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TOWN OF OAK BLUFFS
CWMP

Job Number 111-44140
Revision A
Date 04 Jun 2018

National Heritage Endangered Species Habitats

Figure 4-5

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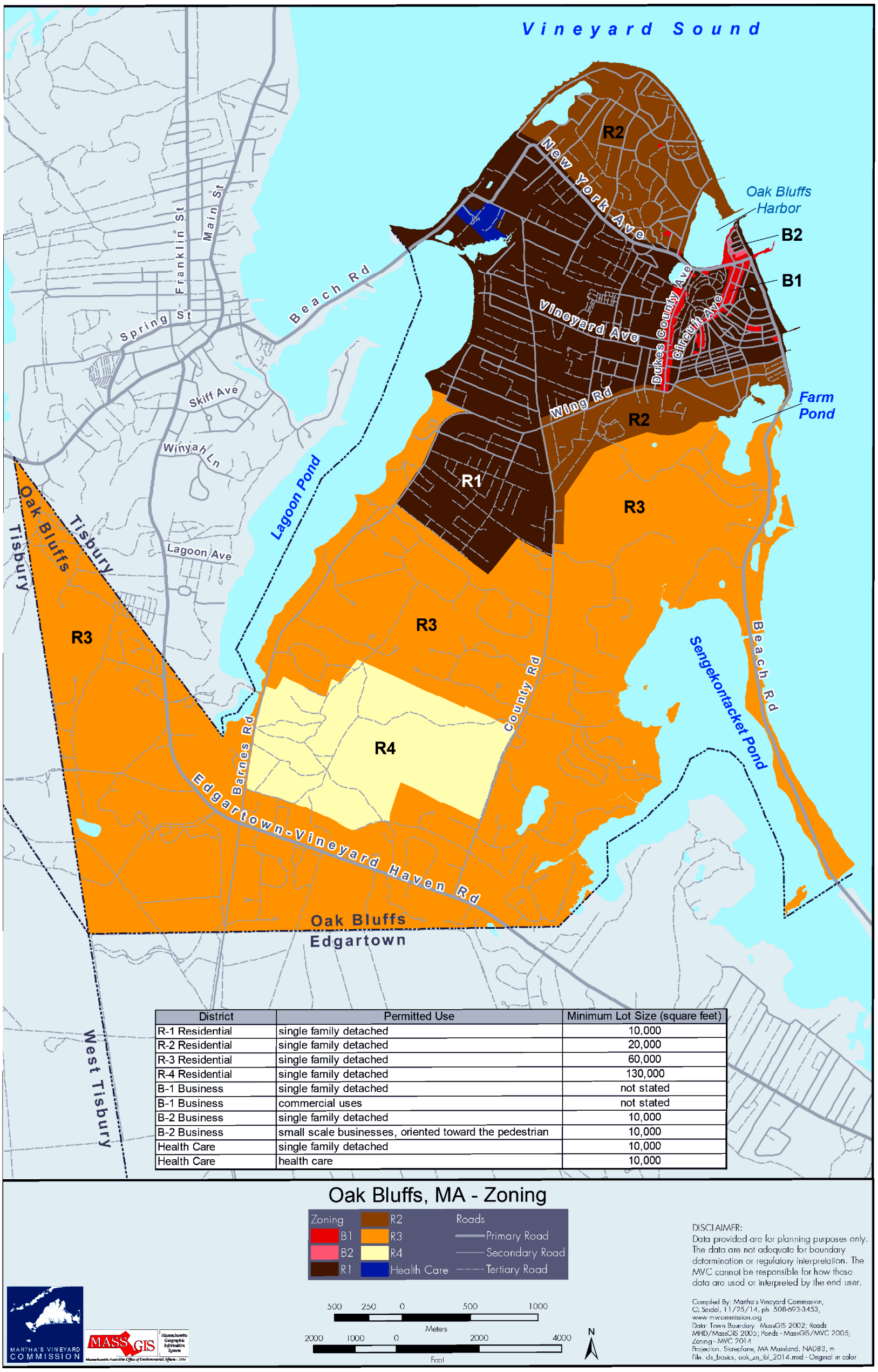
Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:jjobrien G:\111\11144140 TOWN OF OAK BLUFFS CWMP PLAN OF STD\GIS\Maps\MXD_Deliverables\CWMP Figures\Revised pdf 6_4_2018\111-44140F4-5.mxd



District	Permitted Use	Minimum Lot Size (square feet)
R-1 Residential	single family detached	10,000
R-2 Residential	single family detached	20,000
R-3 Residential	single family detached	60,000
R-4 Residential	single family detached	130,000
B-1 Business	single family detached	not stated
B-1 Business	commercial uses	not stated
B-2 Business	single family detached	10,000
B-2 Business	small scale businesses, oriented toward the pedestrian	10,000
Health Care	single family detached	10,000
Health Care	health care	10,000

NOT TO SCALE

N

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TOWN OF OAK BLUFFS
CWMP

ZONING MAP

Job Number	111-44140
Revision	A
Date	04 Jun 2018

Figure 4-6

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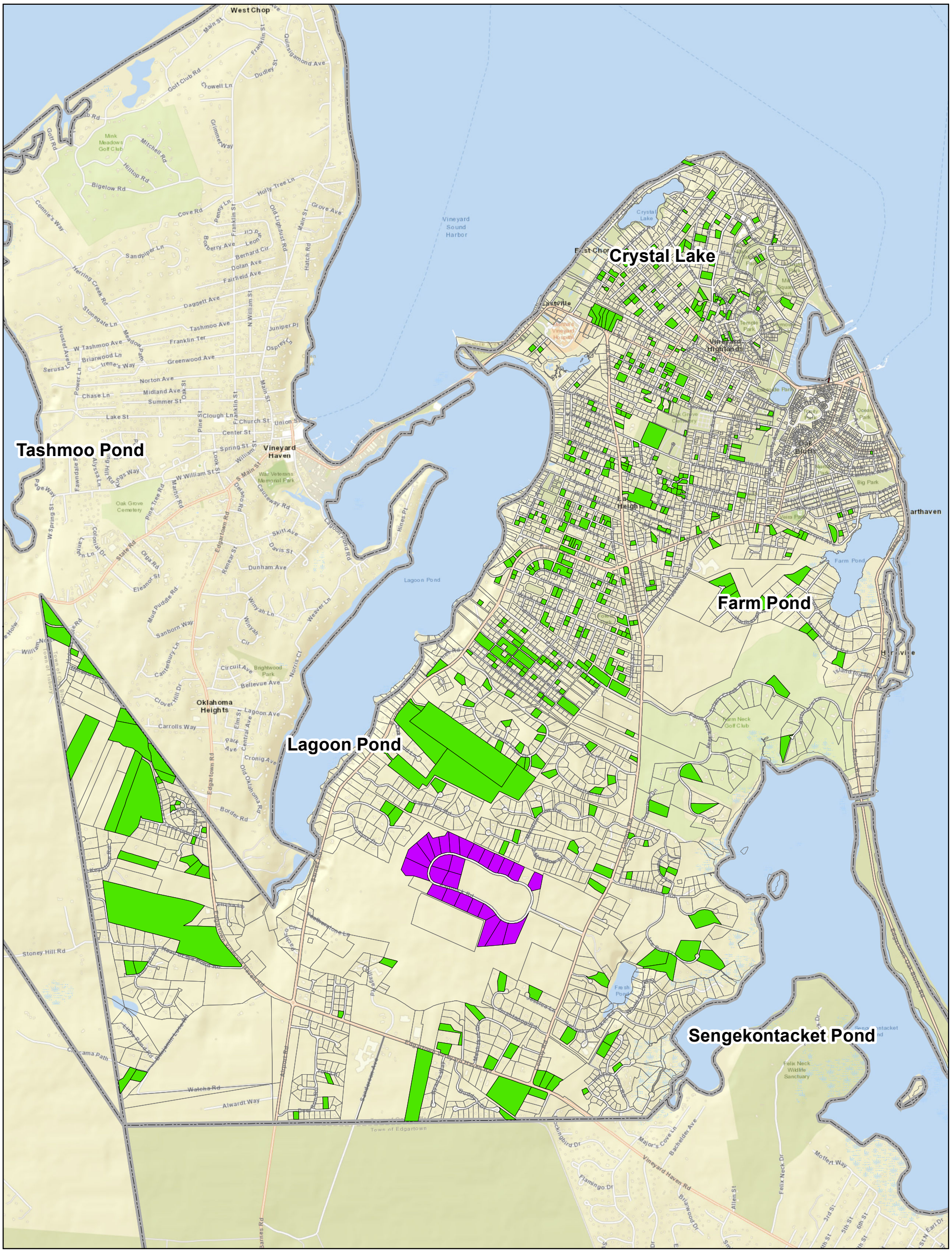

LEGEND

- Residential Potentially Developable Property
- Residential Developable Property
- Commercial Developable Property
- Major Watershed
- Town Boundary

Paper Size ANSI B

0 1,000 2,000 4,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

N

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TOWN OF OAK BLUFFS, MA
CWMP

Job Number 111-44140
Revision A
Date 04 Jun 2018

Developable and Potentially Developable Properties

Figure 4-7

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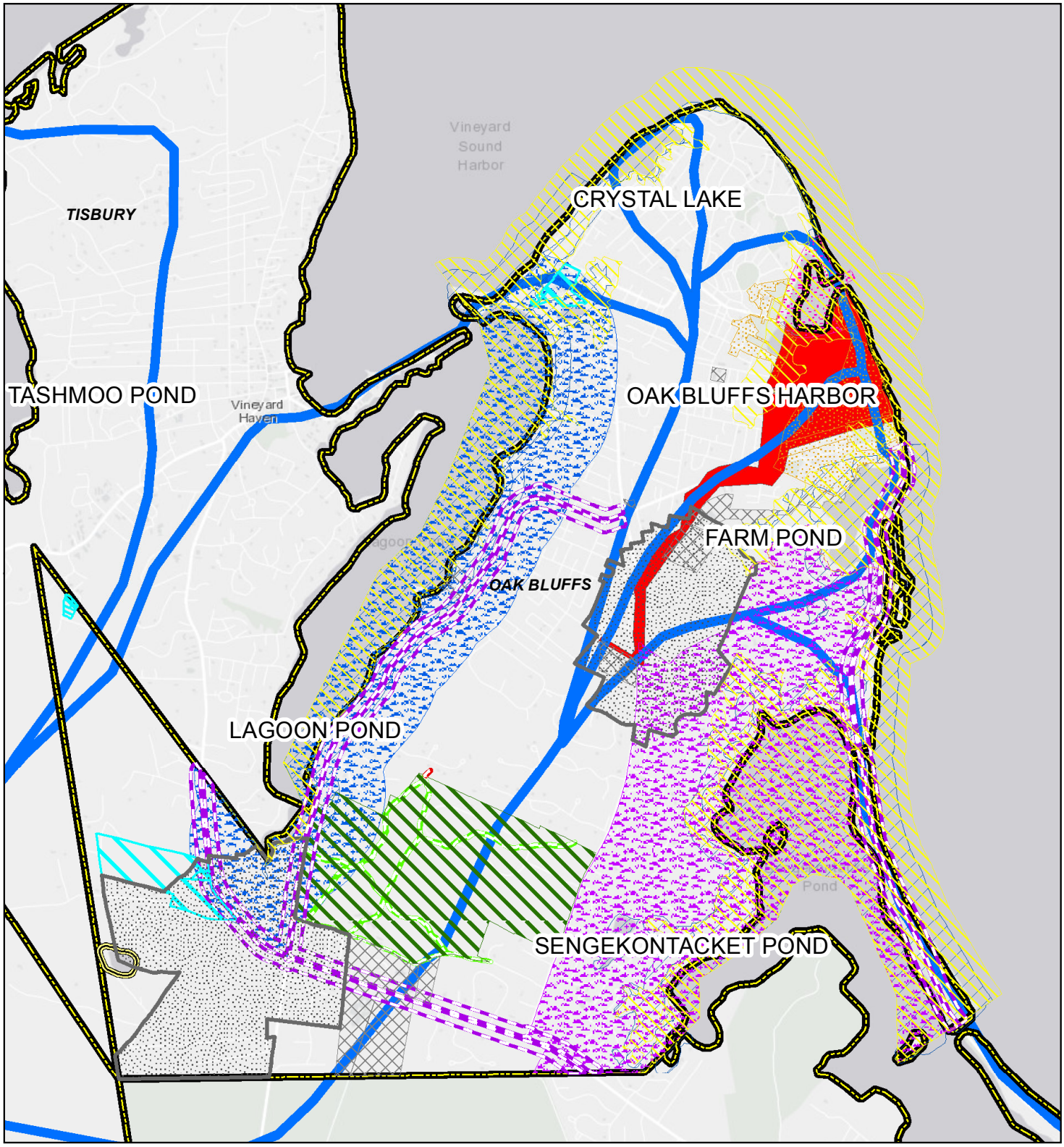

LEGEND

Paper Size ANSI A

0 750 1,500 3,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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TOWN OF OAKS BLUFF
CWMP

WATER RESOURCE PROTECTION
OVERLAY DISTRICT

Job Number	111-44140
Revision	A
Date	04 Jun 2018

Figure 5-1

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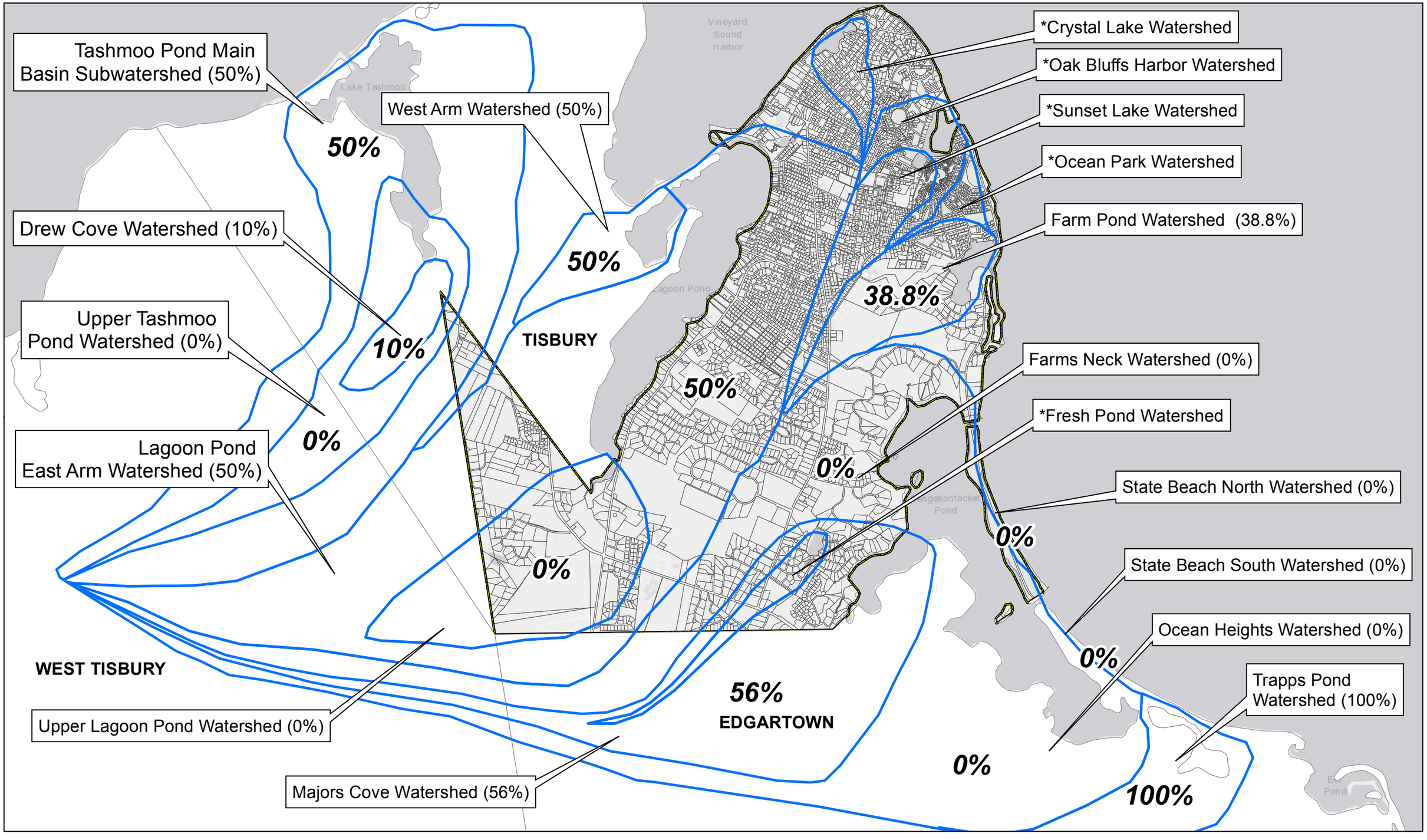

Paper Size ARCH D

0 1,400 2,800 5,600 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

N

LEGEND

***Note: MEP Nitrogen Removal Percentages Not Determined for These Watersheds**

MEP Watersheds

0% EXISTING WASTEWATER NITROGEN REMOVAL % SUGGESTED BY MEP

GHD

Town of Oak Bluffs, Ma
CWMP

ESTIMATED EXISTING WASTEWATER NITROGEN REMOVAL PERCENTAGES TO MEET TMDL AS OF THE DATE OF COMPLETION OF THE MEP REPORTS

Job Number	111-44140
Revision	A
Date	04 Jun 2018

Figure 4-1

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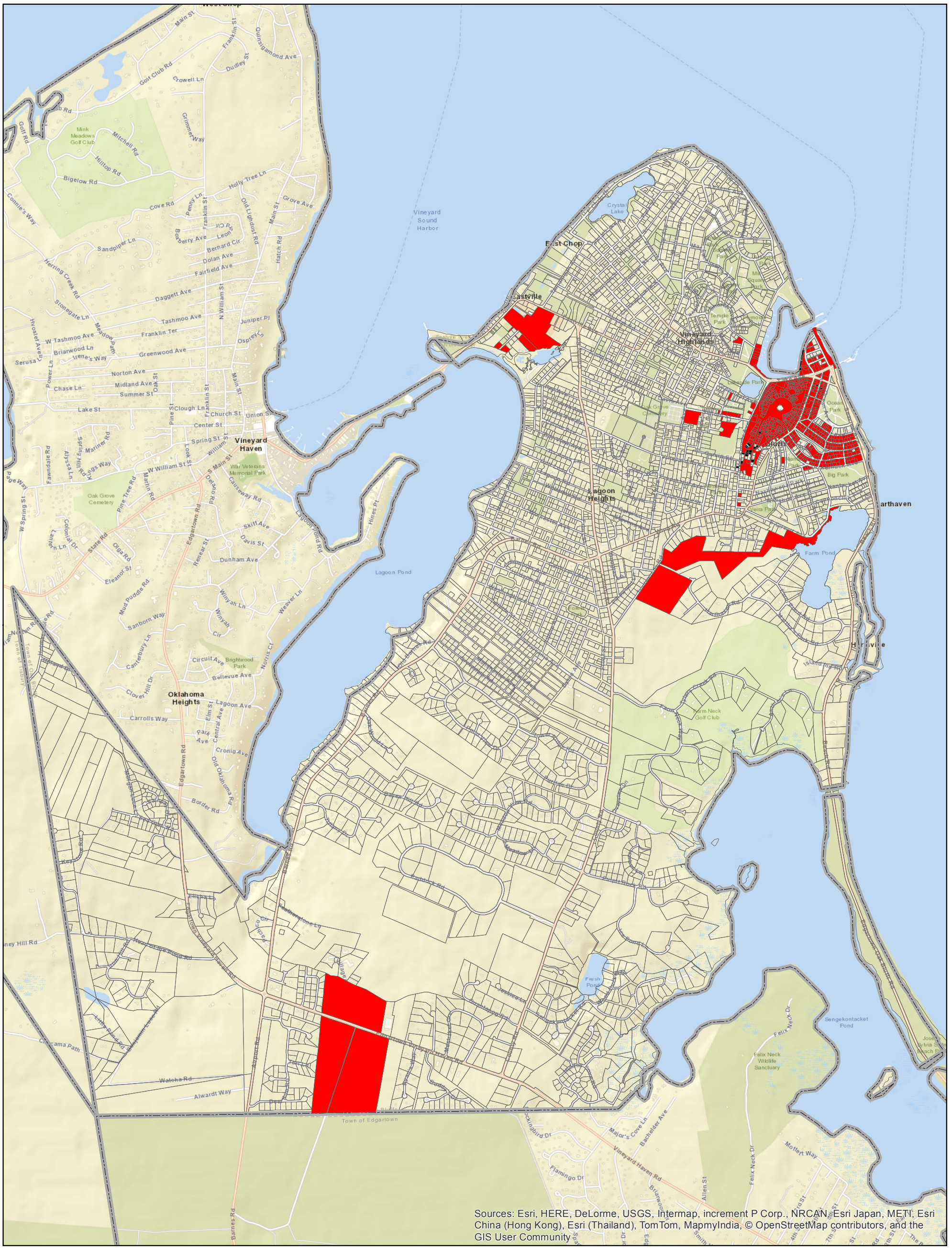

LEGEND

- Properties scheduled to be connected to WWTF
- Properties connected to WWTF
- Town Boundary

Paper Size ANSI B

0 1,000 2,000 4,000 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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TOWN OF OAK BLUFFS
CWMP

Job Number 111-44140
Revision A
Date 04 Jun 2018

Oak Bluffs Centralized Wastewater Treatment System

Figure7-1

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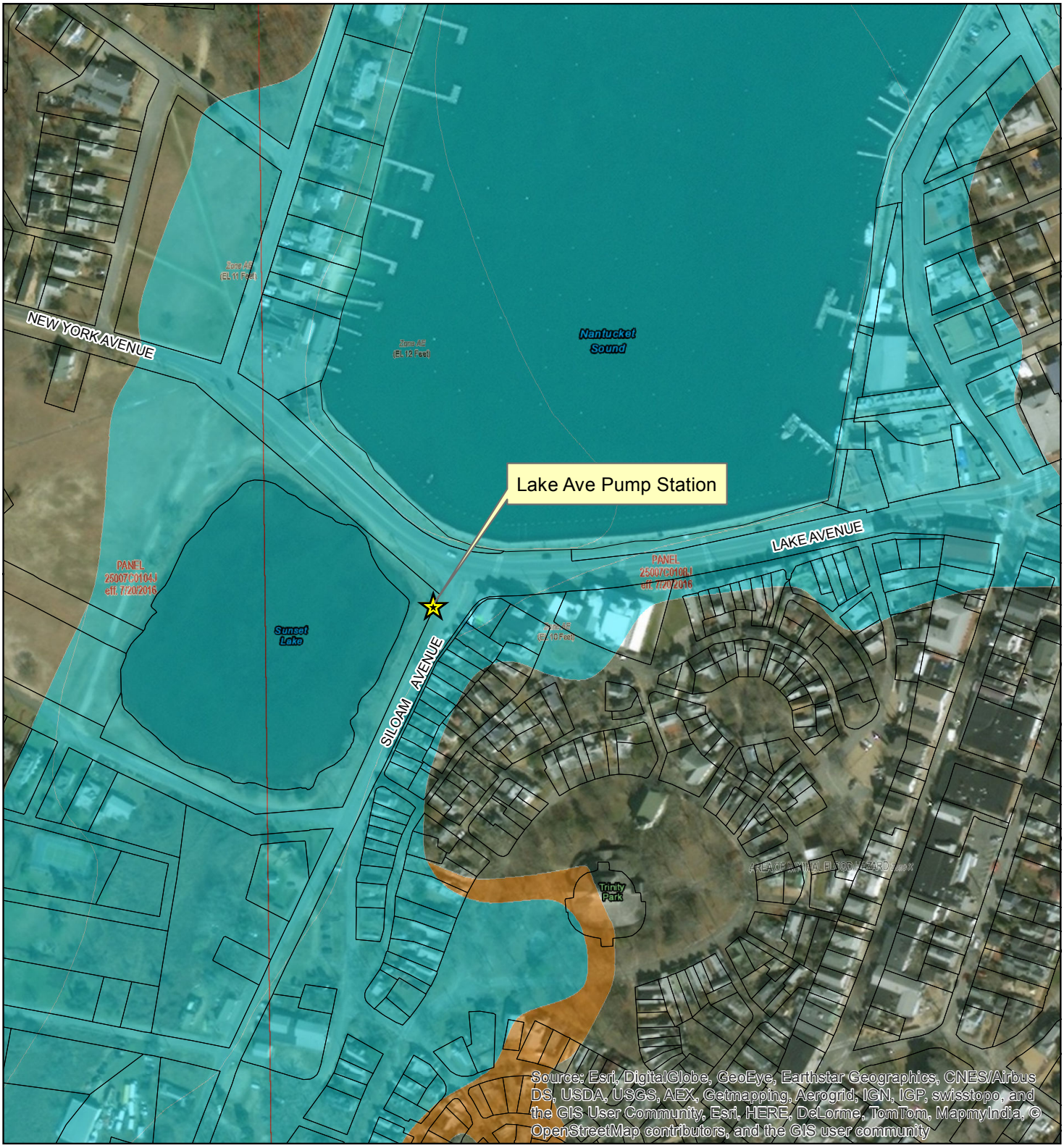

LEGEND

National Flood Hazard Layer

Zone

AE- An area inundated by 100-year flooding, for which BFEs have been determined.

X500 - An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding

Paper Size ANSI A

0 62.5 125 250 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

N

TOWN OF OAK BLUFFS, MA
CWMP

Lake Ave Pump Station
National Flood Map

Job Number	111-44140
Revision	A
Date	04 Jun 2018

Figure 7-3

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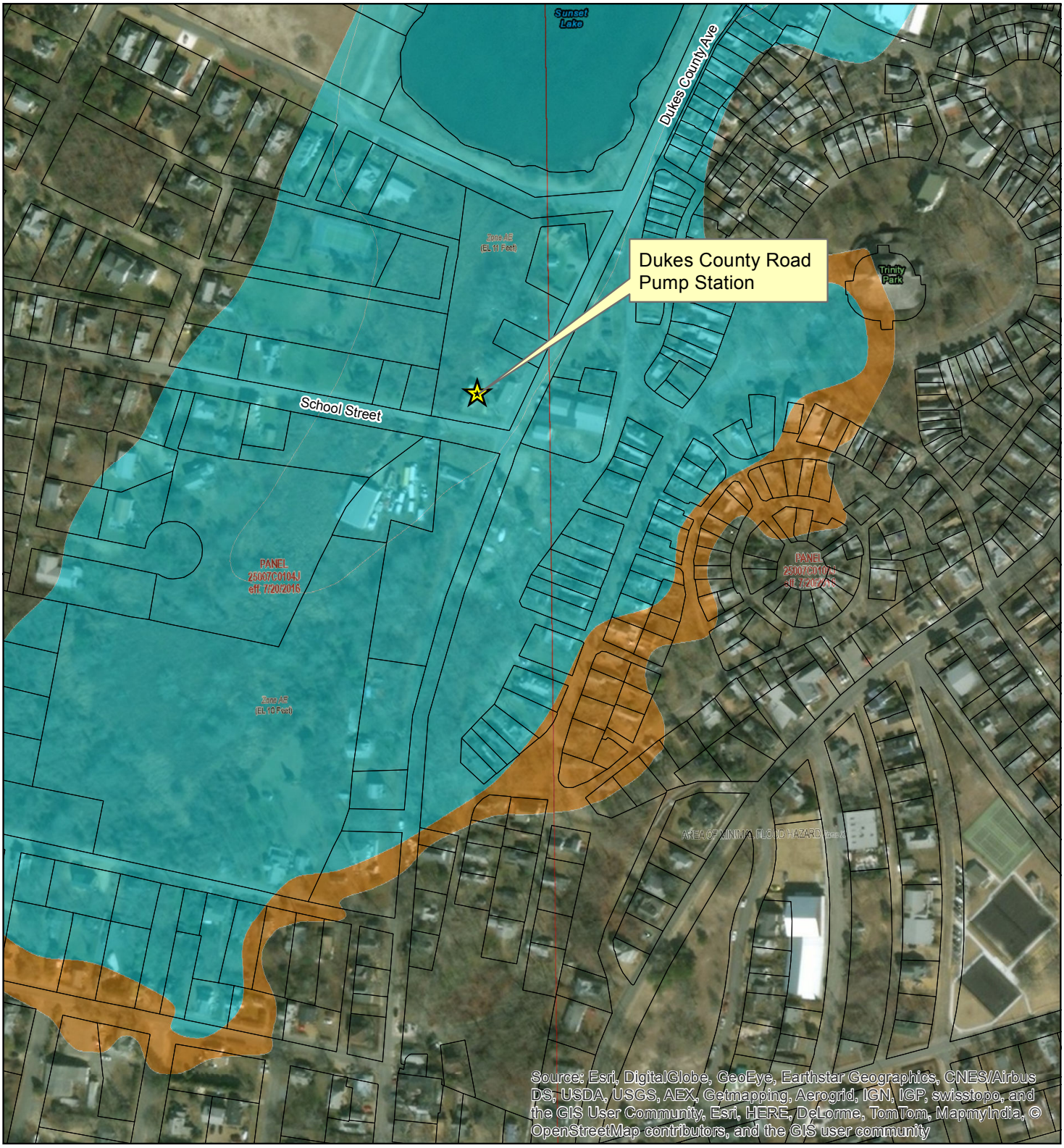

LEGEND

National Flood Hazard Layer

Zone

- AE- An area inundated by 100-year flooding, for which BFEs have been determined.
- X500 - An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding

Paper Size ANSI A

0 62.5 125 250 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

N

TOWN OF OAK BLUFFS, MA
CWMP

Job Number	111-44140
Revision	A
Date	04 Jun 2018

Dukes County Avenue Pump Station
National Flood Map

Figure 7-4

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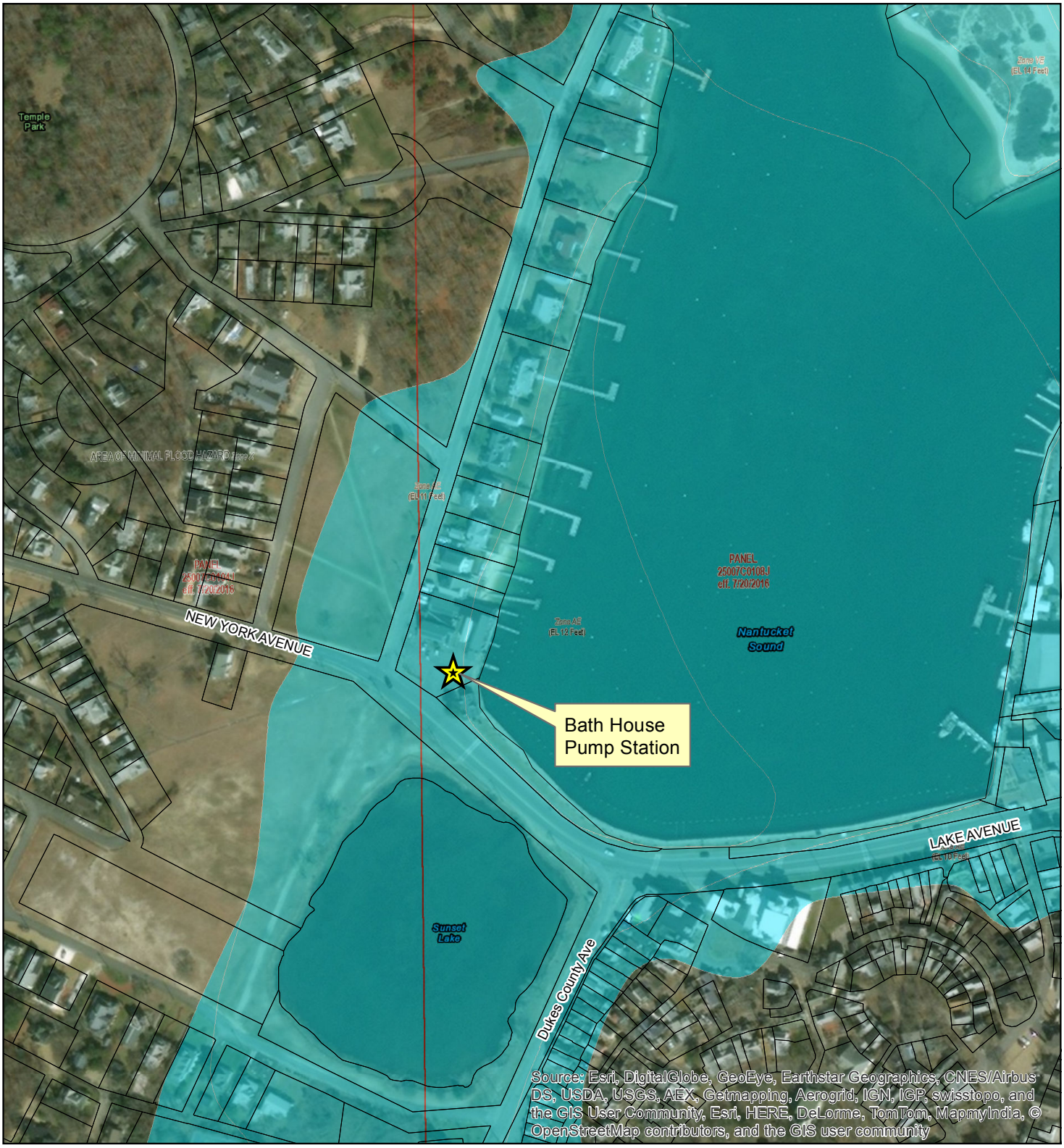

LEGEND

National Flood Hazard Layer

Zone

- AE- An area inundated by 100-year flooding, for which BFEs have been determined.
- X500 - An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding

Paper Size ANSI A

0 62.5 125 250 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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TOWN OF OAK BLUFFS, MA
CWMP

Bath House Pump Station
National Flood Map

Job Number	111-44140
Revision	A
Date	04 Jun 2018

Figure 7-5

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LEGEND

Worst-case Hurricane Surge Inundation Zones

Hurricane Category

- Category 1
- Category 2
- Category 3
- Category 4

Paper Size ANSI A

0 62.5 125 250 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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TOWN OF OAK BLUFFS, MA
CWMP

Lake Ave Pump Station
Hurricane Surge Scenarios

Job Number	111-44140
Revision	A
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Figure 7-6

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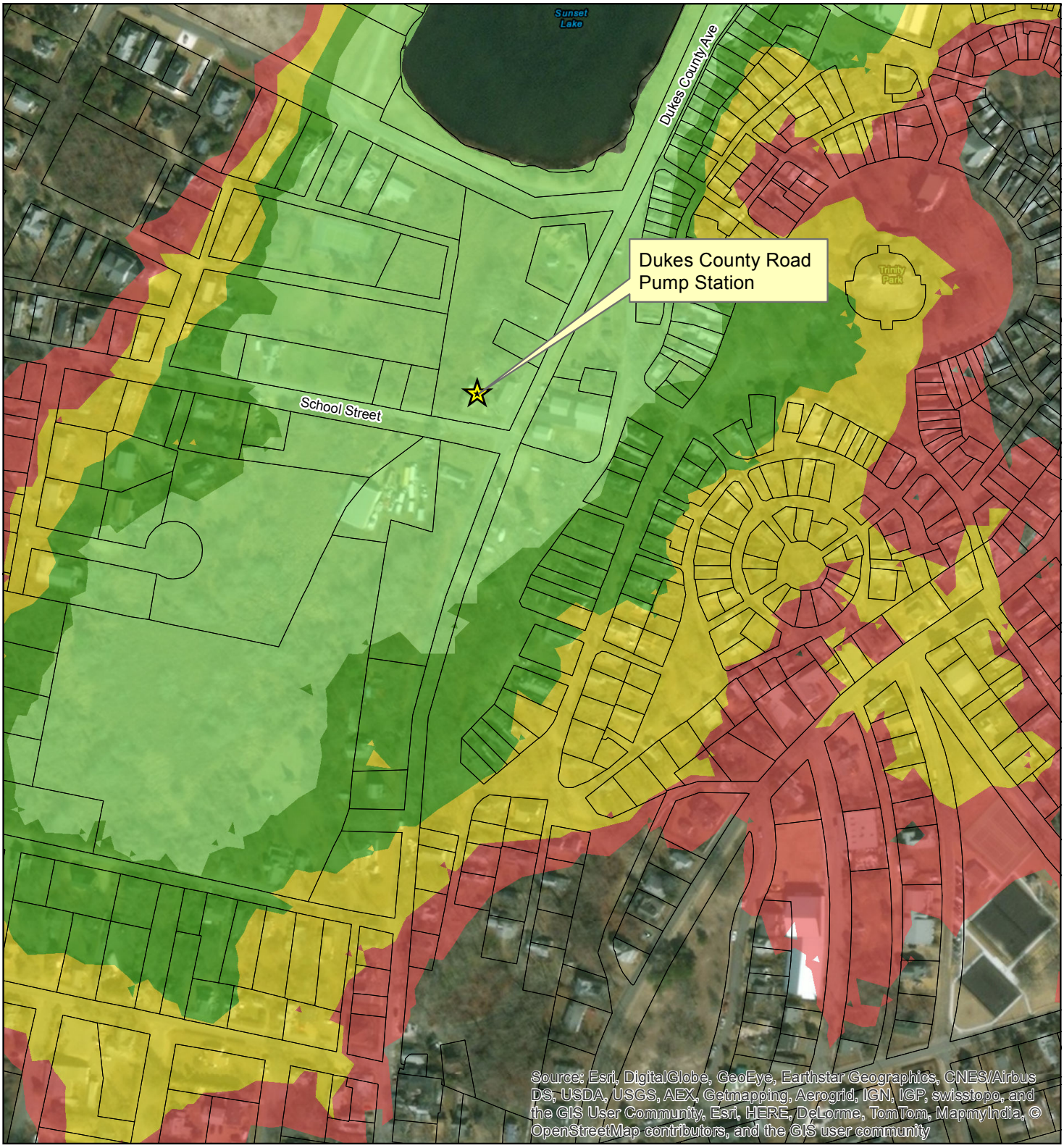

LEGEND

Worst-case Hurricane Surge Inundation Zones

Hurricane Category

- Category 1
- Category 2
- Category 3
- Category 4

Paper Size ANSI A

0 62.5 125 250 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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TOWN OF OAK BLUFFS, MA
CWMP

Dukes County Avenue Pump Station
Hurricane Surge Scenarios

Job Number	111-44140
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Date	04 Jun 2018

Figure 7-7

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LEGEND

Worst-case Hurricane Surge Inundation Zones

Hurricane Category

- Category 1
- Category 2
- Category 3
- Category 4

Paper Size ANSI A

0 62.5 125 250 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

N

TOWN OF OAK BLUFFS, MA
Oal Bluffs CWMP

Bath House Pump Station
Hurricane Surge Scenarios

Job Number	111-44140
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Figure 7-8

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Appendices

Appendix A
2017 Comprehensive Wastewater Management Plan of Study

Town of Oak Bluffs, MA

2017 Comprehensive Wastewater
Management Plan of Study

GHD | 1545 Iyannough Road, Hyannis, MA 02601

11144140 | October 2017

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1. Introduction

The purpose of the Plan of Study (POS) is to provide a listing of the steps needed for the Comprehensive Management Planning Project (CWMP) in the Town of Oak Bluffs, Massachusetts (Town). Outlining these tasks allows Town department staff, regional and State agencies, and the public to understand the CWMP process and efficiently provide input to the Project. The POS has been prepared as an attachment to the Environmental Notification Form (ENF) Application Form and is expected to have the following main uses:

- Initiation of the Massachusetts Environmental Policy Act (MEPA) review process.
- Submittal for Department of Environmental Protection (DEP) review as required.
- Budgeting and scheduling tool for Comprehensive Wastewater Management Planning.
- Development of public education and outreach materials throughout the Project.

This document was prepared in accordance with the guidelines provided in the 'Guide to Comprehensive Wastewater Management Planning', prepared by the Department of Environmental Protection Bureau of Municipal Facilities and dated January, 1996.

2. Planning Background

The Town of Oak Bluffs initiated wastewater planning efforts in the mid-1970's. After several planning effort proposals failed at Town meeting, the 'Town of Oak Bluffs Massachusetts Draft Phase III Wastewater Facilities Plan and Environmental Impact Report EOEA #10456', prepared by Horsley & Witten, Inc. and Wright-Pierce, and dated January 20, 1998' was accepted by the Town at Special Town Meetings in 1998. Comments received from State reviewing agencies and Town citizens were incorporated into the 'Phase IV Final Facilities Plan – A Supplemental Appendix to the Draft Phase III Wastewater Facilities Plan and Environmental Impact Report', prepared by Horsley & Witten, Inc. and Wright-Pierce, dated May 26, 1999' (referred to as the '1999 Facilities Plan' for the remainder of this document).

The 1999 Facilities Plan recommended the construction of a centralized treatment facility to treat wastewater from 529 lots that were identified as requiring off-lot solutions. Construction of the Oak Bluffs Wastewater Treatment Facility (WWTF) was completed in 2002. The majority of the equipment at the facility is approaching the end of its design life and the facility is approaching its flow capacity.

Since the completion of the 1999 Facilities Plan, Massachusetts Estuary Project (MEP) reports were completed for five of the watersheds in the Town, and Total Maximum Daily Loads (TMDL) for Total Nitrogen have been issued for three of the major watersheds in the Town. A TMDL for a fourth watershed has been issued in draft form.

The CWMP update will build on the 1999 Facilities Plan to develop a plan that addresses the nutrient-related needs of the Town, as identified in the MEP reports and TMDLs. The following

planning documents, which were produced subsequent to the completion of the 1999 Facilities Plan, will be reviewed as part of the CWMP:

- 'Martha's Vineyard Wastewater Management Study Prepared for Martha's Vineyard Commission', prepared by Wright Pierce, dated May 2010.
- 'Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Lagoon Pond System, Towns of Oak Bluffs and Tisbury, MA Draft Report' prepared by the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) and the Massachusetts Department of Environmental Protection, dated June 2010.
- 'Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Farm Pond System, Town of Oak Bluffs, MA Final Report,' prepared by the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) and the Massachusetts Department of Environmental Protection, dated November 2010.
- 'Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Sengekontacket Pond System, Towns of Oak Bluffs and Edgartown, MA – Final Report', prepared by the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) and the Massachusetts Department of Environmental Protection, dated January 2011.
- 'Sewering Scenarios Results for Lagoon Pond based on MEP Linked Model Technical Memorandum', prepared by the University of Massachusetts Dartmouth School of Marine Science and Technology Coastal Systems Group, dated October 25, 2011.
- 'Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Oak Bluffs Harbor System, Town of Oak Bluffs, MA – Final Report', prepared by the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) and the Massachusetts Department of Environmental Protection, dated May 2013.
- 'Massachusetts Estuaries Project Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Threshold for the Lake Tashmoo Estuary Towns of Tisbury, West Tisbury and Oak Bluffs, MA – Final Report', prepared by the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) and the Massachusetts Department of Environmental Protection, dated February 2015.
- 'Final Farm Pond Estuarine System Total Maximum Daily Load for Total Nitrogen (CN-391.1)', dated July 2015.
- 'Final Lagoon Pond Estuarine System Total Maximum Daily Loads for Total Nitrogen (CN-390.1)', dated July 2015.
- 'Final Sengekontacket Pond Estuarine System Total Maximum Daily Loads for Total Nitrogen (CN-310.1)', dated November 2015.

- ‘Lagoon Pond PRB Evaluation Report’ Prepared for the Towns of Oak Bluffs and Tisbury, MA by Lombardo Associates, Inc., dated March 1, 2016
- ‘Draft Lake Tashmoo Estuarine System Total Maximum Daily Load for Total Nitrogen (CN 353.0)’, dated May 2017

3. CWMP Plan of Study Development

The Plan of Study provides the Town of Oak Bluffs with an approach and outline for the Comprehensive Wastewater Management Planning (CWMP) effort. A Comprehensive Planning effort typically consists of the following components:

- Needs Assessment – to identify areas where problems, concerns, or impacts may occur; where improvements are required; and to establish background on the planning area.
- Screening Analysis – where alternatives are identified and screened in the effort to develop the last component, a Recommended Plan.
- Recommended Plan – sometimes combined with an Environmental Impact Report or Statement, identifies the recommendations of the planning effort, costs, schedule, and mitigation measures.

Providing an outline of these tasks allows Town department staff, regional and State agencies, and the public to understand the next steps in the planning process and efficiently provide input to the project. The Oak Bluffs CWMP will build on the efforts conducted for the 1999 facilities planning effort. The information compiled during the original planning effort will be updated, where appropriate, to reflect current conditions; and nutrient-related needs will be incorporated into the planning effort.

4. Plan of Study

The following presents a recommended outline for the CWMP, and is divided into the following five (5) phases:

Phase I – Needs Assessment

Phase II – Alternatives Screening Analysis

Phase III – Recommended Plan, Completion of CWMP

Phase IV – Public Participation

Phase V – MEPA Review

4.1 Phase I - Needs Assessment

Following acceptance of the ENF documents, work will proceed with this phase, which consists of evaluations of the existing conditions and the development of future wastewater projections. The

comparison of these two conditions will define the wastewater needs of the study areas. This phase will result in the preparation of a Needs Assessment Report which will be submitted to DEP and MEPA for review and comment.

The following topics will be covered as part of the Needs Assessment Report:

1.1 Project Introduction

- 1.1.1 Project Focus and Scope
- 1.1.2 Discussion on Town Issues, Goals, and Vision
- 1.1.3 Planned Review Process

1.2 Project/Town Background Update

- 1.2.1 Definition of the Planning Area
  - 1.2.1.1 Site Location
  - 1.2.1.2 Town Planning History
  - 1.2.1.3 Known Regional Planning Efforts for Shared Watersheds
    - 1.2.1.3.1 Lagoon Pond
    - 1.2.1.3.2 Sengekontacket Pond
    - 1.2.1.3.3 Tashmoo Pond
  - 1.2.1.4 Population and Demographic Information in Planning Area
  - 1.2.1.5 History of Nutrient Removal Related Projects
    - 1.2.1.5.1 Shellfish
    - 1.2.1.5.2 Permeable Reactive Barriers
    - 1.2.1.5.3 Salt Marsh Restoration

1.3 History of existing facilities including WWTF site, description of upgrades, services areas, and major historical planning documents.

- 1.3.1 Summary of Previous Planning Efforts
- 1.3.2 1999 Facilities Plan
- 1.3.3 Wastewater Treatment Facility and Collection System Construction (eight contracts and major sewer extensions)
- 1.3.4 Permit History
- 1.3.5 2017 Wastewater Treatment Facility Evaluation

1.4 Documentation of Planning and Evaluation Criteria to be used in the CWMP including:

1.4.1 Definition of Planning Period

1.4.2 Discussion of survey datum and flood levels. Discussion of new Federal Emergency Management Agency (FEMA) flood maps and possible impacts on existing facilities.

1.4.3 Discussion of Current and Anticipated Future Permit Limits.

1.4.4 Discussion of environmental and sustainability considerations including, but not limited to, optimizing existing infrastructure, energy efficiency, and alternative energy (with reference to the Commonwealth's Sustainable Development Principles, Water Policy, Water Conservation Standards, and Greenhouse Reduction Policy).

1.5 Existing conditions, including a review and/or condition assessment of the following:

1.5.1 Natural Environment

1.5.1.1 Climate and Sea Level Rise

1.5.1.2 Soils

1.5.1.3 Water and Water Quality (hydrology, surface water, groundwater, water table etc.)

1.5.1.4 Habitats (endangered species, wetlands, vernal pools)

1.5.2 Manmade Environment

1.5.2.1 Demographics analysis for today and future projections to the planning year.

1.5.2.2 Areas of the Town utilizing individual septic systems and their approximate age and condition. This shall include an assessment of the suitability of areas of the Town for such systems based on such factors as soils and nutrient impacts, if any. It shall also include a review of pump out records.

1.5.2.3 Areas of the Town utilizing innovative/alternative septic systems (I/A systems) and their approximate age and condition.

1.5.2.4 Properties with private WWTF and effluent discharge permits. This will include summaries of wastewater flows and effluent quality as available from MassDEP.

1.5.2.5 Water quality problems in surface waters and drinking waters related to wastewater and treated effluent discharges to the groundwater and to surface waters.

1.5.2.6 Existing Town-wide land use and zoning considerations.

1.5.3 Wastewater Infrastructure

1.5.3.1 Collection System and Pumping Stations – collection system condition shall be ascertained from Town personnel and the pump station evaluation shall include pump stations operated by the Town Wastewater Department.

1.5.3.1.1 SSO history

1.5.3.2 Discussion of anticipated sea level rise impacts on existing infrastructure (collection and treatment)

1.5.4 Wastewater (liquid) Treatment Facilities - description and design capacity for major existing WWTF facility processes

1.5.5 Effluent Disposal Facilities

1.5.6 Sludge Management Facilities (residual treatment, handling, and disposal)

1.5.7 Septage Treatment and Disposal

1.5.8 Operations and Maintenance including staffing, maintenance procedures, operating procedures for emergencies, and methods of finance.

1.5.8.1 Identify current staffing and discuss with operational staff any current needs, possible system deficiencies, and items needing improvement beyond routine maintenance.

1.5.8.2 Review existing Asset Management systems or current practices and identify possible alternatives for the Town to consider.

1.5.9 Assessment of No Action Alternative (future conditions with no action taken).

1.6 Flows and Loads, including:

1.6.1 Discussion of the general service area, plant rating, and current and future conditions in the Town. Discussion shall include a population projection discussion (growth characteristics).

1.6.2 Review existing flows and loads including septage. Develop a flow balance of users connected to the WWTF and their current water use.

1.6.3 Discussion of Compliance History

1.6.4 Estimate land use growth in the Town during the 20-year planning period. The analysis will be based on current zoning, land use, available plans, and comments from the Town.

1.6.5 Estimate existing and projected water consumption in the Town for the 20-year planning period. This estimate will be for properties served by public water supplies and private wells.

1.6.6 Project future wastewater flows and loads including septage for the 20-year planning period.

1.7 Summary of Needs

1.7.1 Outline of the elements of the Needs Assessment that will be the subject of Phase III.

The Phase 1 – Draft Needs Assessment Report will be revised based on comments from the Town.

4.2 Phase II - Alternatives Screening Analysis

This phase will identify and screen wastewater alternatives to meet the needs of the planning areas established in the Needs Assessment Report. With input from the Town, potential alternative technologies and management strategies will be screened to identify up to four alternatives including the "No Action Alternative" for further evaluation. This phase will culminate in the preparation of an Alternatives Screening Analysis Report to be submitted for DEP review and comment.

The main tasks for this phase are listed as follows:

Task 1 – Identification and Development of Alternatives

The evaluation will include the following:

- A baseline conditions alternative which will determine the level of treatment possible with optimum performance of existing wastewater collection, treatment, and disposal facilities. Included will be an evaluation of septage management, regional septage disposal options, and repair or upgrade of on-site systems within the planning area.
- Identify service area where on-site systems are inadequate.
- Identify and develop decentralized treatment options for each service area including:
    - Alternative treatment systems (PRBs, shellfish, etc.)
    - Cluster systems
    - Package wastewater treatment plants
    - Combinations of the above
- Identify and develop centralized treatment options for each service area including:
    - Improvement in operation of existing facility (baseline conditions alternative).
    - Expansion/upgrade of existing facility including nitrogen control strategies.
    - Regional solutions – identify and develop options for residuals disposal and discuss costs and environmental benefits for each. Include alternatives for reuse and contractual services for processing and disposal.
- Identify collection system alternatives for centralized and decentralized options.
- Identify flow and load reduction measures, including water conservation.

Task 2 – Screening of Alternatives

2.1. Develop an evaluation matrix screening methodology to screen the various alternatives locations and technologies for wastewater treatment and disposal, including residuals disposal. The matrix will include the following factors:

- Relative Capital Costs
- Relative Operations and Maintenance Costs
- Flexibility
- Environmental considerations including energy use and sensitive environmental receptors.
- Effluent Quality
- Regulatory Requirements
- Potential for Air Emissions/Odors
- Land Requirements
- Anticipated Public Acceptance
- Ease of Implementation
- Maintenance Requirements and Complexity of Operation

2.2. Development of Alternatives – to include “no action”, “fix it first”, and, if appropriate, consideration of innovative approaches (decentralized systems, wastewater reuse) and regional solutions. With input from the Town, up to four alternatives will be selected for further evaluation, including the “No Action Alternative”.

2.3. Submit the Draft Screening Alternatives Report to MEPA for review and comments.

2.4. Revise Draft Report based on public comments, and develop and submit Final Report to the Town.

4.3 Phase III - Recommended Plan (Completion of the CWMP)

Task 1 –Alternatives Ranking

Develop a method of ranking the alternatives which is based on the evaluation of the following:

- Significant environmental impacts;
- Monetary costs;
- Implementation capability;
- Regulatory constraints;
- Public acceptance;

- Reliability;
- Flexibility;
- Optimization of existing facilities; and
- Any other considerations deemed applicable.

Task 2 – Develop Recommended Plan

Utilizing input from the Town, develop a recommended plan. This plan will be detailed in the Comprehensive Wastewater Management Plan. The detailed description of the recommended plan will include:

- Estimated wastewater flows and loads.
- Recommended treatment processes and expected performance.
- Proposed facility and system component layouts.
- Recommended effluent disposal methods.
- Recommended residual disposal plan, as appropriate for septage, scum, grease, grit, screenings, and sludge.
- Detailed planning level capital cost estimate.
- Detailed Operation and Maintenance cost estimates.
- Recommendations for future monitoring and enforcement programs.
- Descriptions of legal/management/institutional issues and associated costs.
- Description of financing and user charge recommendations, including public and private Township, operation, and operations responsibilities.
- Recommended modifications to Town regulations, if necessary.
- A project implementation schedule for the recommended plan including detailed schedule for design and construction of wastewater facilities (or phased construction of facilities).

The Phase III – Draft Recommended Plan will be revised in accordance with Town comments.

4.4 Phase IV - Public Participation

This phase is the coordination of the public review process that proceeds throughout the whole project.

The public review process will contain items needed to properly disseminate information to the Town public. Proper public education is needed to ensure that the recommended plan will be approved by Town Meeting and by the voters in any Proposition 2½ override referendums.

The purpose of this phase is to create and coordinate a public review process which will inform project participants and the Town public, and facilitate the recommended plan's approval by Town Meeting and Town voters.

The main form of public participation for this project is expected to be periodic updates to the Sewer Commission, including a presentation when the plan is finalized. MassDEP will be notified of the date of each presentation.

State guidelines require at a minimum one Public Meeting and one Public Hearing be held for the project. Proposed meeting and hearings for the project are as follows:

- Draft Needs Assessment Report public hearing planned for January 2018.
- Draft Alternatives Screening Analysis Report public hearing planned for May 2018.
- Draft Wastewater Recommended Plan/Environmental Impact Report public hearing planned for December 2018.

4.5 Phase V - MEPA Review

This phase is the coordination of the environmental and public review process that proceeds throughout the whole project.

The environmental review process needs to follow the Massachusetts Environment Policy Act (MEPA) review process. The purpose of this phase is to create and coordinate an environmental and public review process which will inform project participants and the Town public, and facilitate the recommended plan's approval by Town Meeting and Town voters.

The approach for the environmental review process is to file the Plan of Study as an attachment to the Environmental Notification Form (ENF) document to initiate the MEPA Review Process. Subsequent environmental evaluations will be summarized in the Draft Comprehensive Wastewater Management Plan and Draft Environmental Impact Report (DCWMP/DEIR) and in the Final Comprehensive Wastewater Management Plan and Environmental Impact Report (FCWMP/FEIR).

"Special Provisions for Major and Complicated Projects" in accordance with 301 CMR 11.12 are requested from the Secretary of Executive Office of Environmental Affairs. The "Special Provision" requested involves a segmented approach to the study with much public involvement and comment in order to build a consensus for the ultimate recommended plan. The segmented approach involves the individual submittal of project documents for review and comment by the Town and regulatory agencies. All parties will have an opportunity to comment on these documents as part of the joint review process.

The main tasks of this phase are listed below:

1. Utilize the Oak Bluffs CWMP Working Group for Project Review and Public Outreach - this Working Group will be established in 2017 and will meet throughout the project to review project documents and provide project input. This group will also assist with the public participation program.
2. Establish a Stakeholder Group to serve as the Citizen Advisory Committee (CAC).

3. Prepare and conduct a public participation program.
4. Submit and coordinate the public review of the Environmental Notification Form.
5. Submit and coordinate the public review of the DCWMP/DEIR.
6. Submit and coordinate the public review of the FCWMP/FEIR.
7. Coordinate the needed public meetings and hearings to comply with State and regional regulations as well as meet the informational needs of the community.

5. Project Schedule and Costs

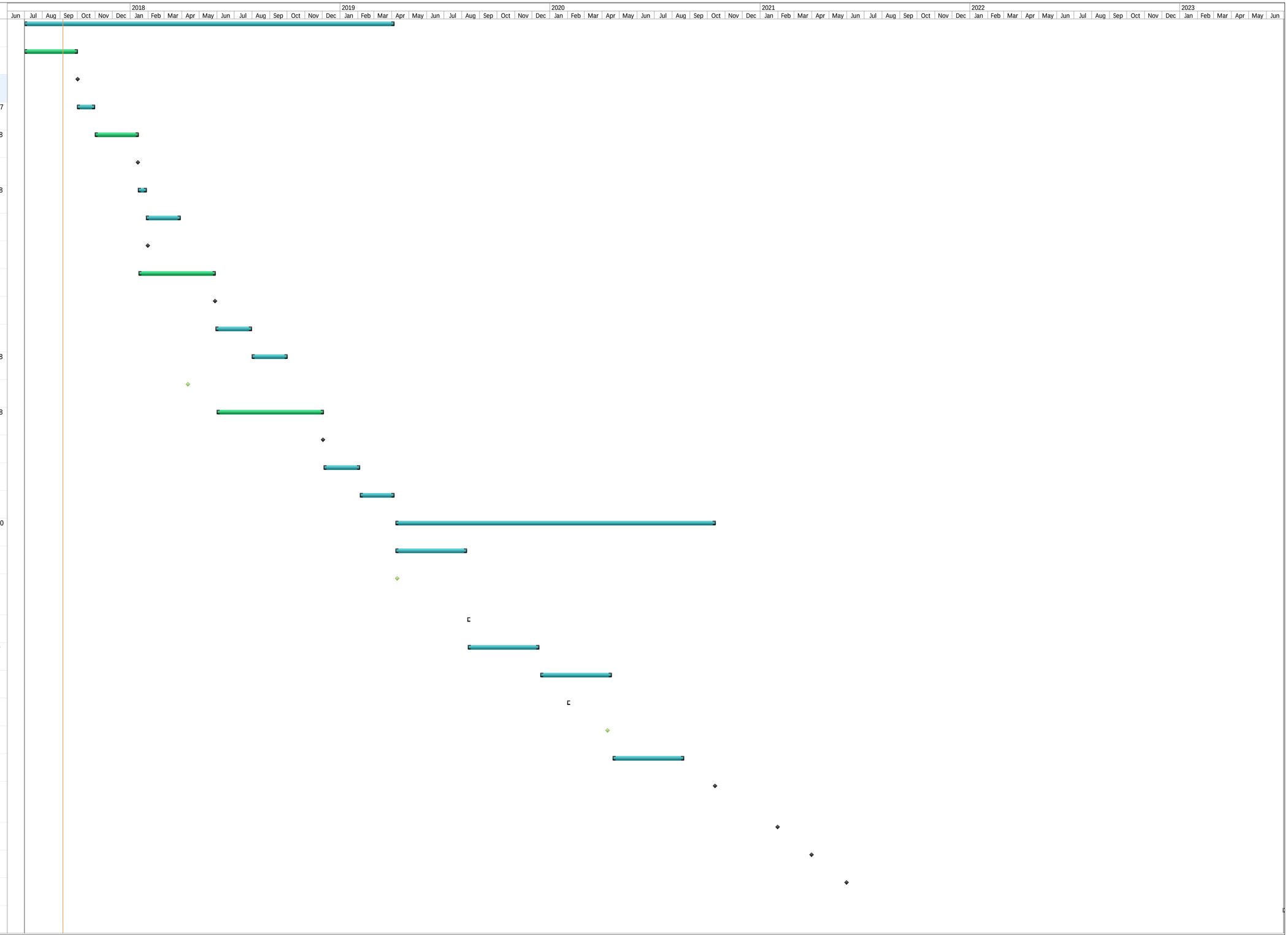
The tentative project schedule is outlined in Attachment A. The tentative schedule may vary based on the public participation component of the project.

At the 2017 Annual Town Meeting the Town allocated $350,000 for the development of the Comprehensive Wastewater Management Plan. A copy of the warrant article and the agreement for Phase 1 services is included in Attachment B.

Attachments

Attachment A
Project Schedule

ID	Task Name	Start	Finish
1	Develop CWMP	Sat 7/1/17	Fri 4/5/19
2	Prepare Plan of Study	Sat 7/1/17	Sun 10/1/17
3	Environmental Monitor Publication Date for Major and Complicated Project		Sun 10/1/17
4	ENR Review Period	Sun 10/1/17	Tue 10/31/17
5	Phase 1 - Needs Assessment Development	Wed 11/1/17	Mon 1/15/18
6	Needs Assessment Presentation to BOS/Stakeholders	Mon 1/15/18	
7	Incorporate NAR comments received into draft NAR for MEPA Review	Mon 1/15/18	Mon 1/29/18
8	MEPA NAR Review	Mon 1/29/18	Thu 3/29/18
9	DEP Intended Use Plan Issued	Thu 2/1/18	
10	Phase 2 - Alternatives Screening Analysis Development	Tue 1/16/18	Tue 5/29/18
11	Alternatives Assessment Presentation to BOS/Stakeholders	Tue 5/29/18	
12	Incorporate ASAR comments received into draft ASAR for MEPA review	Wed 5/30/18	Tue 7/31/18
13	MEPA ASAR Review	Wed 8/1/18	Mon 10/1/18
14	2018 Spring Town Meeting - Request Conceptual Design/Planning/Piloting Funding	Thu 4/12/18	
15	Phase 3 - Recommended Plan and Environmental Impact Report Development	Fri 6/1/18	Mon 12/3/18
16	Recommended Plan/EIR Presentation to BOS/Stakeholders	Mon 12/3/18	
17	Incorporation of Received Comments into Draft to be submitted for MEPA Review	Tue 12/4/18	Mon 2/4/19
18	MEPA Review Period	Tue 2/5/19	Fri 4/5/19
19	WWTF Upgrade Design	Mon 4/8/19	Thu 10/15/20
20	15% WWTF Design Development (Conceptual Design)	Mon 4/8/19	Fri 8/9/19
21	2019 Spring Town Meeting - Request Remainder of Design Funding and early date to request construction funding	Thu 4/11/19	
22	Submit SRF PEF for WWTF Construction	Sun 8/11/19	
23	30% WWTF Design Development	Mon 8/12/19	Fri 12/13/19
24	60% WWTF Design Development	Mon 12/16/19	Fri 4/17/20
25	DEP Intended Use Plan Issued	Sat 2/1/20	
26	2020 Spring Town Meeting - late date to request WWTP upgrade construction funding	Sat 4/11/20	
27	90% WWTF Design Development	Mon 4/20/20	Fri 8/21/20
28	Deadline to Submit WWTF Plans and Specifications to DEP SRF Program for Construction Funding	Thu 10/15/20	
29	Advertise Project to Bidders	Mon 2/1/21	
30	Open Bids	Thu 4/1/21	
31	Notice to Proceed Issued to Lowest Responsible Bidder	Tue 6/1/21	
32	WWTF Upgrade Construction Substantially Complete	Fri 6/30/23	



Preliminary CWMP Schedule (Minimal Float) - For Discussion Only

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Progress

Attachment B
Project Costs

MEMORANDUM

TO: WASTEWATER COMMISSION

FROM: LAURA B. JOHNSTON, TOWN CLERK

SUBJECT: ANNUAL TOWN MEETING, APRIL 11, 2017

DATE: MAY 22, 2017

The following action was taken on your articles at the captioned Town Meeting.

Article 18. A motion was made, seconded and voted unanimously to transfer from Free Cash the sum of $175,000 (One hundred seventy-five thousand dollars) and from the Wastewater Enterprise Fund Retained Earnings Account the sum of $175,000 (One hundred seventy-five thousand dollars) for a total transfer of $350,000 (Three hundred fifty thousand dollars) to the Comprehensive Wastewater Management Plan Account to fund all consultants, services and activities to support the development of said Plan.
Board of Selectmen
Wastewater Commission
Capital Program Committee
Executive Summary: This article funds the development of a Comprehensive Wastewater Management Plan which will assist Town in laying out the technical details for expansion of the current wastewater system in Oak Bluffs
Finance and Advisory Board Recommendation: 8-yes, 0-no

Article 20. A motion was made, seconded and voted unanimously to transfer from the Wastewater Enterprise Fund Retained Earnings Account the sum of $20,000 (Twenty thousand dollars) to the Wastewater Ocean Park Account to fund repairs and maintenance to the Ocean Park wastewater effluent infiltration system.
Board of Selectmen
Wastewater Commission
Capital Program Committee
Executive Summary: This article funds repairs and maintenance to the wastewater effluent infiltration system at Ocean Park. This article is recommended in the Town's Capital Improvement Program.
Finance and Advisory Board Recommendation: 8-yes, 0-no

Article 21. A motion was made, seconded and voted unanimously to transfer from the Wastewater Enterprise Fund Retained Earnings Account the sum of $100,000 (One hundred

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Appendix B
MEPA ENF Certificate

The Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
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November 22, 2017

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: Oak Bluffs Comprehensive Wastewater Management Plan
PROJECT MUNICIPALITY	: Oak Bluffs
PROJECT WATERSHED	: Islands
EEA NUMBER	: 15768
PROJECT PROPONENT	: Town of Oak Bluffs
DATE NOTICED IN MONITOR	: October 10, 2017

Pursuant to the Massachusetts Environmental Policy Act (MEPA; M.G. L. c. 30, ss. 61-62I) and Section 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that this project requires the preparation of an Environmental Impact Report (EIR).

Project Description

As described in the Environmental Notification Form (ENF), the Town of Oak Bluffs will prepare a Comprehensive Wastewater Management Plan (CWMP) to address its wastewater needs and water quality goals. The CWMP will update the Town's Facilities Plan completed in 1999 which recommended the construction of a wastewater treatment plant (WTP) to treat wastewater from 529 lots with inadequate on-site wastewater disposal options. The CWMP will address nutrient-related water quality concerns in five watersheds that were identified in reports prepared as part of the Massachusetts Estuaries Project (MEP). Total Maximum Daily Loads (TMDLs) for Total Nitrogen have been established for the Farm Pond, Sengekontacket Pond, and Lagoon Pond estuarine systems, and a draft TMDL has been prepared for the Lake Tashmoo watershed. The CWMP will evaluate wastewater treatment and other measures to reduce nitrogen in accordance with the TMDLs.

The ENF was comprised of detailed a Plan of Study for the preparation of the CWMP; it did not include supporting data or analysis. As described in more detail in the Scope, the major elements of the CWMP process will include the preparation of a Needs Assessment, an Alternatives Screening Analysis, and Draft and Final Recommended Plans. According to the ENF, the Town's intention in filing the ENF was to engage the public as early as possible in the planning process and encourage its participation throughout the planning and review stages of the CWMP. In consultation with the Town and its consultants, MEPA review of the CWMP will consist of the process outlined below. The Town may submit the documents in accordance with its own planning schedule.

- Notice of Project Change (NPC) containing the Needs Assessment;
- Draft EIR (DEIR) with the Alternatives Screening Analysis and Draft Recommended Plan; and
- Final EIR (FEIR) documenting the Final Recommended Plan.

The Needs Assessment will be subject to a 30-day review period, including a 21-day public comment period. The Certificate on the Needs Assessment will summarize the analysis presented in the document, identify any additional analyses that the Town should consider, and include a Scope for the DEIR.

Project Site

According to the 2010 Census, the year round population of Oak Bluffs is 4,527 residents, which increases to approximately 23,600 people in the summer. The WTP was constructed in 2002 and has a design (peak day) capacity of 320,000 gallons per day (gpd). The average daily flow to the facility is 100,000 gpd; the maximum monthly flow is 205,000 gpd and the peak day flow is 270,000 gpd. The WTP treats wastewater from the majority of the Town's downtown business district and approximately 15 percent of its residential properties. The treatment process consists of preliminary treatment, advanced secondary treatment for nitrogen removal using sequencing batch reactors, tertiary effluent filtration, ultraviolet effluent disinfection and effluent disposal. The average daily flow to the facility is currently 100,000 gpd. The maximum month flow is 205,000 gpd and the peak day flow is 270,000 gpd. Treated wastewater is discharged into two subsurface disposal areas. The Ocean Park subsurface disposal facility has a permitted capacity of 340,000 gpd and the permitted capacity of the sand bed effluent field adjacent to the WTP is 250,000 gpd.

According to the Natural Heritage and Endangered Species Program (NHESP), the project may occur within Estimated and Priority Habitat of rare species. The Massachusetts Historical Commission (MHC) indicated that the project may affect cultural resources listed in the Inventory of Historic and Archaeological Assets of the Commonwealth.

Permits and Jurisdiction

The project is undergoing review pursuant to Sections 11.03(5)(a)(3) and (5)(b)(1) of the MEPA regulations, because the project will likely involve the construction of sewer mains ten or more miles in length. The project may require a Groundwater Discharge Permit, a Chapter 91 License, and a 401 Water Quality Certificate from the Massachusetts Department of Environmental Protection (MassDEP). The project will require review by the NHESP and MHC because portions of the project will occur within Priority Habitat and within or adjacent to recorded archaeological sites and archaeologically

sensitive areas, respectively. It may require Federal Consistency Review with the Massachusetts Coastal Zone Management (MCZM) Office.

The project may require an Order of Conditions (OOC) from the Oak Bluffs Conservation Commission (and, on appeal, a Superseding Order of Conditions (SOC) from MassDEP). The project may require a Section 404 Permit from the U.S. Army Corps of Engineers and a National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) from the U.S. Environmental Protection Agency (EPA).

The Town will seek Financial Assistance from the Commonwealth through the State Revolving Fund (SRF). Therefore, MEPA jurisdiction is broad and extends to all aspects of the project that are likely, directly or indirectly, to cause Damage to the Environment, as defined in the MEPA regulations.

Scope

General

The CWMP should provide the data and analysis outlined in the ENF Plan of Study. I recommend that the Town consult with MassDEP's wastewater program staff during preparation of the CWMP.

Needs Assessment

The Needs Assessment should define the wastewater needs of the Town based on evaluations of existing conditions and projected wastewater flows and water quality goals, including expected permit conditions. It should identify planning areas and provide a clear discussion of wastewater and water quality issues and goals to meet future needs. It should provide demographic information about the Town and review previous planning efforts related to economic development, watershed protection, and wastewater infrastructure. It should document the planning and evaluation criteria to be used in the CWMP, including defining the planning period; defining a survey datum and reviewing existing flood information such as the Federal Emergency Management Agency's (FEMA) flood maps; describing existing and anticipated permit limits; and identifying relevant environmental and sustainability considerations such as climate change, sea level rise, greenhouse gas (GHG) emissions and water conservation principles. The CWMP should thoroughly describe and provide maps of natural resources in the planning areas, soil types, surface and subsurface hydrologic conditions, wetlands, rare species habitat and other relevant natural features.

The CWMP should provide land use and demographic analyses for existing conditions and projections for the planning year. It should describe and provide maps of all components of wastewater treatment and disposal methods, including traditional and innovative/alternative septic systems, private wastewater treatment facilities, the municipal wastewater system and sludge and septage management and disposal facilities. The CWMP should detail existing and projected wastewater flows and loads, permit requirements and compliance history and water consumption from both public and private sources.

The CWMP should analyze surface and groundwater quality, including drinking water, as it may be affected by discharges of wastewater and treated effluent. On the basis of its analysis of existing conditions, the CWMP should include projections of future water quality conditions and the condition and capacity of wastewater management facilities.

Alternatives Screening Analysis

The CWMP should provide a thorough analysis of wastewater treatment and management alternatives for meeting the goals identified in the Needs Assessment. It should assess both technological and non-structural measures.

Alternatives should be identified and evaluated on the basis of the following analysis:

- Review baseline conditions alternative that would determine the level of treatment possible by optimizing the existing wastewater collection, treatment and disposal facilities;
- Identify areas where on-site septic systems are inadequate;
- Identify and develop decentralized treatment options for planning areas where on-site septic systems are inadequate, including alternative treatment systems such as Permeable Reactive Barriers (PRB) or aquaculture, cluster systems, and package wastewater treatment facilities;
- Identify and develop centralized treatment options, including expansion/upgrade of the existing WTP to improve nitrogen removal and regional options for residuals reuse and/or disposal;
- Identify collection system alternatives for centralized and decentralized treatment, options; and
- Identify flow and load reduction measures, including water conservation

The CWMP should include a screening analysis that evaluates the options identified above and potential locations for the siting of the facilities. Factors to be considered include cost, design flexibility for handling varying loads and upgrades, environmental impacts and constraints, effluent quality, permit requirements, odor emissions, land requirements, ease of implementation and maintenance/operation requirements.

According to the ENF, at least four alternatives, including a No Action alternative, will be selected for further evaluation. The CWMP should describe the impacts and potential mitigation measures associated with each alternative.

Recommended Plan

The CWMP should detail the factors and evaluation methodology used to rank the alternatives and select a Recommended Plan. According to the ENF, alternatives will be ranked on the basis of environmental impacts, costs, implementation capability, regulatory requirements and constraints, public acceptance, reliability, flexibility, optimization of existing facilities and other considerations identified during the planning process.

The Recommended Plan should be fully described in the CWMP, including:

- Estimated wastewater flows and loads;
- Expected performance of recommended treatment processes;

- Layout of proposed facilities and system components;
- Recommended effluent disposal methods;
- Recommended residuals disposal plan;
- Detailed capital and maintenance cost estimates;
- Recommendation for future monitoring and enforcement programs;
- Legal, management and institutional issues and costs;
- Financing and user charge recommendations;
- Recommended modifications to Town regulations; and
- An implementation schedule.

The CWMP should identify all permits required to construct and maintain the Recommended Plan. It should document construction-period impacts and identify mitigation measures. The DEIR should provide this information in the form of draft Section 61 Findings for use by state permitting agencies.

Climate Change

Executive Order 569: Establishing an Integrated Climate Change Strategy for the Commonwealth (EO 569) was issued on September 16, 2016. EO 569 recognizes the serious threat presented by climate change and directs agencies within the administration to develop and implement an integrated strategy that leverages state resources to combat climate change and prepare for its impacts. The Order seeks to ensure that Massachusetts will meet GHG emissions reduction limits established under the Global Warming Solution Act of 2008 (GWSA) and will work to prepare state government and cities and towns for the impacts of climate change.

The GHG Policy and requirements to analyze the effects of climate change through EIR review is an important part of this statewide strategy. These analyses advance proponents' understanding of a project's contribution and vulnerability to climate change. I strongly encourage the Town to consider complementary approaches – such as incorporation of renewables and inclusion of low impact development in site design – which can improve the project's resiliency, reduce GHG emissions and conserve and sustainably employ the natural resources of the Commonwealth.

Adaptation and Resiliency

The CWMP should address the capacity of the wastewater collection and treatment systems under projected levels of precipitation and sea level conditions and the resiliency of the system to the effects of climate change. In developing the Recommended Plan, the Town should seek to avoid siting system components within coastal flood zones or otherwise incorporate climate change adaptation measures in the system design, to the extent feasible. The CWMP should identify design features that could increase the resiliency of the proposed infrastructure under future climate change conditions.

Greenhouse Gas Emissions

The CWMP is subject to review under the May 5, 2010 MEPA GHG Policy. The Policy requires Proponents to quantify carbon dioxide (CO_2) emissions and identify measures to avoid, minimize or mitigate such emissions. The analysis should quantify the direct and indirect CO_2 emissions

of the project's energy use. Direct emissions include on-site stationary sources, which typically emit GHGs by burning fossil fuel for heat, hot water, steam and other processes. Indirect emissions result from the consumption of energy, such as electricity, that is generated off-site by burning of fossil fuels, and from emissions from vehicles used by employees, vendors, customers and others. The Policy directs Proponents to use applicable building codes to establish a project emissions baseline that is "code-compliant." However, there is no building energy code equivalent that applies specifically to WWTFs or energy use models (such as eQUEST) designed to estimate the projected energy use of the WWTF processing energy loads.

The CWMP should review WTP designs that include high-efficiency motors that are optimized for the expected wastewater flows as an energy conservation measure. It should include a GHG evaluation of emissions from the WTP and other system components. It should establish a Base Case and an as-proposed Preferred Alternative Case along with providing the other information required by the Policy. Both the projected energy consumption and related GHG emission should be quantified for both cases. Design assumptions for the base case should be based on a typical WWTF and pump station design that meets the requirements of TR-16, *Guides for the Design of Wastewater Treatment Works*, 2016 Edition, which is commonly used as a guide for wastewater facility design in Massachusetts. The as-proposed Preferred Alternative design should include features and measures that would result in a significant reduction from the Base Case in both the consumption of grid electricity and the related GHG emissions. Measures that should be evaluated include: increasing piping sizes to reduce friction loss; use of premium efficiency pumps and motors; and use of variable frequency pump drives (VFD).

The Town should consult MassDEP's "Energy Efficiency and Renewable Energy Opportunities at Water and Wastewater Facilities" webpage[1], the Water Environment Research Foundation's *Utilities of the Future Energy Findings*[2] report published in 2014, the EPA's *Evaluation of Energy Conservation Measures for Wastewater Facilities*[3] (2010), the *Water and Wastewater Energy Management Best Practices Handbook*[4] (2010) prepared by the New York State Energy Research and Development Authority, and other resources to identify energy efficiency practices at WWTFs. For key components and systems of the WTP, the CWMP should review energy-efficient alternatives identified in the reports cited above and indicate whether the Town will adopt the measure or not, and provide a rationale for the decision. The Town should consult with MEPA staff before completing this analysis.

The CWMP should review opportunities for on-site energy generation, including biogas and solar photovoltaic (PV) systems. The Greater Lawrence Sanitary District has set a net zero energy goal that includes the use of biogas produced at the facility as fuel for a combined heat and power (CHP) plant. The CWMP should review the feasibility of using similar technology to generate energy. The CWMP should evaluate the feasibility of adding rooftop or ground-mounted solar PV to provide power for the WTP.

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[1] http://www.mass.gov/eea/agencies/massdep/climate-energy/energy/water-utilities/energy-efficiency-at-water-and-wastewater-facilities.html

[2] Available online at https://www.werf.org/a/ka/Search/ResearchProfile.aspx?ReportId=ENER6C13

[3] Available online at https://nepis.epa.gov/Exe/ZyPDF.cgi/P1008SBM.PDF?Dockey=P1008SBM.PDF

[4] Available online at https://www.nyserda.ny.gov/-/media/Files/Programs/Clean-Energy-Communities/NYSERDA-Water-Wastewater-Energy-Management-Best-Practices-Handbook.pdf

Response to Comments

In order to ensure that the issues raised by commenters are addressed, the Needs Assessment should include a response to comments received on the ENF. This directive is not intended to and shall not be construed to enlarge the scope of the Needs Assessment beyond what has been expressly identified in the Certificate. The Needs Assessment should include a copy of this Certificate and of each comment received.

Circulation

The Needs Assessment should be circulated in compliance with Section 11.16 of the MEPA regulations and copies should also be sent to the list of "comments received" below. A copy of the Needs Assessment should be made available for public review at the Oak Bluffs Public Library.

November 22, 2017
Date

Matt Beaton
Matthew A. Beaton

Comments received:

11/09/2017	Natural Heritage and Endangered Species Program (NHESP)
11/09/2017	Massachusetts Historical Commission (MHC)
11/13/2017	Massachusetts Department of Environmental Protection (MassDEP)–Southeast Regional Office (SERO)
11/13/2017	Martha's Vineyard Commission

MAB/AJS/ajs

RECEIVED
NOV 15 2017
MEPA

November 9, 2017

Secretary Matthew A. Beaton
Executive Office of Energy & Environmental Affairs
Attn: Alex Strysky, MEPA Unit
100 Cambridge Street, Suite 900
Boston, MA 02114

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

Dear Secretary Beaton:

RE: Oak Bluffs Comprehensive Wastewater Management Plan. Oak Bluffs, MA. MHC# RC.63236. EEA #15768.

Staff of the Massachusetts Historical Commission (MHC) have reviewed the Environmental Notification Form (ENF), received October 6, 2017, for the project referenced above and have the following comments. The project presented in the ENF is a planning study with no new construction proposed at this time.

The MHC proposes to review phased wastewater management projects as they are designed. Project planners should submit scaled project plans showing existing and proposed conditions to the MHC for review and comment for each phase of improvements or expansion projects, including wastewater treatment plant location(s), recharge areas, pump stations, equipment storage and materials staging areas and cross-country water and/or sewer right-of-ways. If the project requires federal funding, licensing, permits or approvals, such as use of State Revolving Fund funding administered by the Massachusetts Department of Environmental Protection, then the MHC will continue to review the project pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800) in consultation with the involved federal agencies.

Project planners should consider feasible design and locational considerations that meet the engineering requirements, while also seeking to avoid or minimize impacts to historic and archaeological properties. Project planners should consult the Inventory of Historic and Archaeological Assets of the Commonwealth for identified historic and archaeological properties. The Community-wide Archaeological Reconnaissance Survey was conducted for Oak Bluffs in 1999. The archaeological survey results should also be incorporated by project planners into ongoing project design. Proposed above-ground construction (e.g. pump stations) in historic areas should be designed to be compatible and sensitive to the historic characteristics of the surroundings. Design elements for new construction in historic areas should consider size, scale, massing, height and materials in developing the specifications, and also consider vegetative screening to minimize visual effects. The MHC encourages project planners to consult with the Wampanoag Tribe of Gay Head (Aquinnah), Oak Bluffs Historical Commission, Cottage City Historic District Commission and Martha's Vineyard Commission as project planning proceeds.

The MHC looks forward to reviewing the information requested above and to continued consultation to avoid, minimize or mitigate adverse effects to significant historic and archaeological resources.

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), and/or Massachusetts General Laws, Chapter 9, Sections 26-27C (950 CMR 71) and MEPA (301 CMR 11). If you have questions or require additional information please contact Jonathan K. Patton at this office.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc: Hans von Steiger, Oak Bluffs Wastewater Commission
Bettina Washington, WTGH(A)
DEP-SERO, BRP
Oak Bluffs Historical Commission
Anastasia Rudenko, GHD, Inc.

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

November 13, 2017

Mathew A. Beaton,
Secretary of Environment and Energy
ATTN: MEPA Office
Executive Office of Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: ENF Review EOEEA #15768 OAK BLUFFS. Oak Bluffs

Dear Secretary Beaton,

The Southeast Regional Office of the Department of Environmental Protection (MassDEP) has reviewed the Environmental Notification Form (ENF) for the proposed Oak Bluffs CWMP, located in Oak Bluffs, Oak Bluffs, Massachusetts for the proposed (EOEEA # 15768). The Project Proponent provides the following information for the Project:

The Project will result in a comprehensive Wastewater Management Plan and Environmental Impact Report for the Town. Previous wastewater planning efforts in the Town are described in further detail in the attached Plan of Study. Because the Project is a study, there is no facility or construction project planned at this time. Therefore, this document is submitted for the planning process that is proposed for the study and the Project. The project background, proposed planning process, and outline of the plan's scope is detailed in the attached Plan of Study, dated 2017.

The Town is currently forming a Citizens Advisory Committee (CAC) to oversee the details of the Project and assist in implementation. The CAC is expected to contain representation from multiple Town organizations.

The environmental review process that is proposed in the attached Plan of Study will include review of the following five (5) documents that will be prepared and submitted for review.

- **Environmental Notification Form**
- **Needs Assessment Report**
- **Alternatives Screening Analysis Report**
- **Draft Recommended Plan and Environmental Impact Report**
- **Final Recommended Plan and Environmental Impact Report**

This information is available in alternate format. Contact Michelle Waters-Ekanem, Director of Diversity/Civil Rights at 617-292-5751.
TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

Bureau of Water Resources Comments
Wastewater Management Comments: The ENF for Oak Bluffs lays out a process to complete a CWMP that follows accepted protocols. Details of any plan will be developed as the planning process proceeds.

Bureau of Waste Site Cleanup Comments
Based upon the information provided, the Bureau of Waste Site Cleanup (BWSC) searched its databases for disposal sites and release notifications that have occurred at or might impact the proposed project area. A disposal site is a location where there has been a release to the environment of oil and/or hazardous material that is regulated under M.G.L. c. 21E, and the Massachusetts Contingency Plan [MCP – 310 CMR 40.0000].

The proposed project involves a town-wide initiative to address wastewater management needs, and protect drinking water supplies and water resources. Please be advised that there are many listed BWSC disposal sites located within the proposed project area (Town of Oak Bluffs). Many of the sites have closed under the MCP, but many other disposal sites are open and require continued response actions under the MCP. A listing and discussion of each MCP site will not be presented here.

Interested parties may view a map showing the location of BWSC disposal sites using the MassGIS data viewer (Oliver) at: http://maps.massgis.state.ma.us/map_ol/oliver.php Under "Available Data Layers" select "Regulated Areas", and then "DEP Tier Classified 21E Sites". The compliance status and report submittals for specific MCP disposal sites may be viewed using the BWSC Waste Sites/Reportable Release Lookup at: http://public.dep.state.ma.us/SearchableSites2/Search.aspx

The Project Proponent is advised that if oil and/or hazardous material are identified during the implementation of this project, notification pursuant to the Massachusetts Contingency Plan (310 CMR 40.0000) must be made to MassDEP, if necessary. A Licensed Site Professional (LSP) should be retained to determine if notification is required and, if need be, to render appropriate opinions. The LSP may evaluate whether risk reduction measures are necessary if contamination is present. The BWSC may be contacted for guidance if questions arise regarding cleanup.

Bureau of Air and Waste Comments
Air Quality. Construction and operation activities shall not cause or contribute to a condition of air pollution due to dust, odor or noise. To determine the appropriate requirements please refer to:
310 CMR 7.09 Dust, Odor, Construction, and Demolition
310 CMR 7.10 Noise

Construction-Related Measures. MassDEP requests that the Proponent use construction equipment with engines manufactured to Tier 4 federal emission standards, which are the most stringent emission standards currently available for off-road engines. If a piece of equipment is not available in the Tier 4 configuration, then the Proponent should use construction equipment that has been retrofitted with the best available after-engine emission control technology, such as oxidation catalysts or diesel particulate filters, to reduce exhaust emissions. The Proponent should provide a list of the engines, their emission tiers, and, if applicable, the best available control technology installed on each piece in the subsequent environmental filing.

Massachusetts Idling Regulation. MassDEP requests that the Proponent state specifically in the subsequent environmental filing how it plans to prohibit the excessive idling during the construction period. Typical methods of reducing idling include driver training, periodic inspections by site supervisors, and posting signage. In addition, to ensure compliance with this regulation once the Project is occupied, MassDEP requests that the Proponent establish permanent signage limiting idling to five minutes or less at the completed Project.

Proposed s.61 Findings

The "Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form" may indicate that this project requires further MEPA review and the preparation of an Environmental Impact Report. Pursuant to MEPA Regulations 301 CMR 11.12(5)(d), the Proponent will prepare Proposed Section 61 Findings to be included in the EIR in a separate chapter updating and summarizing proposed mitigation measures. In accordance with 301 CMR 11.07(6)(k), this chapter should also include separate updated draft Section 61 Findings for each State agency that will issue permits for the project. The draft Section 61 Findings should contain clear commitments to implement mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation.

The MassDEP Southeast Regional Office appreciates the opportunity to comment on this proposed Project. If you have any questions regarding these comments, please contact George Zoto at (508) 946-2820.

Very truly yours,

Jonathan E. Hobill,
Regional Engineer
Bureau of Water Resources,

JH/GZ

Cc: DEP/SERO

ATTN: Millie Garcia-Serrano, Regional Director
David Johnston, Deputy Regional Director, BWR
Maria Pinaud, Deputy Regional Director, BAW
Gerard Martin, Deputy Regional Director, BWSC
Jennifer Viveiros, Deputy Regional Director, ADMIN
Brian Dudley, Chief, Wastewater Management, BWR
Allen Hemberger, Site Management, BWSC

MARTHA'S VINEYARD COMMISSION

Secretary Matthew Beaton
EOEA, Attn: MEPA Office
Alex Strysky, EOEA No. 15768
100 Cambridge Street, Suite 900
Boston, MA 02114

Dear Secretary Beaton,

The Martha's Vineyard Commission is pleased to submit staff comments regarding 15768, Comprehensive Wastewater Management Planning Study, Oak Bluffs; to develop a Town-wide plan for wastewater management for the Town of Oak Bluffs. This proposal will not be reviewed by the full Martha's Vineyard Commission for approval as a Development of Regional Impact.

The approach of seeking advance input on the proposed plan is commendable. The following staff comments address III Consistency in the ENF and then follow the order presented in Attachment 1:

- ENF part III D. Consistency with the Island Plan:
    - 1. Economic development – The CWMP should address the following relevant objectives and policies:
        - Objective D1: Preserve and reinforce the traditional settlement pattern of the Island.
            - Strategy D1-1: Limit significant new development in outlying areas.
            - Strategy D1-2: Restore and improve areas that were developed in problematic ways in the past.
        - Objective L6: Locate commercial activities appropriately and ensure that there is sufficient commercial land for future needs.
            - Strategy L6-1: Keep retail activities and visitor services concentrated in vibrant, walkable, town centers.
            - Strategy L6-2: Ensure that each town center has a full range of essential anchor businesses.
    - 2. Adequacy of infrastructure – The CWMP should address the following relevant objectives and policies:
        - Objective D2: Reduce the amount of future development, especially in environmentally sensitive areas.
            - Strategy D2-7: Extend and finance infrastructure in growth areas, and limit infrastructure connections in conservation areas.
        - Objective D4: Ensure that development and redevelopment projects are better planned and designed.

        - Strategy D4-3: Set up an equitable and cost-effective system to finance community improvements.
        - Strategy D4-4: Set up a system of mitigation fees.
    - Objective H3: Increase funding for community housing and related infrastructure and services.
        - Strategy H3-4: Provide infrastructure for community housing.
    - Objective H6: Increase the supply of housing for independent retirees, seniors, and others needing assisted living housing.
        - Strategy H6-1: Quantify and plan for future housing needs for the elderly and those requiring specialized housing.
    - Objective N10: Prepare for Climate Change.
        - Strategy N10-1: Identify lands and infrastructure most at risk to sea level rise.
        - Strategy N10-2: Limit construction in areas at greatest risk and adopt measures to limit impacts.
        - Strategy N10-4: Carry out pre-disaster mitigation to reduce impacts from storms and flooding.
  - 3. Open Space Impacts– The CWMP should address the following relevant objectives and policies:
    - Objective W2: Treat and dispose of wastewater in a manner that will support sustainable drinking water supplies and protect public health and surface water resources.
        - Strategy W2-1: Prepare a summary Wastewater Management Plan.
    - Objective W-3: Develop and implement nitrogen reduction on a watershed or Island-wide basis.
        - Strategy W3-1: Expand sewers and centralized or package wastewater treatment in higher density areas.
        - Strategy W3-2: Facilitate the installation, monitoring, and operation of cluster and individual on-site systems with advanced nitrogen removal.
        - Strategy W3-3: Set growth control regulations related to expansion of wastewater treatment.
    - Objective W5: Ensure appropriate management of coastal ponds and their watersheds, including improvements to water circulation.
        - Strategy W5-1: Complete the Mass Estuaries Project (MEP) studies of coastal ponds.
        - Strategy W5-4: Set regulations limiting nitrogen from new projects in sensitive watersheds.

- Plan of Study – 4.1 Phase I – Needs Assessment
  - 1.5.3.2 Discussion of anticipated sea level rise impacts on existing infrastructure: Note: there is much on this topic in Dukes County Multi-Jurisdiction Hazard Mitigation Plan Update 2015, including assessment and strategies. Prognosis of existing facilities vulnerable to sea level rise should be addressed.
- Plan of Study – 4.2 Phase II – Alternatives Screening Analysis
  - Task 2 – Screening of Alternatives: Evaluation should include the prognosis and maintenance alternatives regarding impacts of sea level rise. There are mitigation strategies in Dukes County Multi-Jurisdiction Hazard Mitigation Plan Update 2015 for

the existing infrastructure. Review of the impacts of sea level rise should also figure heavily in selection of alternatives for new facilities.

With the inclusion of addressing sea level rise, the Plan of Study appears to adequately outline the establishment of goals, data to be collected, and analyses to be conducted. The Town will analyze treatment options and develop a recommended plan.

MVC staff looks forward to following the development of the CWMP. MVC Water Resources Planner Sheri Caseau participated in the MEPA consultation session on October 31 and collaborated on review. She will continue to do so. Thank you for this opportunity for review and comment by MVC staff.

Sincerely,

Jo-Ann Taylor

Jo-Ann Taylor
MEPA Review Coordinator

cc: Oak Bluffs Wastewater Department

MASSWILDLIFE

DIVISION OF
FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

Jack Buckley, *Director*

November 9, 2017

Matthew A. Beaton, Secretary
Executive Office of Energy and Environmental Affairs
Attention: MEPA Office
Alex Strysky, EEA No. 15768
100 Cambridge St.
Boston, Massachusetts 02114

Project Name: *Oak Bluffs Comprehensive Wastewater Management Planning Project*
Proponent: *Town of Oak Bluffs*
Location: *Town of Oak Bluffs*
Project Description: *Comprehensive Wastewater Management Plan*
Document Reviewed: *Environmental Notification Form*
EEA File Number: *15768*
NHESP Tracking No.: *17-37219*

Dear Secretary Beaton:

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the Division) has reviewed the *Environmental Notification Form* (ENF) for the proposed Town of Oak Bluffs Comprehensive Wastewater Management Planning Project and would like to offer the following comments.

Portions of the Town of Oak Bluffs are mapped as *Priority and Estimated Habitat* for state-listed species, which are protected pursuant to the Massachusetts Endangered Species Act (M.G.L c. 131A) and its implementing regulations (MESA, 321 CMR 10.00) as well as the Massachusetts Wetlands Protection Act and its implementing regulations (WPA, 310 CMR 10.37, 10.58(4)(b) and 10.59). In addition to upland areas, the estuarine waters, ponds, streams, and lakes within Oak Bluffs provide critical habitat for a suite of state-listed species. The Division recognizes that the Proponent is undertaking a Planning Study to develop a Comprehensive Wastewater Management plan. According to the ENF, there are no facility or construction projects planned at this time. When siting projects or improvements, the Proponent should consult with the Division during early planning stages to avoid or reduce impacts within areas identified as *Estimated Habitat* and/or *Priority Habitat*.

Those projects that will occur within *Priority and Estimated Habitat* for state-listed species, which are not otherwise exempt from MESA review pursuant to 321 CMR 10.14, require a direct filing with the Division for compliance with the Massachusetts Endangered Species Act (MESA 321 CMR 10.00). The Division notes that sewer systems within ten (10) feet of the edge of existing paved roads may be exempt from MESA review, please see 321 CMR 10.14(10).

The Division will not render a final decision until the MEPA review process and associated public and agency comment period is completed, and until all required MESA filing materials are submitted by the

proponent to the Division. As our MESA review is not complete, no alteration to the soil, surface, or vegetation and no work associated with the proposed project shall occur on the property until the Division has made a final determination.

If you have any questions about this letter, please contact Amy Hoenig, Endangered Species Review Biologist, at (508) 389-6364 or Amy.Hoenig@state.ma.us. We appreciate the opportunity to comment on this project.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

cc: Anastasia Rudenko, GHD, Inc.
Oak Bluffs Board of Selectmen
Oak Bluffs Conservation Commission
Oak Bluffs Planning Department
DEP Southeast Regional Office, MEPA

Appendix C
Wastewater Treatment Facility Evaluation Final Draft Report

Town of Oak Bluffs

Wastewater Treatment Facility Evaluation
Final Draft Report

June 2017

Executive Summary

The Oak Bluffs municipal sewer system and associated Wastewater Treatment Facility (WWTF) were constructed and began operating in 2002 to serve the needs of residential, commercial, and minor industrial and institutional users located within the Town of Oak Bluffs. This facility (also known as a wastewater treatment plant) is approaching its design life and has been suspected to be nearing its capacity. Mechanical equipment at municipal wastewater facilities have design lives of 20 years and thus the Oak Bluffs WWTF is in the final five years of its design life. The State of Massachusetts Department of Environmental Protection requires evaluations of municipal wastewater facilities to be conducted every five years to monitor the status of equipment to make sure it is adequate to maintain treatment and continue to protect the public health and environment.

The primary objective of this engineering study was to determine whether the Town can now ease the restrictions that were imposed on approving new sewer system connections, or whether additional capital improvements and/or operational changes may be necessary for achieving consistent and reliable performance in accordance with the conditions of the discharge permit and the original design intent for the facility. In addition, the report shall satisfy the requirement of the current permit which requires the submission of an "engineering report, prepared by a registered professional engineer, that outlines in sufficient detail what modifications (if any) to the facility or other changes are required to insure that the facility can remain in compliance with its GWDP and other applicable requirements through the next 5 year permit term (year 2020) and beyond."

This evaluation is divided into eight sections. Section 1 provides a description of the scope of work and related information. Section 2 describes the existing wastewater facilities as well as provides a summary of influent and effluent data. Section 3 describes each unit treatment process within the wastewater infrastructure. Each process is provided with a description, evaluation based on engineering guidelines, description of operational issues, and recommendations for improvements.

Section 4 provides a summary of recommendations. This evaluation indicates that although several treatment processes are operating below capacity, other critical processes within the plant are operating at as much as 85% capacity or more. When in-plant pumping rates are considered, the filters are operating slightly higher than 100% capacity due to a lack of redundancy. When plant influent loads are considered, the SBRs appear to be operating at a level that is close to 85-90% capacity. Thus, with the most limiting process controlling the overall plant capacity, the existing facility should be considered to be at capacity. Given the current state of the facility with regard to its capacity, acceptance of additional flows and loads should be kept to an absolute minimum.

Although the results of Section 4 can be provided without regard for other wastewater issues facing the Town, this report provides recommendations in the context of other wastewater issues facing the Town so that all can be potentially addressed in the most efficient and cost-effective manner. Thus, recommendations of the report can be summarized into the following four major categories.

DRAFT

I. Studies and Verification of Flows via Minor Modifications

- Consider implementing a simple asset management system to allow for the creation of a renewal and replacement system (this is now an SRF requirement).
- Conduct an infiltration and inflow (I/I) study by December 2017 to satisfy DEP requirements.
- Pursue funding to mitigate flooding concerns at the coastal pump stations – Lake Ave, Our Market, and Dukes County Ave Pump Stations.
- Flow and load verification:
  - Effluent flow meter calibration
  - Connecting influent flow meter to the SCADA system
  - Increase sampling this summer, at a minimum

II. Plant Improvements

A series of plant improvements were identified as being needed. These are recommendations that correct immediate needs identified in the plant evaluation. It should be noted that there are some major improvements required at this facility that are best addressed in the context of whole-Town wastewater needs, if the analysis of these needs were to begin in earnest immediately via a Comprehensive Wastewater Management Plan (CWMP) effort. If a plant upgrade were to proceed as part of a CWMP effort that is initiated in FY2018 (a funding article for the CWMP passed at Town Meeting in 2017), many of the identified plant improvements are best addressed at the same time. However, delays in the CWMP process may require plant improvements to be addressed outside of the CWMP, which would be a less cost-efficient process.

III. Plant Expansion Needs

Plant expansion needs are WWTF upgrades that may be required to address nitrogen TMDLs. These would be determined through a CWMP and Targeted Watershed Management Plan (TWMP).

IV. Renewal and Replacement Needs

The existing WWTF and related remote mechanical infrastructure (pump stations) is approaching its design life of 20 years. This does not mean it will cease to function at 20 years, but a plan should be implemented to address this infrastructure as part of any plant expansion or to start a renewal and replacement program of mechanical equipment in five years. This could be done through the implementation of an asset management system, which is a requirement for communities to have as part of any future State Revolving Fund (SRF)-funded project.

Section 4 also provides estimated costs associated with some of the more defined steps outlines above.

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I. Studies and Verification of Flows via Minor Modifications Costs

Recommendation	Allowance
Consider implementing a simple asset management system to allow for the creation of a renewal and replacement system (this is now an SRF requirement).	
Pursue funding to mitigate flooding concerns at the coastal pump stations – Lake Ave, Our Market, and Dukes County Ave Pump Stations.	
Conduct an I/I study by December 2017 to satisfy DEP requirements.	
Flow and load verification • Effluent flow meter calibration • Connecting influent flow meter to the SCADA system (verify peak flows) • Add additional influent sampling for summer 2017 (min of one additional sampling time per month)	
Total	**$270,000**

II. Plant Improvements Costs

Recommended plant improvements for immediate needs are best addressed as part of a CWMP, funding for which passed at Town Meeting in 2017. It should be noted that plant improvement needs are all pressing issues that should be delayed only if a CWMP/TWMP process is initiated immediately and information on potential expansion needs is known approximately within the next fiscal year.

Some smaller items are recommended to be addressed immediately including purchasing a spare SBR pump motor and SBR PLC processor, for example, to better protect the facility against unexpected equipment failure. These costs can be addressed mostly as part of the operating budget.

III. Plant Expansion Needs Costs

The Town recently received TMDLs for multiple watersheds including Lagoon Pond and Sengekontacket Pond. A CWMP for the Town and TWMP for each watershed are recommended. Specific needs for these upgrades can only be determined once the Needs Assessment and Alternatives Evaluations for the CWMP are completed. Development of future flows is a critical aspect of this task to determine the future needs of the WWTF.

Section 6 presents some options for expansion. For planning purposes, a sample schedule for a CWMP/TWMP is shown in the following table. It should be noted that this schedule can be highly variable and would depend on Town input and ease at which a consensus can be achieved for solutions. The schedule below is based on input from the Town that at least some additional sewering is expected.

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Table ES-1 Sample CWMP/TWMP Schedule

Stage	Timeframe
CWMP/TWMP	2 years
CWMP/TWMP Implementation – Design (Phase I – Treatment Plant Expansion)	1 year
CWMP/TWMP Implementation – Bidding & Construction (Phase I – Treatment Plant Expansion)	2 years
CWMP/TWMP Implementation – Design (Phase II – Sewering)	1 year
CWMP/TWMP Implementation – Bidding & Construction (Phase II – Sewering)	2 years
Note - The actual number of phases will depend on the outcome of the CWMP/TWMP.	

It should be noted that the cost for plant expansion and associated sewering is highly dependent on the increase in flow. Plant capacity expansion costs due to additional sewering for nitrogen TMDL compliance alone could be in the range of $20 million (this value is not based on a specific plan, but is mentioned to merely provide an order of magnitude cost).

IV. Renewal and Replacement Needs Costs

The existing facility and related remote mechanical infrastructure (pump stations) is approaching its design life of 20 years. A plan should be implemented to address this infrastructure as part of any plant expansion or to start a renewal and replacement program of mechanical equipment in five years. This should be done through the implementation of an asset management system, which is a requirement for communities to have as part of any future State Revolving Fund (SRF) funded project. Any costs associated with renewal and replacement of equipment would be in addition to the costs incurred as part of the plant expansion, and these costs can be considerable when much of the plant pumps, blowers, SBR equipment, etc. will require replacement in the near future.

(continued)

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Section 7 of the report contains a suggested schedule for the above work.

Table ES-2 Suggested Schedule

Fiscal Year	Suggested Action
FY 2017	Consider implementing a simple asset management system to allow for the creation of a renewal and replacement system (this is now an SRF requirement). Conduct an I/I study by December 2017 to satisfy DEP requirements. Pursue funding to mitigate flooding concerns at the coastal pump stations—Lake Ave, Our Market, and Dukes County Ave Pump Stations. If funded, complete work. Flow and load verification: • Effluent flow meter calibration • Connecting influent flow meter to the SCADA system; verify peaks • Increase influent sampling in Summer 2017 to help verify influent design loads
FY 2018	Initiate CWMP/TWMP
FY 2019	Complete CWMP/TWMP. Initiate design of Plant Expansion including items identified under “Plant Improvements”.
FY 2020	Initiate construction of Plant Expansion.
FY 2021	Town should consider initiating a renewal and replacement program for equipment that has exceeded its life expectancy.
Note - Sewering work is not included in the schedule above.	

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Appendices

Appendix A – Inventory of Major WWTF Equipment and Process Tanks
Appendix B – Groundwater Discharge Permit
Appendix C – Basis of Design Memorandum

List of Common Acronyms

ASCE	American Society of Civil Engineers
BOD5	5-day Biochemical Oxygen Demand
CWMP	Comprehensive Wastewater Management Plan
ENF	Environmental Notification Form
EQ	Equalization
gpd	Gallons per Day
gpm	Gallons per Minute
GWDP	Groundwater Discharge Permit
I/I	Infiltration and Inflow
IBC	International Building Code
MassDEP	Massachusetts Department of Environmental Protection
mgd	Million Gallons per Day
mg/L	Milligrams per Liter
NTU	Nephelometric Turbidity Units
O&M	Operations and Management
ORP	Oxygen Reduction Potential
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control and Data Acquisition
SRF	State Revolving Fund
SRT	Solids Retention Time
TDH	Total Dynamic Head
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TOC	Total Organic Carbon
TS	Total Solids
TSS	Total Suspended Solids
TWMP	Targeted Watershed Management Plan
UV	Ultraviolet
VFD	Variable Frequency Drive
WAS	Waste Activated Sludge
WWTF	Wastewater Treatment Facility

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1. Introduction

1.1 Background

The Oak Bluffs Wastewater Treatment Facility (WWTF) was constructed and began operating in 2002. The facility was designed to provide advanced treatment of municipal sewage generated by residential, commercial, and minor industrial and institutional users of the Town of Oak Bluffs sewer system. The treated wastewater is authorized to be discharged into the ground in accordance with conditions established in a discharge permit issued by the Massachusetts Department of Environmental Protection (MassDEP).

Since startup, the Oak Bluffs WWTF has, at times, not performed up to its design expectations. In response, the Town of Oak Bluffs implemented restrictions on approving new sewer connections and began efforts to identify opportunities to provide more consistent and reliable performance through operational adjustments and capital improvements.

Since implementing the restrictions on approval of new sewer connections, the Town has implemented a number of operational adjustments and capital projects to improve performance. These include the installation of a mechanical screen and construction of a primary clarifier in 2006, and adjustments to automated controls for the Sequencing Batch Reactor (SBR) system in 2014.

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1.2 Purpose

In June 2014, the Town retained GHD to perform an engineering study to assess the current capacity and performance of the facility. The primary objective of the engineering study is to determine whether the Town can now ease the restrictions that were imposed on approving new sewer system connections, or whether additional capital improvements and/or operational changes may be necessary for achieving consistent and reliable performance in accordance with conditions of the discharge permit and the original design intent for the facility.

In addition, the report shall satisfy the requirement of the current permit which requires the submission of an “engineering report, prepared by a registered professional engineer, that outlines in sufficient detail what modifications (if any) to the facility or other changes are required to insure that the facility can remain in compliance with its Groundwater Discharge Permit (GWDP) and other applicable requirements through the next fivr year permit term (year 2020) and beyond.”

1.3 Scope

The scope of services provided by GHD in connection with this assignment included the following:

- **Task 1 – Data Analysis:** GHD analyzed historical plant performance monitoring data collected and compiled by the WWTF staff over the 67-month period of January 2009 through July 2014 to assess current influent wastewater flow and loading conditions and wastewater treatment performance.
- **Task 2 – Data Gap Identification:** Based on the results of Task 1, GHD developed recommendations for additional wastewater sampling needed for assessing the capacity and performance of the existing WWTF.

- **Task 3 – WWTF Unit Process Evaluation:** This task involved an assessment of the capacity and performance of each of the wastewater treatment and sludge handling processes comprising the WWTF.
- **Task 4 – Development of Recommendations:** Based on the results of Task 3, GHD developed recommendations for additional capital projects and/or operational adjustments for improving consistent and reliable performance of the facility in accordance with its design intent.
- **Task 5 – Report Preparation:** This task involved preparation of a formal report summarizing the findings, conclusions, and recommendations resulting from completion of the WWTF evaluation. A draft report was prepared and reviewed by representatives of the Town of Oak Bluffs. Written review comments provided by the Town were then addressed and incorporated into this final report.

1.4 Summary of Prior Reports and Projects

There have been several major projects since the wastewater treatment facility was initially constructed in 2001. These projects and related documents are briefly described below and are organized by major topics. These documents were reviewed as part of this evaluation.

- Wastewater Facilities Plan—The Wastewater Facilities Plan and the associated Environmental Notification Form (ENF) was completed in 1999. From this plan came the establishment of the wastewater collection, treatment, and disposal system. These systems were documented in the following contracts:
  - Contract No. 1 – Wastewater Collection System
  - Contract No. 2 – Wastewater Treatment Facility
  - Contract No. 3 – Wastewater Disposal System
- Preliminary Treatment – the existing treatment facility
  - Contract No. 4 – Influent Screening
- Failure of several Ocean Park subsurface beds and the implementation of a new disposal area
  - Various Ocean Park investigation documents by GHD on record at the Wastewater Department
  - Contract No. 5 – Effluent Disposal Improvements
  - Total Organic Carbon Removal (Preliminary Draft)
  - Contract No. 6 – Effluent Pump Station and Other Plant Modifications
- Additional storage
  - Contract No. 7 – Garage (Modular Construction)
- Pump Station Improvements related to Hazard Mitigation
  - Contract No. 8 – Pump Station Improvements

In addition, the Operations and Maintenance (O&M) manual for the WWTF was reviewed as well as select manufacturer O&M manuals.

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1.5 Limitations

This report has been prepared for the Town of Oak Bluffs and may only be used and relied on by the Town for the purpose established in the professional services agreement with GHD. GHD otherwise disclaims responsibility to any party other than the Town of Oak Bluffs arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the professional services agreement and are subject to the limitations described herein.

The opinions, conclusions, and recommendations outlined in this report are based on conditions encountered and information reviewed at the time when this report was prepared. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the time when the report was prepared.

The opinions, conclusions, and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by the Town of Oak Bluffs, which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD has prepared preliminary cost estimates for recommendations presented in Section 4 of this report. The cost estimates have been developed using information reasonably available to the GHD employee(s) who prepared this report; and are based on assumptions and judgments made by GHD.

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2. Existing Facilities and Data Analysis

2.1 Description of Existing Facilities

The Oak Bluffs municipal sewer system and associated WWTF were constructed and began operating in 2002 to serve the needs of residential, commercial, and minor industrial and institutional users located within the Town of Oak Bluffs. The municipal sewer system and the wastewater treatment facility were designed by the engineering firm of Wright-Pierce.

As noted in the O&M Manual prepared by Wright-Pierce, the municipal sewer system is a hybrid low pressure/gravity system. Wastewater discharged by users of the sewer system is conveyed by gravity and/or pumping to the Dukes County Avenue Pump Station where two 88 horsepower constant-speed submersible sewage pumps are installed to pump the sewage to the Oak Bluffs WWTF via a 12-inch diameter force main. Under normal operating conditions, one pump acts as a standby, ready for operation should the service pump fail to start or when preventive maintenance or emergency pump repair is necessary. According to the O&M Manual, each pump has a rated capacity of 900 gallons per minute (1.3 million gallons per day) at 128 feet of total dynamic head (TDH). In addition to the Dukes County Avenue Pump Station, several other pump stations discharge directly into the force main that conveys wastewater to the treatment facility. The pump stations that discharge directly to the plant are shown in Table 1.

Table 1 Pump Stations Discharging to the WWTF

Location/Pump Station	Flow (peak)
Dukes County Ave	900 gpm
Hospital	90 gpm
Ice Rink (includes High School flow)	125 gpm
Fire House/Elementary School	Small grinder pumps
Total	**1115 gpm (1.61 mgd)**

With all pump stations considered, the theoretical plant peak hydraulic flowrate is approximately 1.60 million gallons per day (mgd) with the rated peak flow for the facility at 1.28 according to the O&M manual.

The Oak Bluffs WWTF is located at 17 Pennsylvania Avenue in the Town of Oak Bluffs. As noted in the O&M prepared by Wright-Pierce, the facility was designed to treat up to 0.370 mgd of wastewater on a daily average basis and up to 1.28 mgd of wastewater on a peak hourly basis. In addition, according to the O&M Manual for the sequencing batch reactors, the sequencing batch reactors have a maximum daily flow of 0.320 mgd.

As originally designed, the facility provided wastewater treatment consisting of preliminary treatment (raw sewage grinding and bypass coarse 1-inch manual screening), advanced secondary treatment for nitrogen removal using sequencing batch reactors, tertiary effluent filtration, and ultraviolet (UV) effluent disinfection. The facility was permitted to discharge up to 0.34 mgd of treated wastewater to sand beds for subsurface disposal in accordance with conditions outlined in a wastewater discharge permit issued by MassDEP.

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Processing of sewage sludge generated as a result of wastewater treatment included thickening by decanting using Un-Thickened and Thickened Sludge Storage Tanks. Thickened sludge is hauled off-site for disposal on a contract basis.

Several upgrade projects have been completed since initial construction of the Oak Bluffs WWTF. In 2006, the Town retained Stearns & Wheler LLC (now GHD Inc.) to provide engineering services in connection with an upgrade project that included the following:

1. Installation of a mechanical screen to provide better protection of downstream wastewater treatment systems by providing better removal of large solids and stringy materials from the influent sewage flow.
2. Construction of a primary clarifier to remove heavy solids and floating scum from the influent sewage flow.
3. Modifications to Un-Thickened Sludge Storage Tank Nos. 1, 2, 3, and 4, including piping modifications to raise the elevation of air diffusers and replacement of un-thickened sludge transfer pumps.

In 2009, after the Town purchased property located adjacent to the wastewater treatment plant site, GHD was retained to provide engineering services in connection with the design and subsequent construction of two new effluent sand beds on the new site. Construction of the effluent sand beds was authorized in January 2011 and is now complete.

In February 2013, detailed plans and specifications were completed by GHD for an effluent pump station and other miscellaneous WWTF modifications that included the following:

1. Replacement of pressure transducers with ultrasonic level sensors for continuous measurement of sludge level in the Un-Thickened Sludge Storage Tanks.
2. Demolition of telescoping valves used for decanting sludge stored in the Thickened Sludge Storage Tanks.
3. Construction of an effluent pump station, including two submersible pumps, for pumping filtered effluent to the new sand beds constructed in 2011.

An inventory of major equipment and process tanks currently comprising the Oak Bluffs WWTF is provided in Appendix A.

Figures 1 and 2 show the location of the existing WWTF and disposal areas.

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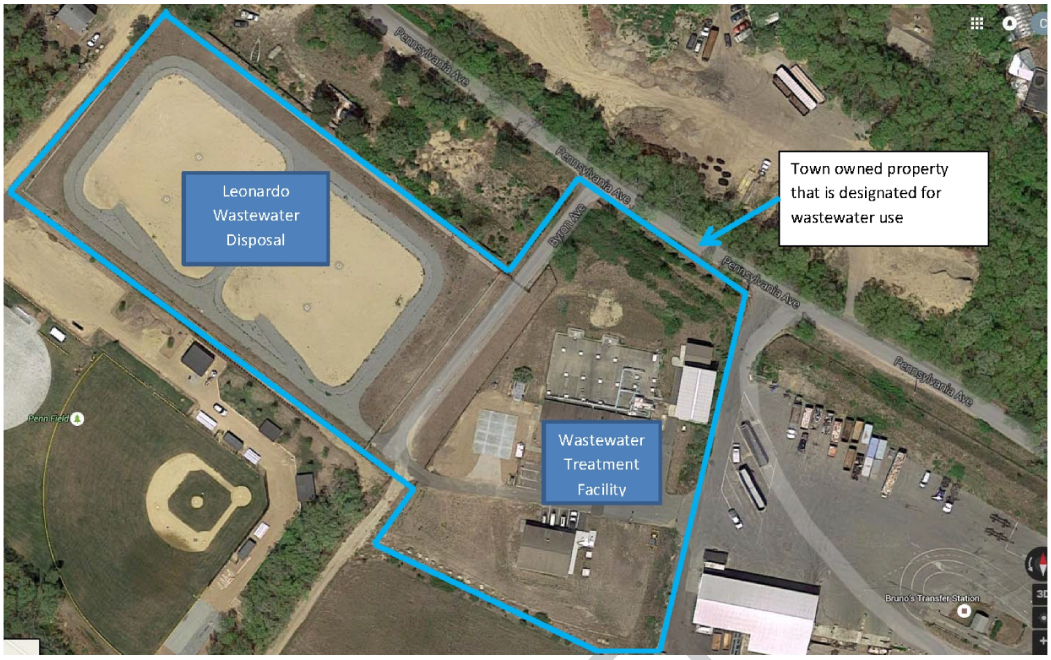

Figure 1 WWTF Site Plan

Figure 2 Ocean Park Site Plan

2.2 Effluent Limits and Performance Requirements

In July 2010, MassDEP renewed the discharge permit for the Oak Bluffs WWTF. On a maximum monthly average basis, the renewed permit authorizes discharge of up to 340,000 gallons per day of treated wastewater to the original Ocean Park Subsurface Disposal Area and up to 250,000 gallons per day to the newly acquired Leonardo Disposal Area. In total, the Oak Bluffs WWTF is currently authorized to treat and discharge up to 370,000 gallons per day on a maximum monthly average basis. Select conditions of the discharge permit are summarized in Table 2.

Table 2 Effluent Discharge Limitations

	Ocean Park Disposal Area	Leonardo Disposal Area
Flow [1]	340,000 gal/day	250,000 gal/day
Oil & Grease	15 mg/L	15 mg/L
Total Suspended Solids (TSS) [2]	30 mg/L	10 mg/L
5-Day Biochemical Oxygen Demand (BOD5) [2]	30 mg/L	30 mg/L
Total Nitrogen (daily maximum)	10 mg/L	10 mg/L
Nitrate-Nitrogen	10 mg/L	10 mg/L
Settleable Solids	0.1 mL/L	
Fecal Coliform Bacteria	200/100 mL	200/100 mL
Total Dissolved Solids (TDS)	1000 mg/L	
Turbidity		5 NTU
pH (acceptable range)	6.5 – 8.5	6.5 – 8.5

Notes:

[1] Oak Bluffs WWTF flow not to exceed 370,000 gallons per day.

[2] Monthly average concentrations of BOD5 and TSS in the discharge shall not exceed 15% of monthly average concentrations of BOD5 and TSS in the WWTF influent.

Refer to Appendix B for the complete permit.

2.3 Influent Wastewater Flows and Loadings

Historical plant performance monitoring data collected and compiled by the Oak Bluffs WWTF staff over the 67-month period of January 2009 through July 2014 were analyzed to determine current operating conditions and performance for the Oak Bluffs WWTF.

2.3.1 Flows

Daily (24-hour average) wastewater flow data recorded over the 67-month period of record are presented in Figure 3. As shown, the volume of wastewater received by the Oak Bluffs WWTF varies seasonally with greater volumes received during the summer months (June-September) when tourism is at a peak. The flow data does not indicate significant variability attributable to wet weather operating conditions. This suggests that the sewer collection system is a relatively tight system with minimal infiltration and inflow.

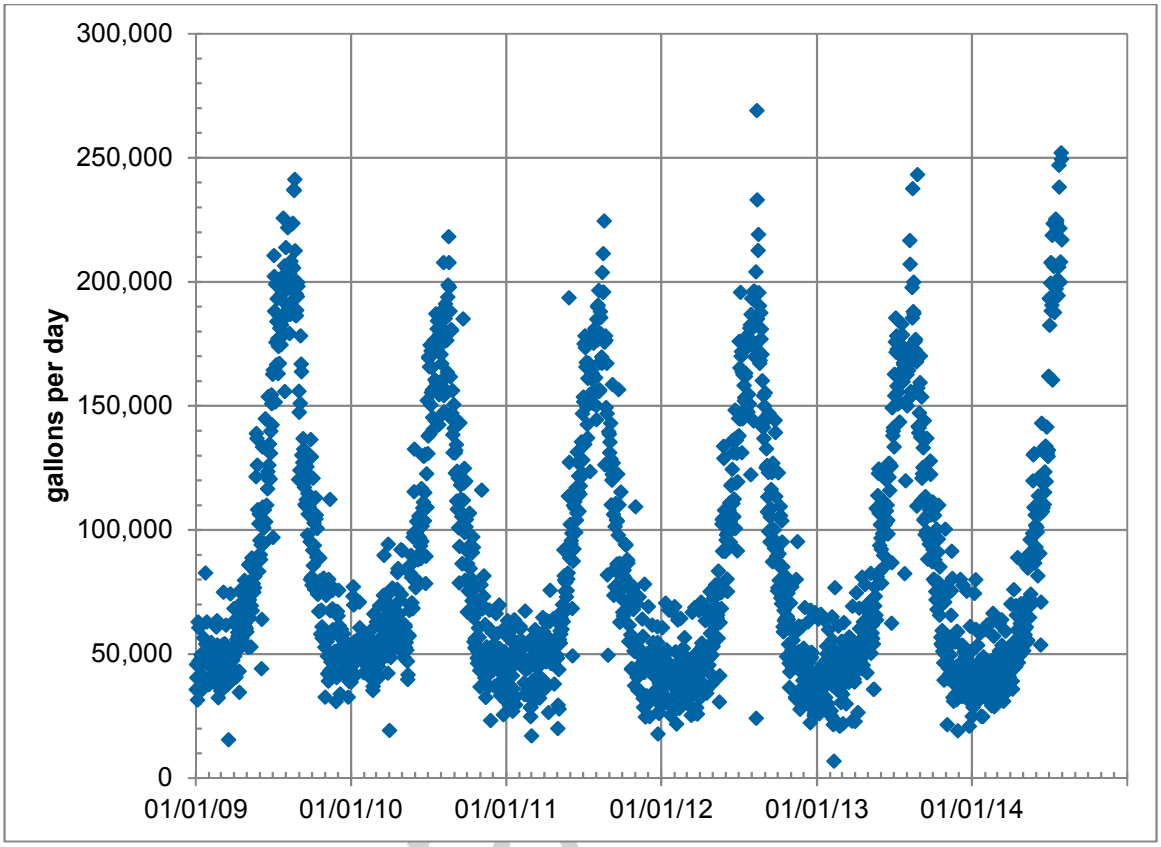

Figure 3 Daily Wastewater Flows

Table 3 summarizes minimum and maximum wastewater flows recorded over the 67-month period of record. As shown, the annual average flow has ranged from approximately 80,000 to 94,000 gallons per day and the maximum monthly (30-day) average flow recorded was approximately 204,000 gallons per day. On a maximum monthly average flow basis, the Oak Bluffs WWTF is currently operating at approximately 55% of its permitted design capacity (370,000 gallons per day).

Table 3 Wastewater Flow Data Summary

Averaging Period	Flow, gal/day	
	Minimum	Maximum
24-Hour (Daily) Average	6,886 (02/10/13)	269,032 (08/12/12)
7-Day (Weekly) Average	31,842 (02/26-03/04/11)	221,413 (08/16-22/09)
30-Day (Monthly) Average	39,711 (02/02-03/03/13)	204,235 (07/25-08/23/09)
365-Day (Annual) Average	79,933 (05/01/11-04/29/12)	94,290 (05/02/09-05/01/10)

Peak influent flows are not recorded by the Town and thus the “peak hour” flow, a design flow used for some unit process sizing, is unknown. What is known is the maximum possible flowrates that can be conveyed to the plant. According to the plant O&M Manual, each pump at the Dukes County Ave Pump Station has a rated capacity of 900 gallons per minute at a total dynamic head of 128 feet (only one pump operates while the other is a standby pump). In addition, flow from a hospital pump station (90 gpm), ice rink (including the high school (125 gpm), and in-plant recycle station (210 gpm) contribute additional hydraulic load on the facility. Based on the rated pump capacities, a peak potential influent flow from the collection system to the Oak Bluffs WWTF is approximately 1.6

mgd while this value increases to 1.91 mgd (1,325 gpm) if in-plant recycle is included. This will be further analyzed in the next section.

2.3.2 Summary of Current Flows

The plant flows can be summarized as follows:

Table 4 Plant Flow Summary

Flow	Design Flows (mgd) per Town Documents	Current Flows (mgd)
Average		100,000
Design Flow (stated design flow for treatment in SBRs only)	320,000	
Maximum Month	Not Reported	205,000
Maximum (peak) Day	370,000	270,000
Peak Hour	Not reported	TBD
Peak Potential Influent Flow (based on pumping rates at pump stations)	1,280,000	1,600,000
Peak Flow/Max Day Peaking Factor	3.5	6.0

Because of the multiple pumping systems, the peak potential flow would be unusually high as a peak flow. The Town does not have any data to allow true influent peak flows to be determined. In order to determine Peak Hour flowrates, two methods are used as follows:

Method I (use of original design peaking factor)

If the peaking factor used in design is applied to the current max (peak) day flow, the projected current peak flow would be estimated to be 945,000 gpd.

Method II (use of TR-16 peaking factors)

If the “Ratio of Extreme Flow to Average Flow” chart from TR-16 is used, the peaking factor applied to average flow of 100,000 gpd to estimate maximum day flow would be 3, which would yield a max day flow of 300,000 gpd, slightly more than the current max day flow. If the peaking factor for peak instantaneous flow is used, the chart yields a peaking factor of 5.5 which results in a flow of 550,000 gpd. Thus, the current peak instantaneous flow is estimated to be 550,000 gpd. For some processes, internal recycle should be considered at 210 gpm which would increase the peak to approximately 600,000 gpd.

Summary

Based on these two methods, it would appear that the true peak flow is currently well below the peak as determined by the peak pumping rates. Thus, the actual current peak flow that would need to be accommodated is likely to be less than 1 mgd.

Discussion

Thus, the design and current flows are shown in Table 5.

Table 5 Design and Current Flows

Flow	Design (mgd)	Current (mgd)
Average		100,000
Design Flow	320,000	270,000
Maximum Month	Not Reported	205,000
Maximum (peak) Day	370,000	270,000
Peak Hour	1,280,000	600,000 (estimated)
Peak Potential Influent Flow	1,280,000	1,610,000
Peak Potential Influent Flow/Max Day Peaking Factor	3.5	6.0

Because the actual peak flow at Dukes County Ave may be significantly lower than the pump capacity, it is highly unlikely that a sustained peak of 900 gpm would be experienced by the WWTF. It is possible that the installation of a Variable Frequency Drive (VFD) on the Dukes Pump Station pumps would keep the peak flows lower if instantaneous peak flows were determined to be an issue.

It is recommended that this method be validated by checking pump run hours or re-implementing recording of influent flows or rechecking peak effluent flows after this summer.

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2.3.2 Loads

The staff at the Oak Bluffs WWTF conduct routine sampling and laboratory analysis of the wastewater received in accordance with the monitoring and reporting requirements specified by MassDEP in the discharge permit. Sampling and analysis of the WWTF influent is performed twice per month for BOD_5, once per week for TSS, and once per month for total Kjeldahl nitrogen (TKN). Figures 4, 5, and 6 summarize concentrations reported for each parameter.

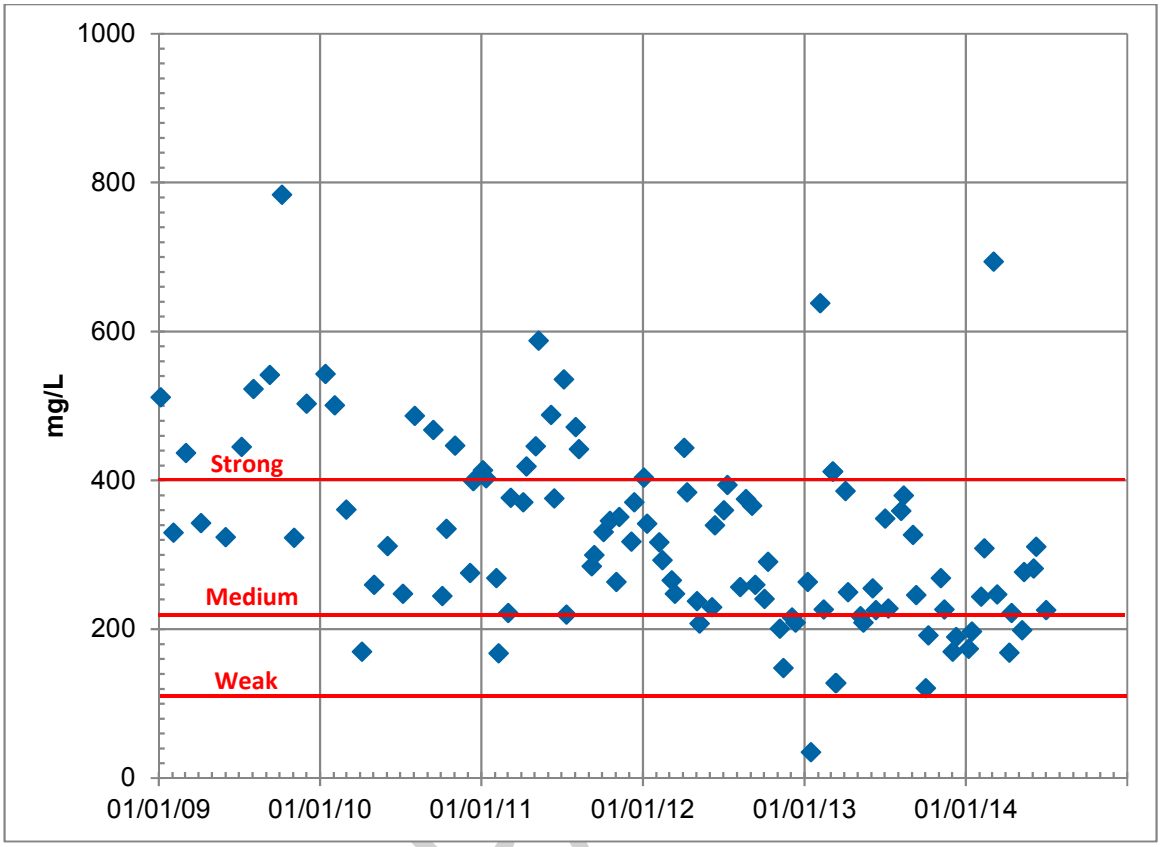

Figure 4 Influent BOD_5 Concentration

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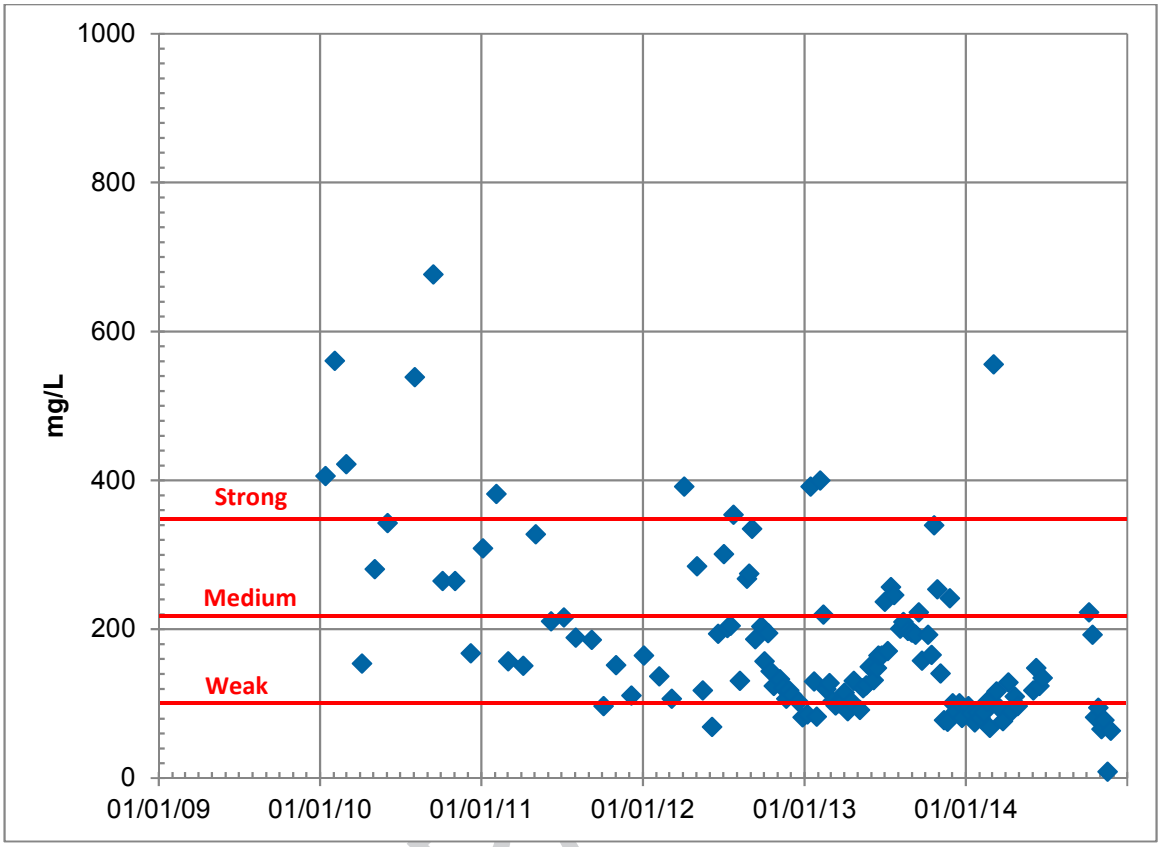

Figure 5 Influent TSS Concentration

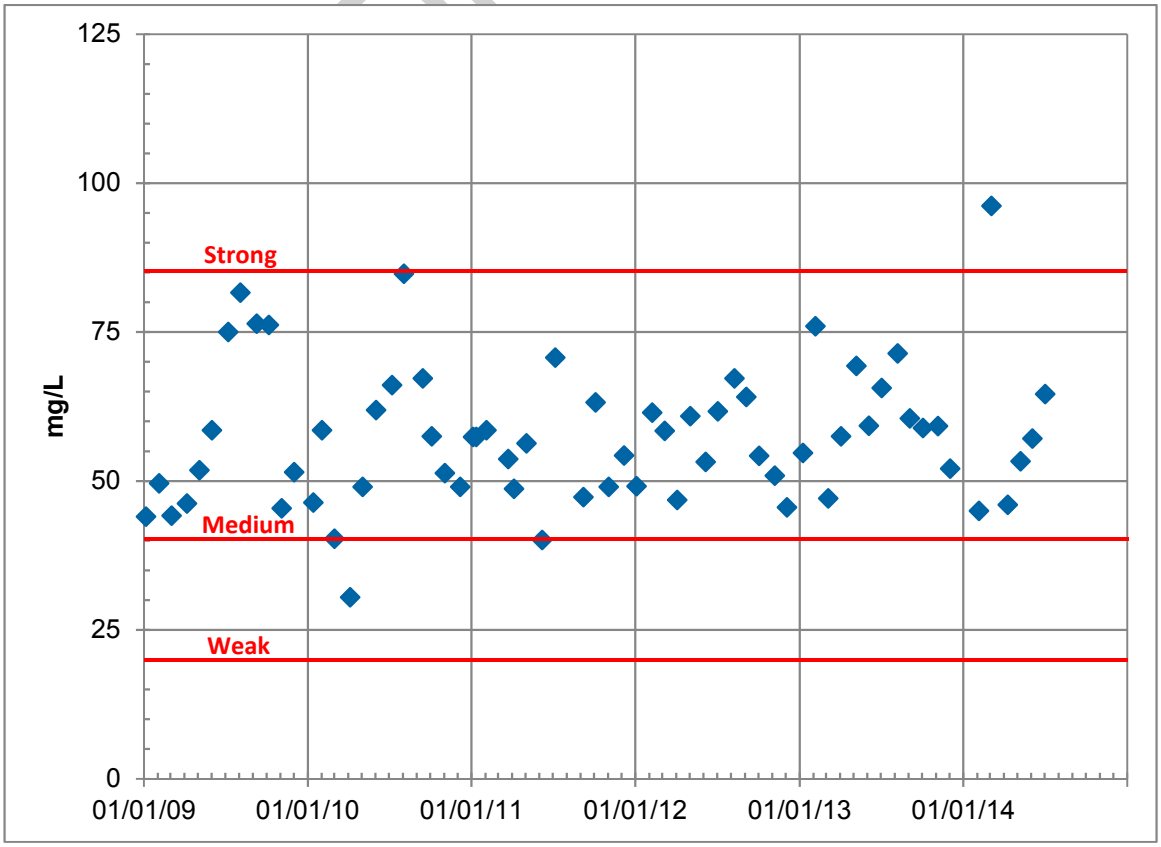

Figure 6 Influent TKN Concentration

As shown in Figures 4 and 6, influent concentrations for BOD_5 and TKN generally fall within the range considered typical for medium-to-strong domestic sewage. Influent concentrations for TSS, however, fall within the range typical for weak-to-medium strength domestic sewage. It is unclear why influent concentrations of TSS appear to be low relative to influent concentrations of BOD_5 and TKN; however, it is worth noting that laboratory analyses for BOD_5 and TKN are performed by a commercial laboratory whereas laboratory analyses for TSS are performed by the Oak Bluffs WWTF staff.

Records of sludge quantities removed from the Oak Bluffs WWTF for off-site disposal were obtained for the purpose of verifying influent wastewater characteristics. The data summarized in Table 6 indicates that 387,000 gallons of sludge were removed from the Oak Bluffs WWTF for disposal over the 12 month period of December 2013 through November 2014. The average total solids (TS) concentration of the sludge disposed was 2.5%. Based on this concentration, the amount of dry sludge solids disposed over the 12-month period was 40.27 tons, or approximately 220 pounds per day on average.

Using an annual average flow of 87,000 gallons per day, the dry sludge solids removed is equivalent to an influent concentration of approximately 300 milligrams per liter. Based on this amount of sludge, the reported influent TSS concentrations appear to be low. An influent TSS concentration in the range of 300 milligrams per liter would be considered typical for medium-to-high strength municipal sewage, which would be consistent with influent concentration data reported for BOD_5 and TKN. Review of the sample location and procedures for sample collection and handling are suggested to verify that influent TSS sampling data is representative of true WWTF influent characteristics.

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Table 6 Sludge Quantities Disposed

	Volume (gallons)	Dry Tons	Solids Conc. (% TS)
December 2013	18,000	1.39	1.85
January 2014	27,000	2.18	1.94
February 2014	9,000	0.30	0.80
March 2014	45,000	2.78	1.48
April 2014	27,000	1.47	1.31
May 2014	45,000	5.30	2.82
June 2014	36,000	3.95	2.63
July 2014	45,000	5.48	2.92
August 2014	45,000	6.08	3.24
September 2014	63,000	8.15	3.10
October 2014	9,000	1.24	3.30
November 2014	18,000	1.95	2.60
Total	**387,000**	**40.27**	**2.50**

Table 7 summarizes daily average flows and mass loads for BOD_5, TSS, and TKN recorded over the summer tourist season (June through September) and over the off-season (October through May). Review of plant records indicates that the Sequencing Batch Reactor System was originally

designed to treat a summer daily average flow of 0.32 mgd and summer daily average BOD_5, TSS, and TKN mass loads of 1,006 lb/day, 1,142 lb/day, and 136 lb/day respectively. Based on the data presented in Table 6, current summer daily average WWTF influent flow and load conditions expressed as a percentage of original design conditions are 44% for flow, 42% for BOD_5, 23% for TSS, and 57% for TKN.

Table 7 Daily Average Influent Flows and Loads (Jan 2009-Jul 2014)

	Tourist Season (Jun 1 – Sep 30)	Off Season (Oct 1 – May 31)
Flow	0.14 mgd	0.056 mgd
BOD_5 concentration	360 mg/L	334 mg/L
BOD_5 mass load	424 lb/day	156 lb/day
TSS concentration	223 mg/L	178 mg/L
TSS mass load	262 lb/day	83 lb/day
TKN concentration	66 mg/L	54 mg/L
TKN mass load	78 lb/day	25 lb/day

2.4 WWTF Effluent Characteristics

The staff at the Oak Bluffs WWTF also conducts routine sampling and laboratory analysis of the effluent discharged by the facility in accordance with the monitoring and reporting requirements specified by MassDEP in the discharge permit. Sampling and analysis of the WWTF effluent is performed twice per month for BOD_5, once per month for TSS, and twice per month for TKN, ammonia, nitrate, and total nitrogen. Daily effluent concentrations for these parameters are summarized in Figures 7, 8, 9, and 10. Observations based on analysis of the data are summarized as follows:

- As shown in Figure 7, the Oak Bluffs WWTF has generally been able to achieve effluent BOD_5 concentrations less than 10 milligrams per liter, well below the effluent limit of 30 milligrams per liter contained in the discharge permit. Effluent BOD_5 concentrations greater than 10 mg/L were reported on only six occasions over the 67-month period of record and an effluent concentration of greater than 30 milligrams per liter was only recorded on one occasion.
- As shown in Figure 8, the Oak Bluffs WWTF has generally been able to achieve effluent TSS concentrations less than 15 milligrams per liter. Review of data for the 67-month period of record identified no reported effluent TSS concentrations exceeding the maximum allowable concentration (30 mg/L) specified in the discharge permit for discharge to the Ocean Park Disposal Area. However, the maximum allowable effluent TSS concentration (10 mg/L) specified in the permit for discharge to the Leonardo Disposal Area was exceeded on nine occasions (20% of available data).
- As shown in Figure 9, the Oak Bluffs WWTF demonstrated consistent compliance with permit effluent limits for nitrate and total nitrogen. The effluent limit (10 mg/L) for total nitrogen was exceeded only once (in January 2010) and the effluent limit (also 10 mg/L) for nitrate-nitrogen was not exceeded for any of the sample data reported.

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- Although the effluent limit for nitrate-nitrogen was never exceeded over the 67-month period of record, effluent nitrate-nitrogen concentrations did exhibit significant variability considering the sequencing batch reactor system at the plant was designed to provide nitrogen removal. As shown in Figure 10, effluent TKN and ammonia concentrations also exhibited significant variability. The variability in effluent ammonia and nitrate concentrations suggest the need for better control of operational adjustments to aerobic and anoxic conditions in the SBR system.

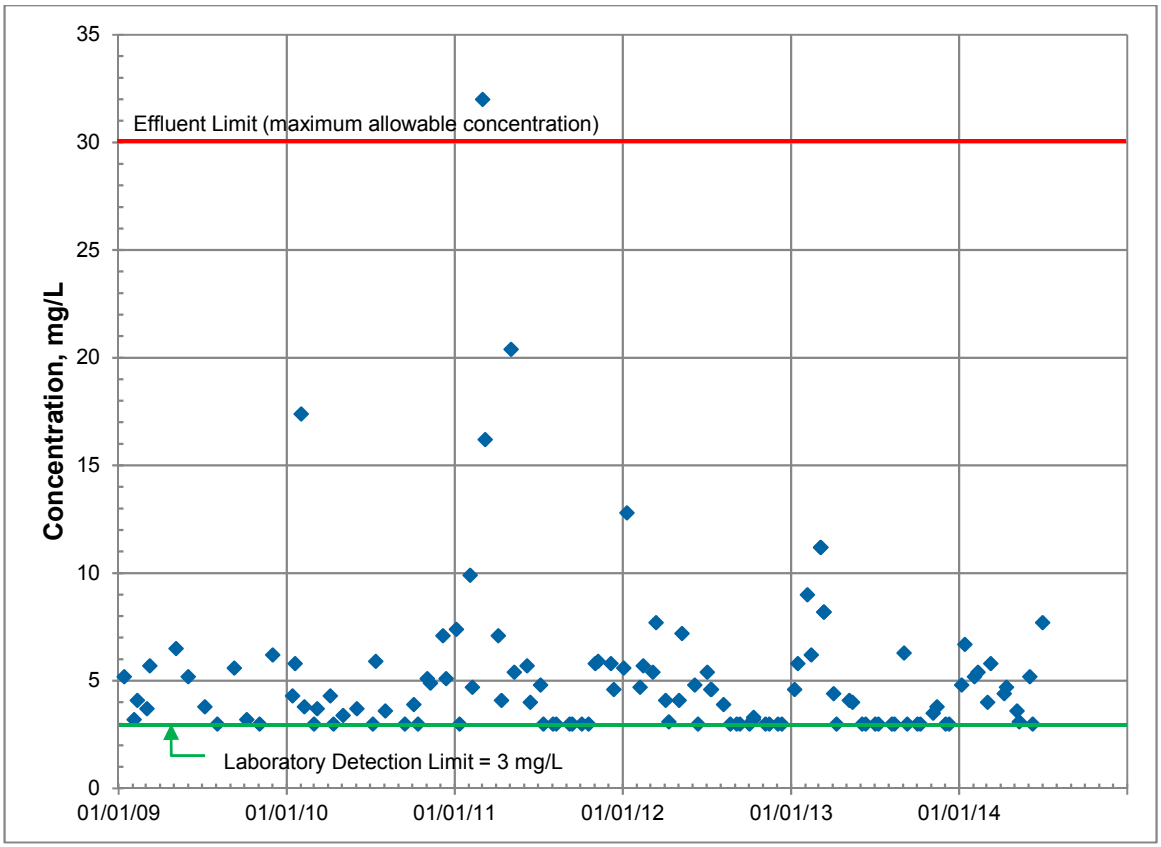

Figure 7 Effluent BOD_5 Concentration

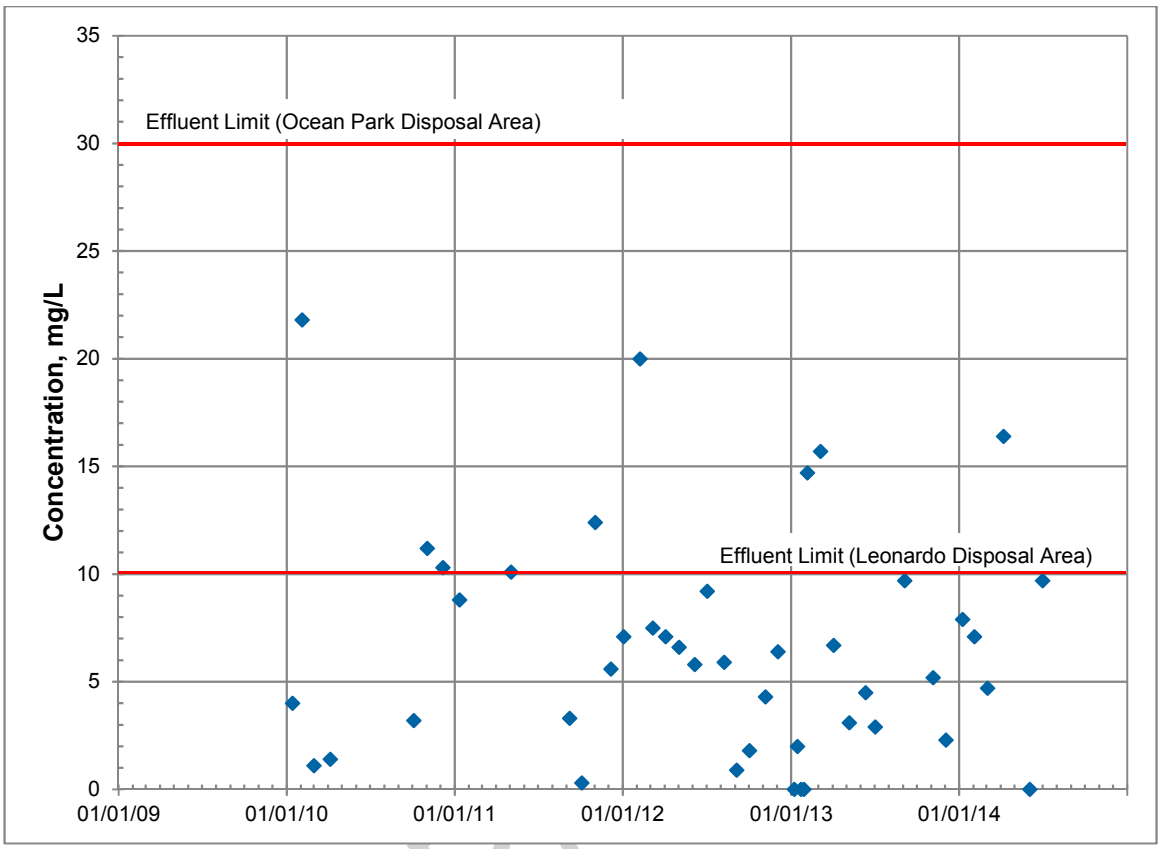

Figure 8 Effluent TSS Concentration

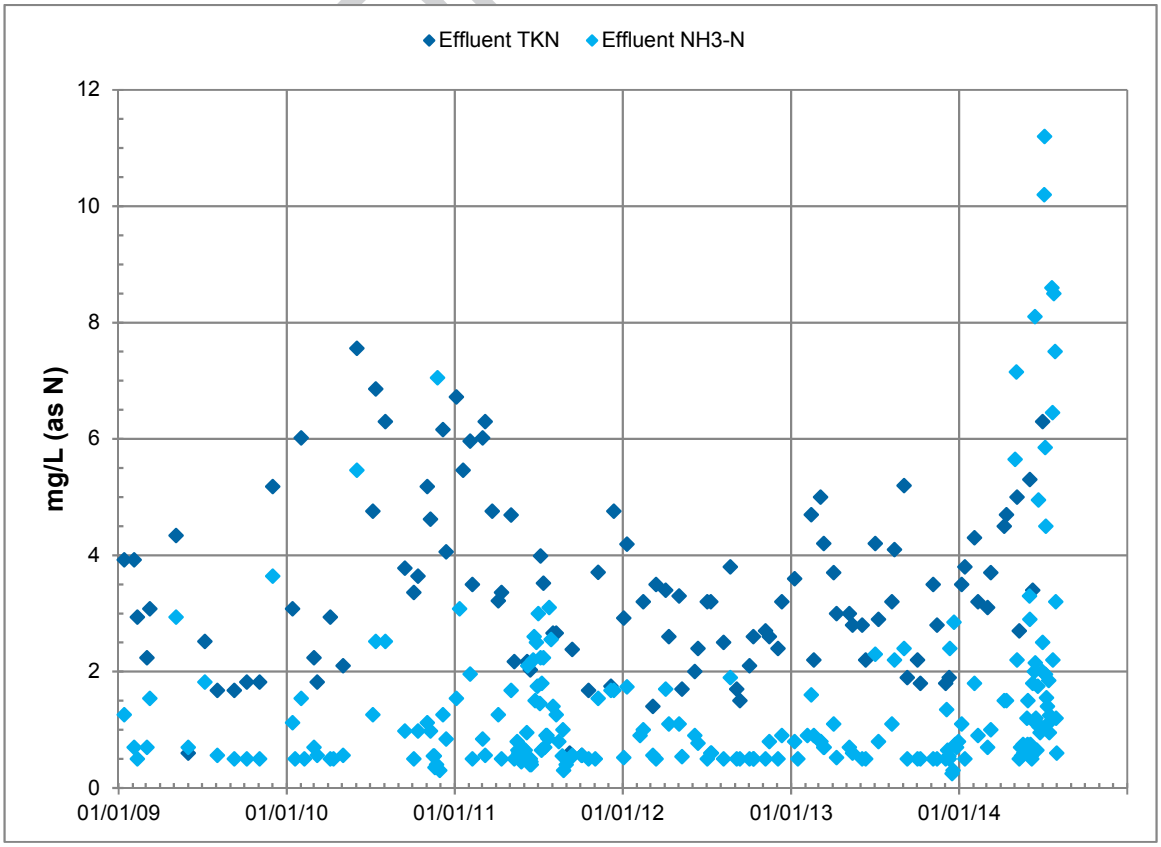

Figure 9 Effluent TKN and Ammonia Concentrations

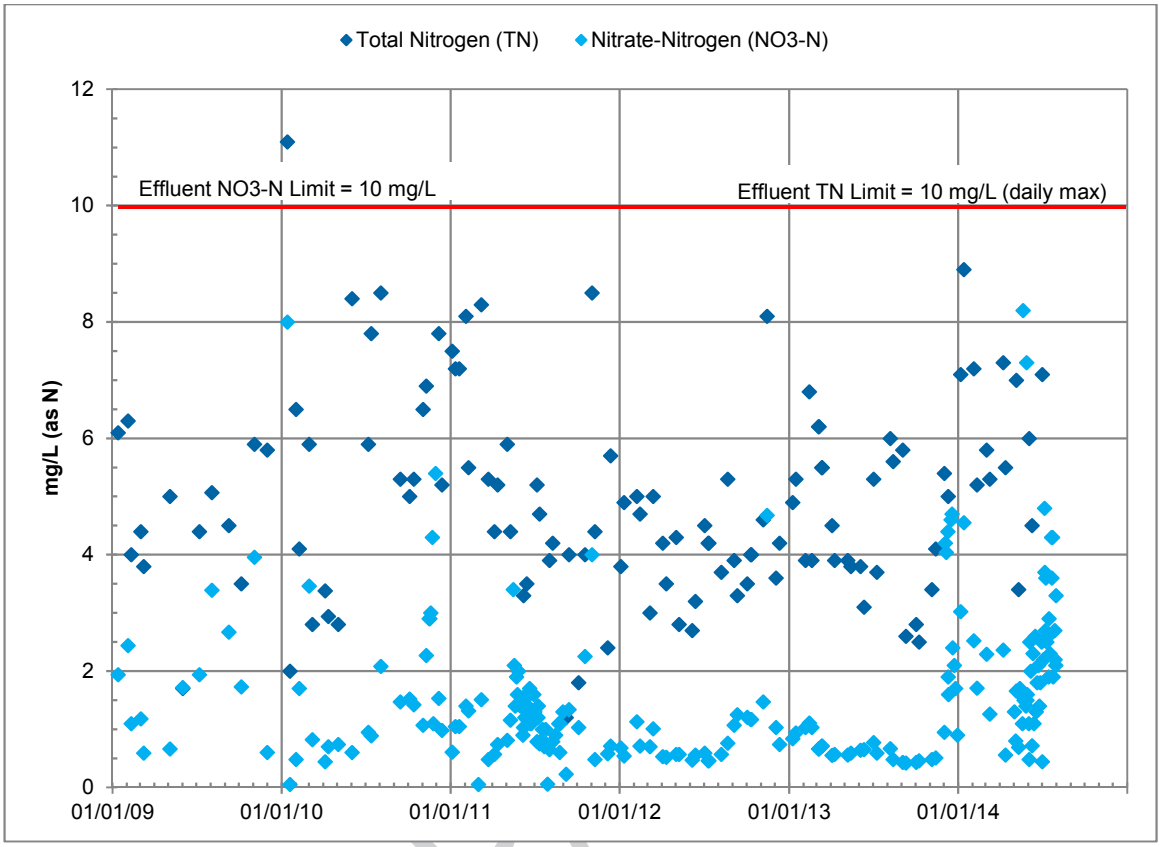

Figure 10 Effluent Nitrate and Total Nitrogen Concentrations

2.5 Additional Sampling

To assist in analyzing plant performance, GHD recommended additional sampling of the primary clarifier effluent and tertiary filter effluent to gain additional insight into overall plant performance. The additional sampling was performed over the months of October and November 2014 and the results are summarized in Table 8.

Table 8 Results of Supplemental Sampling

Parameter	Date	Concentration, mg/L (1)			
		Plant Influent	Clarifier Effluent	Filter Effluent	WWTF Effluent
BOD_5	10/06/14	283	368	<2.0	
	10/14/14	343	268	<2.0	<2.0
	11/03/14	208	229	<2.0	
	11/11/14	222	218	<2.0	
	12/01/14	269	467	<2.0	<2.0
TKN	10/06/14		69.6	1.3	
	10/14/14		65.4	3.5	4.7
	11/03/14		49.5	1.8	
	11/11/14		57.9	1.7	

Parameter	Date	Concentration, mg/L [1]			
		Plant Influent	Clarifier Effluent	Filter Effluent	WWTF Effluent
	12/01/14	54.7	60.1	1.4	1.3
Ammonia-N	10/06/14	48.9	52.2	<0.5	
	10/14/14		46.2	1.8	2.8
	11/03/14	34.2	34.6	<0.5	
	11/11/14		41.8	<0.5	
	12/01/14	39.3	39.9	<0.5	<0.5
Nitrate-N	10/06/14		0.36	0.63	
	10/14/14		0.35	0.48	0.41
	11/03/14		0.30	1.76	
	11/11/14		0.30	2.97	
	12/01/14	0.30	0.29	0.91	0.76
Nitrite-N	10/06/14		<0.020	<0.020	
	10/14/14		<0.020	0.29	0.23
	11/03/14		<0.006	0.14	
	11/11/14		<0.006	<0.006	
	12/01/14	<0.006	<0.006	<0.006	0.10
Total Nitrogen	10/06/14		70.0	1.9	
	10/14/14		65.8	4.3	5.3
	11/03/14		49.8	3.7	
	11/11/14		58.2	4.7	
	12/01/14	55.0	60.4	2.3	2.2

Notes:

[1] All samples are 24-hour time composite samples, except for filter effluent samples, which are grab samples.

The results from the supplemental sampling data indicate an improvement in SBR performance since the summer months. With the exception of the data for October 14, 2014, effluent ammonia concentration was reduced to less than 0.5 mg/L. Measurable nitrite-nitrogen concentrations were detected in samples of the filter effluent and WWTF effluent on October 14 and November 3, 2014. These results suggest incomplete nitrification in the SBR system. For all other samples, measureable concentrations of nitrite-nitrogen were not detected in the filter effluent.

Nitrate-nitrogen concentrations were reduced to the range of approximately 0.5 to 3.0 milligrams per liter in the filter effluent and WWTF effluent. Effluent total nitrogen concentrations less than 5 milligrams per liter (original SBR design intent) were recorded for all filter effluent samples analyzed.

The supplemental sampling data suggest that the primary clarifier is achieving little or no BOD_5 removal. For three of the five samples analyzed, primary clarifier effluent BOD_5 concentration was actually greater than the concentration measured in the WWTF influent. This observation might be explained by internal plant recycle flows (filter backwash from tertiary clarifiers and decant from sludge thickening).

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3. Unit Process Evaluation

3.1 Evaluation Guidelines

Wastewater and sludge treatment unit processes provided at the Oak Bluffs WWTF have been evaluated based upon current industry design practice as published in the following references:

1. New England Interstate Water Pollution Control Commission, TR-16: Guides for the Design of Wastewater Treatment Works, 2011 Edition.
2. Water Environment Federation, Manual of Practice No. 8: Design of Municipal Wastewater Treatment Plants, Fifth Edition, McGraw-Hill, 2010.

An inventory of major equipment and process tanks comprising the Oak Bluffs WWTF is provided in Appendix A.

3.2 Raw Sewage Screening

3.2.1 Description

Raw sewage is conveyed to the Oak Bluffs WWTF site by a 12-inch diameter force main from the Dukes County Avenue Pump Station where two constant speed non-clog submersible pumps (one service, one standby) are installed. According to the plant O&M Manual, each pump has a rated capacity of 900 gallons per minute at a total dynamic head of 128 feet. Additional pump stations have been added to the influent force main, and when in-plant recycle is considered, as much as 1.91 mgd may be conveyed to the facility, but the actual peak (including internal recycle) is likely closer to 0.60 mgd (per Section 2).

The 12-inch force main discharges (submerged) to an Influent Box located adjacent to the Primary Clarifier. Wastewater flow exits the influent box via a 24-inch wide channel containing an inclined cylindrical fine screen with 6-millimeter openings. The screen, which has a rated capacity to handle up to 1.73 mgd of wastewater on a peak flow basis, is self-cleaning and is designed to remove large solids and stringy materials from the wastewater flow.

3.2.2 Evaluation

The peak flow that is theoretically possible at the facility—1.91 mgd (1325 gpm)—exceeds the rated capacity of the screen, but the projected current peak hour flow of 0.60 mgd is well below the design peak for the screen of 1.73 mgd. This flow discrepancy could presumably be managed by regulating flow from one or more of the pump stations.

3.2.3 Operational Issues

None noted.

3.2.4 Recommendations

The unit is approaching 10 years old and is only halfway through its design life. Although it appears that the screen is properly sized when estimated peak hour flows are considered, there are recommendations for further confirming plant flows that should be implemented.

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If flows are added, especially as a result of additional sewering, this may require modifications to handle additional flow. In the meantime, regulation of flow within the collection system could be used to manage the potential flow discrepancy.

3.3 Primary Clarification

3.3.1 Description

After passing through the fine screen, wastewater enters the primary clarifier where the flow velocity decreases, allowing grit and other heavy solids to settle to the bottom of the clarifier. The decrease in flow velocity also allows lighter (floatable) solids to rise to the surface. A mechanical chain-and-flight collector mechanism continuously scrapes solids from the bottom of the clarifier to a sludge hopper located at the influent end of the clarifier. The primary sludge is then pumped from the clarifier sludge hopper to Un-Thickened Sludge Holding Tanks by two double disc positive displacement-type pumps.

The mechanical chain-and-flight collector mechanism also skims the surface of the clarifier moving floating solids (primary scum) to a scum collector mechanism that spans the width of the clarifier. The scum collector is manually operated to remove the accumulated primary scum from the surface of the clarifier to a wet well where submersible centrifugal (chopper-type) pumps are installed. Piping and manual valves provide operational flexibility to either return the primary scum to the influent box located upstream of the fine screen at the primary clarifier system or to pump the scum to the Un-Thickened Sludge Holding Tanks. The settled wastewater is then collected in V-notch weir troughs located downstream of the scum baffle and collector mechanism.

The primary clarifier has a bypass that can be used if the clarifier is out of service or if the clarifier is removing too much organic material such that it impacts the nitrogen removal process in the SBRs.

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3.3.2 Evaluation

Primary clarifiers are typically sized based on surface overflow rate (wastewater flow rate divided by clarifier surface area). According to TR-16, the surface overflow rate of primary clarifiers should not exceed 600 gallons per day per square feet (gpd/ft^2) of surface settling area at design average daily flow and 3,000 gpd/ft^2 at design peak flow.

The dimensions of the primary clarifier provide a surface settling area of approximately 486 square feet. Based on current operating conditions, the primary clarifier surface overflow rate is approximately 420 gpd/ft^2 at the maximum monthly (30-day) average flow 205,000 gpd and 1,300 gpd/ft^2 at the peak flow condition (0.6 mgd pumping capacity). If peak potential flow (1.9 mgd) is considered, the primary clarifier is undersized. However, the primary clarifier was not installed for BOD and TSS removal, but mainly to serve as an enhanced preliminary treatment process (the performance of the SBRs does not rely on BOD removal in the primary clarifiers).

There used to be locations where hydrogen sulfide has caused some corrosion of concrete. These areas have been addressed, but this condition should be monitored.

3.3.3 Operational Issues

A backup means of shutting off primary sludge flow is needed in the Primary Sludge Building.

A new gear is needed for the primary settling tank scum trough.

3.3.4 Recommendations

Because the SBRs were not designed with primary clarifiers upstream of them, decreased removal efficiency as a result of higher peak flows in the primary clarifiers is not seen as an issue.

The tank and equipment are approaching 10 years old and are only halfway through their design life. However, hydrogen sulfide corrosion in the tank should be monitored as well as the addition of motor operated valve on the pump discharge pipe.

However, if additional flows are added, especially as a result of additional sewering, this may require modifications to handle additional flow.

3.4 Sequencing Batch Reactor System

3.4.1 Description

Biological treatment of wastewater for BOD_5 and nitrogen removal is provided by an Omniflo® SBR system. The system was furnished by Evoqua Water Technologies (formerly U.S. Filter Jet Tech Products) and includes four SBR reactors, each equipped with an influent distributor/sludge collection manifold, jet aeration header, liquid motive pump, floating decanter, and appurtenant equipment, instrumentation, and controls for automated feed, mixing, aeration, settling, and decanting.

As designed, the system is intended to provide automated batch treatment of wastewater for nitrogen removal. According to records from construction of the WWTF, each SBR was intended to provide four batch treatment cycles per day. Each cycle was to consist of a series of five steps providing capacity to treat up to 20,000 gallons of influent wastewater over a period of 6 hours after which the treatment cycle would repeat. The five steps included in each treatment cycle are as follows:

- Fill step (90 minutes): During the fill step, wastewater (primary clarifier effluent) flows by gravity to the SBR. According to the O&M Manual, initial filling of the SBR would begin with mixing turned off. After a period of time, the system controls would turn mixing on so as to provide anoxic conditions conducive for achieving some degree of nitrogen removal (denitrification).
- React step (180 minutes): During the react cycle, air supply to the sequencing batch reactor is cycled on and off. According to available plant records, it was intended that the air supply would be on for approximately 50% of the total time in the react step.
- Settle step (45 minutes): Following the react step, mixing and aeration are turned off allowing solids to settle to the bottom of the SBR and for a clear liquid layer to form at the top.
- Decant step (20 minutes): Following settling, the decant mechanism in the SBR is used to decant the clear treated wastewater from the top of the SBR to the Flow Equalization Basin.
- Idle step (25 minutes): After decanting is complete, the SBR remains idle for a period of time during which sludge wasting is accomplished.

With all four SBR tanks in service, the system was intended to provide capacity to treat up to 320,000 gallons per day of wastewater (per the O&M manual). At this capacity, the system was designed to provide for complete nitrification (ammonia removal) down to minimum wastewater temperature of 8 degrees Celsius based on an aerobic solids retention time of eight days and a

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mixed liquor suspended solids concentration of 3,250 milligrams per liter. In addition, the system was designed with the intention that denitrification (nitrogen removal) would be provided to reduce the concentration of total nitrogen (TN) in the SBR effluent to 5 milligrams per liter, or less.

3.4.2 Evaluation

Based upon review of historical plant performance monitoring data, the peak 24-hour wastewater flow received by the Oak Bluffs WWTF was approximately 270,000 gallons per day, just slightly less than 85% of the capacity based on the cycle times described in the O&M Manual. As a result, it would appear that capacity should be available to handle some additional wastewater flow.

In addition, when loadings are considered, the facility appears to be near capacity. Because influent concentrations are comprised of limited testing (BOD is twice per month, TSS is once per month, and ammonia once per month), peaking factors were used to estimate actual loads to the SBRs. Influent loads to the SBR are estimated as follows.

Table 9 Calculation for Maximum Month and Maximum Day Loads

	BOD (Max Month)	BOD (Max Day)	TKN (Max Month)	TKN (Max Day)
SBR influent load (average summer)	420 lb/d	420 lb/d	78 lb/d	78 lb/d
Recycle Load peaking factor (using data from Section 2.5)	1.16	1.16	1.08	1.08
Weekend Factor (no data available – an allowance is used)	1.1	1.1	1.1	1.1
TR-16 Peaking Factor for Max Month and Max Day	1.26	1.6	1.24	1.4
Loading (lb/d)	675 lb/d	857 lb/d	115 lb/d	130 lb/d
Design Loading per O&M Manual	1006 lb/d	None listed	136 lb/d	None listed
Percent of Design Loads	67%	85% (based on design loading)	85%	96% (based on design loading)

When max month loads are considered, the loadings are approximately 75% of the design loads. When max day is considered, these loads are approximately 90% of the design loads. Due to the limited sampling performed on plant influent (which is as required in the permit) and the fact that sampling may not be representative of all loads (especially sludge decant and enough of a range of influent conditions), the estimated max month loads are not considered conservative enough to rely upon and thus, the current SBR loadings are likely closer to the max day loads and the estimated state of being at 85% capacity when flows are considered seems to be validated by the loading analysis.

However, plant performance monitoring data presented in Section 2 of this report, indicates that the SBR system has not produced the degree of wastewater treatment intended. Concentrations of

ammonia-nitrogen in the WWTF effluent have not been reduced to less than 1 milligram per liter on a consistent and reliable basis. In addition, concentrations of nitrate-nitrogen in the WWTF effluent have not been reduced sufficiently to consistently and reliably achieve an effluent total nitrogen concentration of less than 5 milligrams per liter. Based on discussions with the plant operators, continuing difficulties with ammonia and nitrate removal performance were encountered during the summer of 2014 and are attributed to ongoing efforts to adjust SBR cycle times to optimize performance.

GHD reported results of a survey of nine municipal wastewater treatment facilities that use sequencing batch reactor systems for nitrogen removal. The facilities were located in Maryland, Pennsylvania, and Virginia and utilized systems furnished by three different manufacturers of SBR systems. The results of the survey indicated a range of nitrogen removal performance with effluent total nitrogen concentrations varying from a low of approximately 2.5 milligrams per liter to a high of 9.5 milligrams per liter.

The facility from the survey that produced the lowest effluent TN concentration used an Omniflo® SBR System with tertiary traveling bridge sand filters similar to the Oak Bluffs WWTF and was operating at approximately 68% of design average daily flow (two-year average for 2007-2008). The performance for the similar facility indicated average effluent ammonia-nitrogen concentration of approximately 0.5 milligram per liter and effluent nitrate-nitrogen concentration of approximately 1 milligram per liter. This performance was achieved with the SBR system operated with a solids retention time of 36 days (approximately twice the design solids retention time (SRT)) and a 45%:55% split between aerobic and anoxic operating time during the “React” step.

A major finding of the survey was that SBR nitrogen removal performance was primarily associated with the degree of automated controls provided for the SBR system, and to frequent monitoring and adjustment of operating conditions to maintain solids retention time and proper aerobic:anoxic times for complete nitrification and denitrification. Supervisory Control and Data Acquisition (SCADA) system modifications were made in 2014 to provide the operators at the Oak Bluffs WWTF with greater control of SBR operating parameters. WWTF performance over the summer of 2014 suggests that the operators are continuing to become familiar with additional control adjustments provided.

Based on the information made available to GHD for this study, it does not appear that the operators monitor solids retention time as a key operating parameter for the SBR system. In addition, due to a lack of instrumentation, it is hard for the operators to track parameters that other facilities may monitor (such as SRT). Monitoring and control of SRT is important for optimizing SBR performance. This coupled with a formal process of recording operational adjustments made to the SBR system is essential to achieving stable operation and performance of the SBR system. In addition, the Town may want to consider installing additional field instruments, such as ammonia and Oxygen Reduction Potential (ORP) sensors, in each of the SBR tanks to provide additional data that may be helpful to identify further operational adjustments that may improve and stabilize nitrogen removal performance.

3.4.3 Operational Issues

The mud valves do not close. All draining is accomplished by pumping.

The Town is lacking a spare motor for the motive pump and expressed a desire to have one because of the criticality of the equipment.

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3.4.4 Recommendations

The SBRs and related equipment (blowers, pumps, etc.) are all approaching their design life in the next five years. Although this equipment should be fine for the next five years, the Town should consider replacement of some or all of this equipment after five years as it will have exceeded its design life.

The SBR process may be close to its capacity—85-90%. In reviewing plant data, it would appear that the optimization of this process should be the primary goal at this time. In order to optimize the operation of the SBR and enhance control over this process, several items are suggested as follows:

Table 10 Suggestion for Improved Operation and Control

Item	Reason
Ammonia and ORP probes	Provide information about cycles and provide better control of cycles
Additional controls such as a Waste Activated Sludge (WAS) and TSS concentration meter	To assist in calculating SRT

In addition, the mud valves need to be replaced in-kind or with another type of valve.

If additional flows are added, especially as a result of additional sewering, this may require modifications to handle additional flow.

3.5 Flow Equalization System

3.5.1 Description

A wastewater flow equalization tank is provided to dampen the rate of flow of decant from the sequencing batch reactor system. Dampening the flow rate is necessary because the SBR decanting rate (1,000 gallons per minute) exceeds the peak flow capacity of the downstream effluent filter system (540 gallons per minute – assuming one filter is out of service).

The flow equalization tank measures 6’-2” wide by 36’-4” in length. Three constant speed submersible sewage pumps are installed in the flow equalization tank for pumping the flow to the effluent filters. According to the O&M Manual prepared by Wright-Pierce, the pump controls allow for selection of either one pump or two pump operation. The third pump serves as a standby ready for service when preventive maintenance or emergency pump repair is necessary. Each pump has a rated capacity of 400 gallons per minute (576,000 gallons per day) at a total dynamic head of 20 feet. This is slightly less than the rated peak flow of the plant.

3.5.2 Evaluation

Based on the pump control levels specified in the O&M Manual, the maximum working volume of the equalization tank is approximately 16,800 gallons. This maximum working volume appears sufficient to handle the maximum decant volume (20,000 gallons) from each SBR treatment cycle with one equalization pump in service.

Based on the SBR decant system delivering 1,000 gallons per minute of flow to the equalization basin during decanting and based on one equalization pump transferring flow to the effluent filters, the water level in the equalization basin would rise by slightly more than seven feet. After decanting of the SBR ends, it appears it would take approximately 30 minutes to draw the level in the

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equalization tank back down in time for the next SBR to decant. Assuming all SBR tanks are operating on an approximate six hour cycle, that would theoretically leave approximately 40 minutes time between when the equalization tank pump turns off and the next decant cycle begins.

3.5.3 Operational Issues

The Town has reported that the equalization tanks have inadequate volume. There are times in the summer when they do not empty fast enough to allow an additional SBR to decant. It is possible that the pumps no longer pump at their design rates.

The primary issue with this tank is that real-time water levels are not known and the existing floats should be replaced with level sensors.

3.5.4 Recommendations

The primary recommendation is to install new level sensors.

Based on the peak flow, these equalization pumps are likely at capacity, but recommendations are tied to the effluent filtration system. However, it should be noted that the pumps are within five years of their design life and the Town should plan to replace this equipment after five years.

3.6 Effluent Filtration System

3.6.1 Description

Two traveling bridge filters provide tertiary treatment for removing suspended solids from the SBR effluent. As discussed in the operation and maintenance manual for the WWTF, the filters are designed to reduce the concentration of suspended solids in the sequencing batch reactor effluent to 5 milligrams per liter, or less. Effective performance of the effluent filters is necessary for proper operation and performance of downstream unit operations including ultraviolet disinfection and effluent disposal.

Each filter consists of a prefabricated steel tank containing 108 square feet of filter media. The filter bed is divided by partitions into 8-inch wide filter cells (total of 27 per filter unit) consisting of 10.25 inches of silica sand media supported by a porous plate and underdrain plenum. Sequencing batch reactor effluent is pumped from the Flow Equalization Tank. The wastewater flow to each filter is controlled by an influent weir. After passing over the influent weir the wastewater enters the filter bed area at the top. The flow then passes down through the sand media, and is collected in the underdrain plenum. The underdrain plenum for each filter cell is connected to a common filter effluent channel. The water level in the filter effluent channel is controlled by an effluent weir.

Over time, solids accumulate in the filter media increasing the head loss through the filter. Periodic backwashing of the filter is necessary to reduce the head loss and prevent overflow of the filter. Backwashing is accomplished by a traveling bridge assembly using filtered water from the effluent channel. During a backwash cycle, the traveling bridge assembly moves from one end of the filter to the other, sequentially backwashing each of the filter cells while the other filter cells remain in service. Dirty filter backwash water is collected and conveyed by gravity to a recycle pump station where it is pumped to the WWTF influent.

3.6.2 Evaluation

The capacity of traveling bridge filters is primarily determined by the filtration rate (rate of wastewater flow applied to the filter in gallons per minute divided by the filter surface). According to

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the specifications prepared by Wright-Pierce, each filter is designed to treat a daily average flow of 300,000 gallons per day and a peak hourly flow of 450,000 gallons per day. These daily average and peak hourly flow capacities correspond to filtration rates of 1.9 and 2.9 gallons per minute per square foot of filter surface area. These filtration rates meet the TR-16 recommendation of not to exceed 5 gallons per minute per square foot of filter surface area under peak hour conditions. Based on GHD's experience, these filtration rates are considered typical for tertiary treatment of municipal wastewater.

The design filtration rates, however, do not take into consideration that the constant speed equalization pumps deliver SBR effluent to the filters at a rate of approximately 400 gallons per minute (576,000 gallons per day). At this pumping rate the applied filtration rate is approximately 3.7 gallons per minute per square foot of filter surface area, which is not exceeding 5 gallons per minute per square foot of filter surface area under peak hour conditions as long as both filters are operating if two feed pumps are in use (which is a design condition in the O&M manual). When TR-16 requirements that the filters need to handle peak flow with one filter out of service are considered, the loading rate to the filters is actually nearly 7.5 gpm/sq ft, well above the TR-16 requirements.

The effluent filters are thus undersized. This, coupled with the fact that the design provides no redundancy for those occasions when a filter must be removed from service for preventive maintenance or emergency repair, may adversely impact the ability of the plant to achieve consistent and reliable compliance with the effluent TSS limit of 10 milligrams per liter required for discharge of effluent to the Leonardo Disposal Area. Plant effluent TSS concentrations reported over the 67-month period of January 2009 through July 2014 appear to support this finding.

The O&M Manual prepared by Wright-Pierce indicates that operation of the effluent filters was to be coordinated with operation of the equalization pumps. According to the manual, when operation of two equalization pumps is selected, both effluent filters should be in service. However, this is not an acceptable operational mode for effluent filters because one cannot be out of service. Based on review of the system design, GHD recommends operating both effluent filters at all times other than when preventive maintenance or emergency repairs are required.

In addition, the equalization pumps operate at full speed. As a result, this leads to a peak flow event occurring all the time when two pumps are running and a near peak event occurring when one pump runs and one filter is in service. This is a less than ideal operational mode for the filters.

3.6.3 Operational Issues

No additional issues noted. However, it was suggested that a TSS probe may prove useful in monitoring the solids levels in the effluent.

3.6.4 Recommendations

TR-16 recommends that a redundant filter for treatment plants that operate year-round, which applies to the Oak Bluffs WWTF, such that the filter system is capable of providing full capacity treatment at peak hourly flow with one unit out of service for maintenance and one filter backwashing, or at least reflecting one filter in the system in backwash mode. Thus, the facility requires at least one additional filter given the operational conditions outlined in the O&M manual, or a true coordination of the feed rate to the filter which would require additional equalization capacity. However, the type of filter that the facility needs may change in the very near future if additional portions of Town are sewered and this could also impact equalization volume. It would be prudent to consider the future filter needs when addressing the current shortcoming. In addition, this

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equipment is within five years of its design life. It should be noted that the previously discussed Flow Equalization system may need to be modified based on the changes to the filtration system.

3.7 Ultraviolet Effluent Disinfection System

3.7.1 Description

An ultraviolet (UV) disinfection system (Trojan UV 4000LF) provides inactivation of 99.9%, or more, of fecal coliform bacteria present in the effluent from the traveling bridge filters. According to the WWTF O&M manual, the system has a rated peak flow capacity of 1 mgd and was designed to reduce the concentration of fecal coliform bacteria present in the effluent to less than 14 per 100 milliliters on a maximum 30-day geometric mean basis and to less than 25 per 100 milliliters on a peak day basis.

The UV disinfection system is located in the Filter Building and consists of a single disinfection channel containing two banks of high-intensity medium-pressure ultraviolet lamps. For effective UV lamp performance, the depth of flow in the channel is controlled by a 60-degree V-notch weir. According to the O&M Manual, controls provide for automatic adjustment of UV lamp output to minimize the amount of power used while maintaining consistent and reliable compliance with the effluent limitation for fecal coliforms (200/100 mL) contained in the groundwater discharge permit issued by MassDEP for the WWTF effluent. The adjustment is made automatically based on signals provided by ultrasonic level and wastewater transmittance sensors that continuously monitor depth of flow in the channel and wastewater transmittance.

Effective performance of the UV disinfection system is predicated on effective performance of the effluent filter system. Specifically, the filtered effluent should contain no more than 5 mg/L of total suspended solids, have a turbidity of no more than 2 nephelometric turbidity units (NTU), and provide 65% transmittance, or greater, of UV light having a wave length of 253.7 nanometers.

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3.7.2 Evaluation

Based on analysis of wastewater flow and performance monitoring data, the existing UV system has demonstrated consistent and reliable performance for reducing the concentration of fecal coliform bacteria in the plant effluent to less than 200 per 100 milliliters (30-day geometric mean concentration) as required by the discharge permit issued by MassDEP. However, the system is near capacity. According to Trojan, the system is designed to treat no more than 1 mgd – its hydraulic peak. Considering the current peak projected plant flow (0.6 mgd) and equalization pump capacity (as high as 0.8 mgd), the UV system is near, but not overcapacity.

3.7.3 Operational Issues

The Town reports that the channel has a growth when the flows are low. Also, the channel cannot be taken off line.

3.7.4 Recommendations

The UV system is near its design capacity. Within the next few years, this unit will need to be replaced due to reaching its design capacity and for age-related reasons. For consistent and reliable effluent disinfection beyond that timeframe, the Town should consider planning to replace the UV disinfection system as it will be approaching the end of its useful life after five years.

3.8 Effluent Pumping and Disposal Systems

3.8.1 Description

The Town has two effluent disposal locations—Ocean Park Subsurface Disposal Area and the Leonardo Disposal Area. The disposal area design criteria are shown below:

Table 11 Design Criteria

Disposal Area	Ocean Park Subsurface Disposal Area	Leonardo Disposal Area
Type of Disposal	Subsurface	Surface (Sand Bed)
Capacity (permitted)	340,000 gpd	250,000 gpd
Loading Rate	3 gpd/sf	5 gpd/sf
Area	142,814 sf (total) 132,613 (active)[1]	50,000 square feet
Associated Pump Station	Viera Park Pump Station	Effluent Pump Station at WWTF
Pump Capacities	2 pumps at 620 gpm each	2 pumps at 400 gpm each

Notes:

1. Based on plant records, Beds D-2 and F-3 have been taken out of service and are currently unavailable for use.

Prior to 2009, a portion of the Ocean Park disposal area was suspected to have failed. Wastewater from the disposal area was suspected to have risen to ground level due to wet ground being detected. A number of beds were suspected to have compromised capacities, but as more investigations were done, only two were ultimately taken out of service. The cause of the failed beds was never determined; instead individual beds were taken offline to avoid future problems. Based on documentation, it appears that beds F-3 and D-2 are offline permanently.

The current permit for the wastewater treatment facility includes a flow rate for Ocean Park that is 30,000 gallons per day below its original design flowrate of 370,000 gpd. The permit does not restrict the use of any portion of the Ocean Park disposal area, but does have a maximum flowrate of 340,000 gpd.

In a September 23, 2009 letter from the Town to DEP, the flow reduction of approximately 30,000 gpd was documented along with the proposed remedy of shutting off the problematic beds (only Bed D-2 was mentioned in the letter, but Bed F-3 was taken offline at an earlier time). In the letter, the Town agreed to “make all necessary repairs” if the lost capacity were ever needed again.

A wet pit submersible pump station has been constructed at the site of the Oak Bluffs WWTF for pumping WWTF effluent to the new sand beds constructed at the newly permitted Leonardo Disposal site. The pump station includes two constant speed submersible centrifugal pumps. Each pump has a rated capacity of 400 gallons per minute at a total dynamic head of 40 feet.

Interconnected piping and manual valves allow the WWTF effluent to continue to be conveyed by gravity to the Viera Park Pump Station for pumping to sand beds located at the Ocean Park Disposal Site.

The Viera Park Pump Station is a submersible wet pit pump station that includes two constant speed non-clog submersible pumps. Each pump has a rated capacity of 620 gallons per minute at a total dynamic head of 28 feet.

3.8.2 Evaluation

The capacities of the two effluent pump stations appear adequate for current and design flow conditions. However, the Viera Park Pump Station and Ocean Park Pump Station are both within five years of their design life and the Town should consider a plan to address this infrastructure as the equipment begins to exceed its life expectancy in five years.

The pumps used for the Leonardo property have not been used yet; but since they are new, it is assumed there are no pressing issues with them.

As for the effluent disposal areas, the Leonardo property disposal area is new and there are no known issues with it. However, the Ocean Park disposal area has had issues in the past and several of the beds have been taken offline.

All but two beds have been in continuous operation since they were originally constructed around the year 2000. Since the two beds were taken offline, there have been no reported issues with wastewater rising to the ground surface. Thus, it would seem that the only known issues lie with the two beds that have been taken out of service.

There are many potential causes for these two beds to have failed including one or more of the following issues: leaking valves, inconsistent elevations for the distribution network, construction of individual beds, subsurface material in and around the beds. One or more of these issues could have caused the individual beds to become hydraulically overloaded.

There are several potential remedies for the Ocean Park disposal area. These include:

1. Additional investigation of the condition of the D, E, and F beds and further investigation into the distribution network. This has unknown findings and could lead to replacement of several beds and improvements to the distribution.
2. Rehabilitate the two beds that have been taken offline and investigate the distribution network for these beds to try to remedy any potential imbalance in distribution; in addition, valve replacement may be needed as well as the addition of control devices to help show valve failures (and connection to the plant SCADA system is also recommended).
3. Request permission from the State to reactivate the two beds that were taken offline to run as a trial. The plan would consist of adding valves to each bed to allow it to be shut off manually if needed. If successful, this may also include valve replacement and the addition of control devices to help show valve failures (and connection to the plant SCADA system).

The first option seems to be unnecessary given that since beds F-3 and D-2 have been offline, the disposal area has had no operational issues. Proceeding with Option 3 would be the least costly, but it is unknown if the state would allow this option given the record that each bed has failed and may be clogged with dead bacteria.

3.8.3 Operational Issues

No additional issues were noted.

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3.8.4 Recommendations

The recommendations have to do with bringing the capacity of the Ocean Park disposal area back to its original design of 370,000 gallons per day to optimize effluent disposal capacity. It would seem prudent to proceed with Option 3, but to be prepared to proceed with Option 2 if Option 3 is not acceptable to the State.

However, it should be noted that the pumps and mechanical equipment are within five years of their design life and the Town should plan to replace this equipment at least as the design life ends around year 2020. However, if additional flows are added, especially as a result of additional sewering, this may require modifications to handle additional flow.

3.9 Sludge Storage System

3.9.1 Description

The sludge processing system at the Oak Bluffs WWTF includes four Un-Thickened Sludge Storage Tanks and two Thickened Sludge Storage Tanks. Primary sludge from the primary clarifier and waste activated sludge from the sequencing batch reactors are pumped to Un-Thickened Sludge Storage Tanks.

A sluice gate is installed in the wall separating Un-Thickened Sludge Storage Tanks No. 1 and 2 allowing the operators to remove either tank from service during periods of low sludge production. During periods of peak sludge production, the sluice gate is opened allowing Un-Thickened Sludge Storage Tanks No. 1 and 2 to be operated as a single tank. Un-thickened Sludge Storage Tanks No. 3 and 4 are similarly designed with a sluice gate to isolate the two tanks allowing either tank to be removed from service when necessary.

Submersible pumps are installed in Un-Thickened Sludge Storage Tanks No. 1 and 3. These pumps are used to transfer the blended sludge to Thickened Sludge Storage Tanks No. 1 and 2. Thickened Sludge Storage Tanks No. 1 and 2 were originally equipped with telescoping valves. The valves were intended to be used by the operators to reduce the volume of sludge to be disposed. Sludge thickening was to be accomplished by manually lowering the telescoping valves to decant relatively clear supernatant from the surface of the tanks following a period of quiescent settling with the air supply to the tanks turned off. The telescoping valves, however, experienced chronic leaking and were difficult to maintain. As a result, the telescoping valves were demolished during the Influent Screening and Primary Clarifier Upgrade project. Sludge thickening is currently accomplished by the operators using a submersible pump that is manually lowered into the tank.

Thickened sludge is periodically pumped from the Thickened Sludge Storage Tanks to tanker trucks and hauled off-site to another municipal wastewater treatment facility for further processing and disposal.

Most of the equipment will be at its design life in year 2020.

3.9.2 Evaluation

Upon review, the capacity of the sludge processing facilities appears adequate to meet current and design flow and load conditions.

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3.9.3 Operational Issues

The unthickened sludge pumps have presented operational problems to the operations staff, especially with scum and fully dewatering the tank.

In addition, there are issues with the level sensors in these tanks and these should be replaced in full.

Also, the primary sludge valves in the unthickened sludge tanks present operational issues and should be relocated to a separate vault.

3.9.4 Recommendations

Level sensors should be replaced.

It is recommended that a separate vault be constructed to house the primary sludge valves.

It should be noted that the rest of the mechanical equipment is within five years of its design life and the Town should plan to replace this equipment at least as the design life ends around year 2020. However, if additional flows are added, especially as a result of additional sewering, this may require modifications to handle additional flow.

3.10 Process Drainage and Recycle Stream Pump Station

3.10.1 Description

A Recycle Stream Pump Station located to the east of the Operations Building collects the following flows and returns such flows back to the influent force main upstream of the Primary Clarifier using two Recycle Stream Pumps (RP-1 and RP-2), each having a capacity of 210 gpm.

- Drainage from SBR Tanks, Unthickened Sludge Tanks, and Thickened Sludge Tanks via mud valves in each tank. Drainage from each tank is connected to a common 8-inch pipe that brings the flow to the Recycle Stream Pump Station.
- Supernatant decanted from the Thickened Sludge Tanks using telescoping valves via an 8-inch pipe.
- Filter backwash from the Filter Building and emergency overflow from the UV Channel in the Filter Building via an 8-inch pipe.
- Plumbing drains from the Operations Building via a 4-inch pipe.
- Floor drains from the Filter Building via a 3-inch pipe.
- Splash pad drain from the Sludge Loading Area.

3.10.2 Evaluation

Recycle flow is currently being returned as a slug load back to the head of the plant, which has a high potential of overloading the treatment processes. It is recommended that recycle flow be introduced at a steady pace.

3.10.3 Operational Issues

The flap valve in the wet well can stay open at times and needs to be fixed. A pinch valve may address this problem.

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3.10.4 Recommendations

The recycle at the plant should re-introduced to the treatment facility at a slower rate. This will require additional equalization capacity as well as new pumps.

Add a pinch valve to the building drain line to prevent flap valve from getting stuck open.

In addition, it should be noted that the rest of the mechanical equipment is within five years of its design life and the Town should plan to replace this equipment at least as the design life ends around year 2020. However, if additional flows are added, especially as a result of additional sewering, this may require modifications to handle additional flow.

3.11 Chemical Feed Facilities

3.11.1 Description

The chemical feed facilities at the WWTF include caustic soda, sodium hypochlorite, and sodium hydroxide (caustic). These facilities consist of the following:

1. Alkalinity (soda ash) Feed System

The alkalinity system consists of a room on the first floor which is used to break 50-lb bags of soda ash so that it may be conveyed to the 1,500 gallon storage/mix soda ash tank on the floor below. The soda ash system is used to replace alkalinity that is consumed in the nitrification process.

2. Caustic Soda Feed System

The Caustic Soda Room on the first floor is used to store 55-gallon drums of caustic soda (sodium hydroxide) for use with the odor control scrubber in the basement. The solution is added to the scrubber by gravity.

3. Alkalinity (soda ash) Feed System

Two 500-gallon sodium hypochlorite tanks are located in the basement of the Operations Building. This system has two chemical feed pumps that were taken from another chemical feed system on the site.

3.11.2 Evaluation

The various chemical feed systems are evaluated as follows:

1. Alkalinity (soda ash) Feed System

This process is not in use. It can only run in manual since the flow detection system is no longer connected to the alkalinity addition system.

2. Caustic Soda Feed System

This system is located in a room on the first floor. This area should be in a dedicated area with containment. If major changes are made to the facility, this system should be set up in a segregated area.

3. Sodium Hypochlorite Feed System

This system is in a containment area, but the original pump shave failed and pumps from other systems are in use. The pumps for this system will require replacement.

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3.11.3 Operational Issues

None noted

3.11.4 Recommendations

In the short-term, sodium hypochlorite feed pumps will be needed. If alkalinity is ever needed, the system should be tied to the SCADA system. Otherwise changes related to providing containment for two of the systems would be a longer term improvement that is recommended if major changes are made.

In addition, it should be noted that the mechanical equipment is within five years of its design life and the Town should plan to replace this equipment at least as the design life ends around year 2020. However, if additional flows are added, especially as a result of additional sewering, this may require modifications to handle additional flow.

3.12 Odor Control Facilities

3.12.1 Description

The Town has two odor control systems. One system is a scrubber located in the basement. This system primarily collects air from the SBRs and sludge holding tanks. Air from the primary clarifier headspace is also conveyed to the scrubber. In addition, the facility has an activated carbon unit.

3.12.2 Evaluation

Without having any test data to show where odorous air migrates to, the only test for the need for more odor control is to consider the number of odor complaints, and there have been few odor complaints.

3.12.3 Operational Issues

An automated means of removing water from an outside sump is desired to maintain odor control at the primary clarifiers on a consistent basis.

3.12.4 Recommendations

Providing a basic pump to dewater the odor control drain line is recommended.

In addition, it should be noted that the mechanical equipment is within five years of its design life and the Town should plan to replace this equipment at least as the design life ends around year 2020. However, if additional flows are added, especially as a result of additional sewering, this may require modifications to handle additional flow.

3.13 Potable Water Booster Facilities

3.13.1 Description

The town has a single potable water booster system. The skid mounted package system consists of backflow preventer, meter, hydrocumulator tank, and two booster pumps and control panel. The system design capacity is 120 gpm at 50 psi with 25-40 psig suction pressure. This system is used to provide process water throughout the facility.

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3.13.2 Evaluation

Outside of being within 5 years of its design life, there are no known issues with this pumping system.

3.13.3 Operational Issues

None noted.

3.13.4 Recommendations

It should be noted that the mechanical equipment is within five years of its design life and the Town should plan to replace this equipment at least as the design life ends around year 2020. However, if additional flows are added, especially as a result of additional sewering, this may require modifications to handle additional flow.

3.14 WWTF Site Issues

The only site issue that was noted was that pavement is needed at the new Garage area.

3.15 Off-Site Pump Stations

3.15.1 Description

The Town has five major raw sewage pump stations as well as hundreds of grinder pump stations located throughout Town. The main raw sewage pump stations are listed below and are shown diagrammatically in Figure 11.

- Dukes County Ave
- Lake Ave
- Our Market (Bath House)
- Ice Rink
- Hospital

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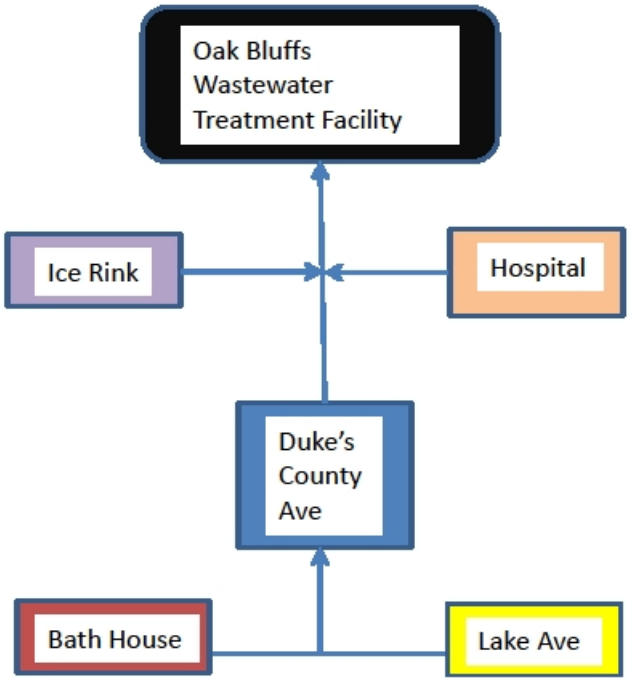

Figure 11 Main Raw Sewage Pump Stations

The Dukes County Ave, Lake Ave, and Our Market Pump Stations were all constructed around year 2000. The lone modifications to these stations were made in 2015 when an emergency generator and platform was constructed. This generator provides emergency power for both Dukes County Ave and Lake Ave pump stations. The work was funded through a grant from the Massachusetts Coastal Zone Management agency as a hazard (flood) mitigation measure.

The hospital pump station is only about eight years old and the Ice Rink pump station is about five years old.

3.15.2 Evaluation

The primary issues with these pump stations are as follows:

- Dukes County Ave, Lake Ave, and Our Market are all located in the 100-year flood zone and are at risk for flooding. A memo was developed in 2014/2105 to document these issues. See Appendix C.
- Dukes County Ave, Lake Ave, and Our Market are all within five years of their design life.
- None of the pump stations are connected to the plant SCADA system.
- The Dukes County Ave Pump Station was originally slated to convey all sewage flow in the sewer service area. Now that additional pump stations have been added to the system to directly pump to the WWTF, the Dukes Ave Pump Station is using oversized pumps based on current plant design flows.

No issues were reported for the Hospital and Ice Rink pump stations.

Flood Risk Analysis

The current Building Code in effect for the State of Massachusetts is the Eighth Edition (August 2010). In accordance with the Commonwealth of Massachusetts website, the Massachusetts State

Building Code (780 CMR) – Ninth Edition, Base Volume (2015 International Building Code (IBC) with amendments) is to be released sometime in mid-2016. Due to the time it would take to implement recommendations in this report, the assessment below is based upon the Ninth Edition of the Building Code, which references the ASCE 24-14: Flood Resistant Design and Construction design standard. Additionally, FEMA requires applicants for all structure elevation projects to comply with ASCE 24-14 (or latest edition), as a minimum design criteria.

Applicability of ASCE 24-14 to Flood Mitigation Measures

As illustrated in Figure 12, the provisions of ASCE 24-14 are only applicable for new structures and for existing structures that are to undergo substantial improvements that cost 50% or more of the structure's pre-improvement market value.

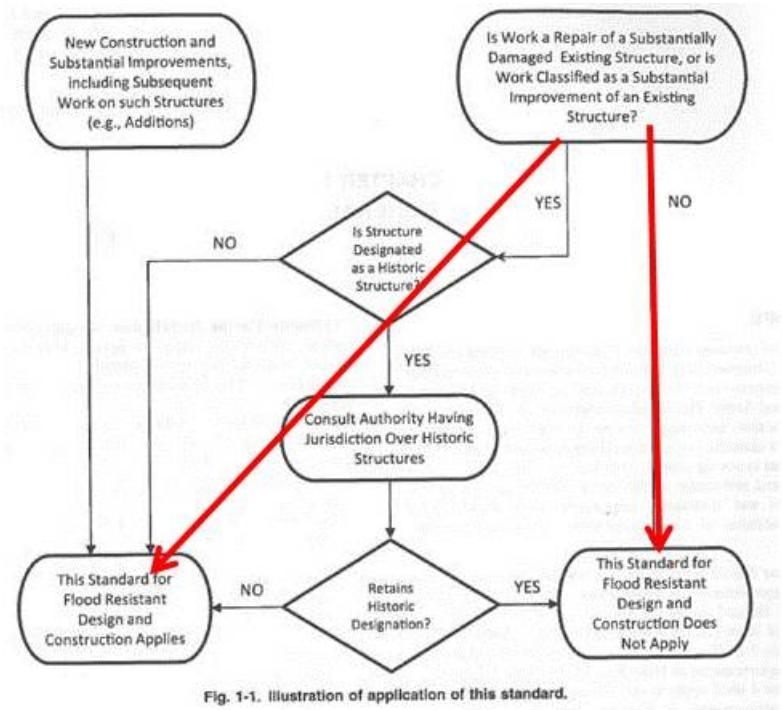

Figure 12 Applicability of ASCE 24-14 to Proposed Mitigation Measures (Source: ASCE 24-14)

ASCE 24-14 outlines two different mitigation options for structures within a flood plain:

- "Dry flood-proofing" entails a combination of measures that results in a structure being able to withstand forces of a flood load while keeping the structure watertight.
- "Wet flood-proofing" entails provisions to relieve forces of a flood load by allowing the flood water to infiltrate into the structure, but making sure the exposed materials and utilities of the structure are not susceptible to water damage.

Both types of mitigation are discussed in further detail below.

Dry Flood-Proofing

ASCE 24-14 does not allow structures in High Hazard Flood Areas/Zones (defined as Zone V and Zone Coastal A) to be dry flood-proofed. This standard applies to any structure where flood-

proofing the building is expected to cost 50% or more of the structures pre-improvement market value.

The costs associated with reinforcing structures like the Dukes County Ave Pump Station will likely exceed the 50% cost threshold which triggers the need for these particular existing structures to follow the guidelines of ASCE 24-14. Therefore dry flood-proofing is technically not considered as a mitigation measure for pump stations that fall within this category. However, due to the critical nature of this infrastructure, dry flood-proofing is likely the remedy for this location, and a variance may be needed for this.

Wet Flood-Proofing

Although ASCE 24-14 also limits the use of wet flood-proofing in these zones, it is interpreted that the existing pump stations can be “wet flood-proofed” on the basis that they are “structures that are functionally dependent on close proximity to water” as allowed per ASCE 24-14. This principle has been applied to pump stations in this report since they have a functional need at their location and cannot be moved. The pump stations close proximity to water might be coincidental, but they need to be close to water in order to serve their function.

Summary

Based on an analysis of State and local codes, the following flood mitigation measures are recommended for further consideration in this report:

- Lake Ave and Bath House Pump Stations – wet flood-proofing
- Dukes County Ave Pump Station – dry flood-proofing (seek waiver if needed)

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3.15.3 Operational Issues

None noted.

3.15.4 Recommendations

The Dukes County Ave, Lake Ave, and Our Market Pump Stations face several challenges. Each is within five years of its life expectancy and each is located within a 100-year floodplain and several feet below the 100-year flood level. It is recommended that the Town start to formulate a plan to upgrade these stations as well as make provisions for the fact that these stations now lie in the 100-year flood plain. There are a number of improvements that could be made to these stations and the costs depend on if the improvements are related to hazard mitigation only or hazard mitigation and upgrade due to age. Some improvements are proposed in Table 12.

Table 12 Possible Improvements

Pump Station	Primary Hazard Mitigation Improvements	Age-Related Improvements That Will Be Required As Equipment Meets Its Design Life
Dukes County Ave	Superstructure needs to be replaced to protect electrical equipment.	Pump replacement. Replacement of controls. Replacement of electrical equipment.
Lake Ave	Existing panel is not suitable for being submerged and either needs an immersible panel for a few controls that are left or a replacement panel.	Pump replacement. Replacement of controls. Replacement of electrical equipment.
Our Market (Bath House)	Existing panel is not suitable for being submerged and either needs an immersible panel for a few controls that are left or a replacement panel.	Pump replacement. Replacement of controls. Replacement of electrical equipment.

The minimum recommended improvements include building replacement at Dukes County Ave and replacement panels at Lake Ave and Our Market Pump Stations.

It should be noted that the mechanical equipment is within five years of its design life and the Town should plan to replace this equipment at least as the design life ends around year 2020. However, if additional flows are added, especially as a result of additional sewering, this may require modifications to handle additional flow.

Given the need to make major changes at the Dukes County Ave Pump Station, a comprehensive plan is recommended for this station including the determination of future flows in the area, determination of suitable mechanical equipment to suit the future flows, and determination of suitable modifications to accommodate the flood levels.

It is also recommended that the existing stations be connected to the plant SCADA system.

3.16 Architectural Evaluation

A visual review to the site was performed to determine if any architectural-related issues were visible. This was not a code review. A code review would be performed if any portion of the facility were to be upgraded such that the new work would meet the latest codes.

3.16.1 Operations Building

The Operations Building is relatively new (15 years old) and no architectural-related issues were noted. Buildings such as this are expected to last at least 50 years.

3.16.2 Filter Building

The Filter Building is relatively new (15 years old) and no architectural-related issues were noted. Masonry buildings such as this are expected to last at least 50 years.

3.16.3 Primary Sludge Building

The Primary Building is relatively new (eight years old) and no architectural-related issues were noted. Masonry buildings such as this are expected to last at least 50 years.

3.16.4 Garage

The Garage is relatively new (one year old) and no architectural-related issues were noted. Pre-engineered buildings such as this are expected to last approximately 20 years.

3.16.5 Miscellaneous Exterior Structures

No architectural-related issues were noted elsewhere. If major changes are made in any given area of the facility, that area would need to be brought up to current codes. For example, handrail is likely needed on the exterior tanks.

3.17 Structural Evaluation

A visual review to the site was performed to determine if any structural related issues were visible. This was not a code review. A code review would be performed if any portion of the facility were to be upgraded such that the new work would meet the latest codes.

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3.17.1 Operations Building (including Pump Gallery)

The Operations Building is relatively new (15 years old) and no structural-related issues were noted. Masonry buildings such as this are expected to last at least 50 years.

3.17.2 Filter Building

The Filter Building is relatively new (15 years old) and no structural-related issues were noted. Masonry buildings such as this are expected to last at least 50 years.

3.17.3 Garage

The Filter Building is relatively new (15 years old) and no structural-related issues were noted. Pre-engineered buildings such as this are expected to last approximately 20 years.

3.17.4 Primary Clarifier

The primary clarifier is relatively new (eight years old). However, some corrosion of the interior concrete was noted. Concrete structures such as this are expected to last at least 50 years.

3.17.5 Primary Sludge Building

The primary sludge building is relatively new (eight years old). Masonry structures such as this are expected to last at least 50 years.

3.17.6 SBRs, Unthickened and Thickened Sludge Tanks

The unthickened and thickened sludge tanks are relatively new (15 years old). Concrete structures such as this are expected to last at least 50 years. However, the tanks do have stress cracks on them and these should be further investigated and repaired as required. Sludge tank interior may have corrosion issues also and should be further investigated.

3.17.7 Equalization Tank

The equalization tank is relatively new (15 years old). Concrete structures such as this are expected to last at least 50 years.

3.17.8 Effluent Pump Station

The effluent pump station is relatively new (two years old). Concrete structures such as this are expected to last at least 50 years.

3.17.9 Miscellaneous Vaults

Miscellaneous vaults are relatively new (15 years old). Concrete structures such as this are expected to last at least 50 years.

3.18 Electrical and Controls Evaluation

The WWTF contains electrical equipment and controls that primarily date back to 2000. For the most part, this equipment is all serviceable and in good working condition. However, as the equipment approaches 20 years old in 2020, much of it may be ready for replacement. Specific decisions on replacement should be made in the near future. The following is a list of items that require more immediate attention.

3.18.1 Electrical

None noted.

3.18.2 Controls

Effluent Flow Meters—The plant has two effluent flow meters—one at Ocean Park and one at the WWTF at a V-notch weir located after the UV system. These flow meters currently read different values and it is not known which is correct. Based on some infield testing, the flow meter at the treatment facility may be reading low, but this is based on very rough measurements. The two meters will never match exactly, but the two should be calibrated to understand which reads correctly. In addition, the V-notch weir at the plant could have second level sensor installed to track discrepancies in flow.

Level Sensors—A number of level sensors throughout the plant should be replaced or added. Sludge tank level sensors require replacement. While in the equalization tank, two level sensors should be added for better tracking of actual tank level.

Spares—Spare level sensors and turbidity meters are recommended to have on hand.

3.19 SCADA System Evaluation

In 2014, a SCADA system was installed at the Oak Bluffs WWTF. In addition, the SBR PLC processor was replaced and several other smaller improvements were made. The majority of the existing control system is 15 years old. There are several additional improvements that are recommended as follows:

- Provide redundant SCADA system computer.
- Connect the influent flow meter to the SCADA system.

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- Connect remote pump stations to the plant SCADA system—five raw sewage and two effluent pump stations. This could be done using a Mission system (cellular) or a wireless radio system.
- Remove the wall mounted dialer unit and transfer all remaining alarms to the SCADA system.
- Procure two uninstalled PLC CPUs as backups.
- Add Wi-Fi in the new garage.

3.20 Heating and Ventilation System

The intent of this evaluation is to report on deficiencies related to age and industry standard related issues. The primary industry standard related issue that was reviewed with regard to this evaluation is NFPA 820.

3.20.1 Operations Building

The existing HVAC systems in the Operations Building are 15 years old and approaching their design life. In addition, there are several other issues related to the HVAC systems:

- The HVAC system needs to be balanced.
- The primary ventilation system in this building draws exhaust from the generator and brings that into the building.
- The presence of “sludge piping” in the basement technically requires the entire building to be rated as an Explosion-proof Class I Division 2 area. New additions to the building should meet this classification. The Town should either grant a waiver on this classification or if the building is significantly changed at some point, there should be an effort to take sludge piping out of the building.
- Other equipment such as boilers will be approaching their design life.
- Fuel tanks may require replacement in the near future.

3.20.2 Filter Building

The existing HVAC systems in the Filter Building are 15 years old and approaching their design life. These should be planned to be replaced as their design life ends in 2020.

3.20.3 Primary Sludge Building

The existing HVAC systems in the Primary Sludge Building are only eight years old. No changes are recommended.

3.20.4 Garage

The existing HVAC systems in the Garage are only a year old. No changes are recommended.

3.21 Fire Detection/Suppression

The existing fire detection and suppression systems are listed in the O&M manual. The following items should be noted:

- The existing chemical feed systems do not have quantities that require fire suppression.

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- The current edition of NFPA 820 classifies the operations Building as a Class I Division 2 area. Any changes to the Operations Building will require either a waiver from the Town or an upgrade of the building to meet this standard.
- The fire alarm in the Filter Building has corroded, and is in need of replacement.

3.22 Other Requirements

The Town should be aware of two MassDEP requirements that may impact the Town. First, DEP is requiring all municipalities to conduct an Infiltration/Inflow (I/I) study by December 31, 2017. For a study like this, flow monitoring must be conducted in the spring of 2017.

In addition, any new State-funded project (SRF program) is allowed only if the municipality has an asset management system in place.

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4. Options and Recommendations

4.1 Flows and Loads

The plant flows based on evaluation of plant data is shown below. This evaluation indicates that the plant is operating at as much as 85+% capacity. However, when individual unit processes are considered based on actual in-plant pumping rates, the filters are potentially operating slightly higher than 100% capacity due to a lack of redundancy. However, several facilities are below capacity.

Table 13 Plant Flows

Flow	Original Design Flows (mgd)	Current (mgd)
Average		100,000
Maximum Month	Not Reported	205,000
Maximum (peak) Day	370,000 (320,000 – SBR only)	270,000
Peak Hour	1,280,000	600,000
Peak Potential Influent Flow	1,280,000	1,610,000
Peak Flow/Max Day Peaking Factor	3.5	6.0

When plant influent loads are considered, the facility also appears to be operating at a level that is close to 85-90% capacity. This evaluation was based on peaking factors due to limited data being available. Additional influent sampling would be required to better define this.

There are three recommendations with regard to plant flows and loads as follows:

- Re-implement recording influent plant flows to verify peak flows.
- Calibrate effluent flow meters to verify plant flows and monitor flows for an additional year to verify peak flow.
- Consider additional influent sampling in summer of 2017 (FY 2017-8) to aid in further load analyses.

4.2 Unit Process Capacity

The following is a list of the unit processes and their current status as to plant flows:

Table 14 Current Status of Unit Processes

Unit Process	Capacity	Capacity as a Percentage of Current Flows	Comment
Influent Screen	1.73 mgd	Below capacity per current peak flow, but at capacity considering pump station peaks	Re-assess after flow meter is calibrated and longer term data is available.
Primary Clarifier	1.73 mgd	Below capacity per current peak flow, but at capacity considering pump station peaks	Re-assess after flow meter is calibrated and longer term data is available.
SBR	0.32 mgd 1.28 mgd	Based on flow and loads, this is projected to be 85-90% capacity	
Equalization Pumps	1.15 mgd	Approximately at capacity	Based on decant volume and potential for two tanks to decant.
Filters	Currently overcapacity	200% +	An additional filter is needed. Consideration needs to be given for changing the filters if nitrogen removal will be required in the future.
UV	1 mgd	Estimated to be as high as 80% capacity based on equalization tank pump rates.	
Effluent pump stations	Two stations	Both appropriately sized	Sized to convey flow to one of two disposal areas.
Effluent Disposal	340,000 Ocean Park 250,000 Leonardo	Well under capacity (40% based on max month)	The only action recommended is to restore lost capacity from Ocean Park to increase capacity to 370,000.

Based on the above table, the existing facility is near capacity. In the case of the effluent filtration system, by former and current standards, the facility should have an additional filter. Other

processes are near capacity, but this can be confirmed after flow meter calibration and should be considered further when addressing nitrogen TMDLs in Town.

Given the current state of the facility with regard to its capacity, acceptance of additional flows and loads should be done with care.

There are a number of categories of recommendations that should be considered with regard to the wastewater infrastructure. These are categorized as follows:

I. Studies and Verification of Flows via Minor Modifications

- Consider implementing a simple asset management system to allow for the creation of a renewal and replacement system (this is now an SRF requirement).
- Conduct an I/I study by December 2017 to satisfy DEP requirements.
- Pursue funding to mitigate flooding concerns at the coastal pump stations – Lake Ave, Our Market and Dukes County Ave Pump Stations.
- Flow and load verification:
  - Effluent flow meter calibration
  - Connecting influent flow meter to the SCADA system
  - Increase sampling at least next summer

II. Plant Improvements

- These are recommendations that correct immediate needs identified in the plant evaluation.

III. Plant Expansion Needs

- These are WWTF upgrades that may be required to address nitrogen TMDLs and/or additional sewering. These would be determined through a Comprehensive Wastewater Management Plans (CWMP) or Targeted Watershed Management Plan (TWMP).

IV. Renewal and Replacement Needs

- The existing facility and related remote mechanical infrastructure is approaching its design life of 20 years. This does not mean it will cease to function at 20 years, but a plan should be implemented to address this infrastructure as part of any plant expansion or to start a renewal and replacement program of mechanical equipment in five years. This could be done through the implementation of an asset management system, which is a requirement for communities to have as part of any future SRF funded project.

4.3 Summary, Options, and Recommendations

For the most part, the WWTF is in good condition. None of the equipment has exceeded its life expectancy and the structures are in good condition and well below their life expectancy. The primary current issues have to do with plant flows and loads and the related capacity of several processes. However, most of the facility will have exceeded it life expectancy in another five years and a plan should be implemented to address this while incorporating the needs of meeting the TMDLs for Town watersheds. This section will address the two lower levels of the recommendations as these represent the most immediate needs to consider.

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4.3.1 Studies and Verification of Flows via Minor Modifications

The costs associated with this level of the recommendations are shown in the following table.

Table 15 Costs

Recommendation	Allowance
Consider implementing a simple asset management system to allow for the creation of a renewal and replacement system (this is now an SRF requirement)	$50,000
Pursue funding to mitigate flooding concerns at the coastal pump stations – Lake Ave, Our Market, and Dukes County Ave Pump Stations	$100,000 (Town share)
Conduct an I/I study by December 2017 to satisfy DEP requirements	$100,000
Flow and load verification • Effluent flow meter calibration • Connecting influent flow meter to the SCADA system (verify peak flows) • Add additional influent sampling for summer 2017 (minimum of one additional sampling time per month)	$20,000
Total	**$270,000**

4.3.2 Plant Improvements

A summary of current issues is presented below. Most of these could be included in a plant upgrade if it were to take place soon as part of CWMP recommendations (see Section 4.3.3) as processes that are flow and nutrient dependent may change with the CWMP. Immediate needs are indicated in bold in the "recommendation" column below.

Table 16 Current Issues Summary

Issue No.	Issue	Discussion	Recommendation
1	Add pavement and heat to the Garage area		Address as funds are available
2	Permit has a permitted flow of 0.370, but O&M manual lists 0.32 mgd; and SBR and UV O&M manual indicates that the design flow is 0.32 mgd.	0.370 mgd does appear to be a flow that the plant was designed around for a max day, but for the purposes of treatment, 0.320 mgd appears to be the correct plant rating. No action needed.	No action
3	Primary Clarifiers • Replace scum trough gears. • Add motor operated valve on pump discharge as a		If CWMP proceeds, these items could be addressed as part of maintenance budget or plant upgrade that

Issue No.	Issue	Discussion	Recommendation
	positive means to shut off flow.		may result from the CWMP
4	SBRs • Add ammonia and ORP probes. • Add a WAS/TSS meter on WAS pipeline. • Replace Mud Valves in each tank. • Address cracks in tank. • Obtain spare motive pump motor.	This system is nearing capacity. SBR treatment levels could be enhanced with additional monitoring and control.	If CWMP proceeds, most of these items could be addressed as part of maintenance budget or plant upgrade that may result from the CWMP. **It is recommended that a spare motive pump motor be obtained to guard against failure of an existing motor**.
5	Effluent filters • Upgrade needed soon.	Inadequately sized. An additional filter is needed. Primary issue with this is filters may need to change to denitrification filter to address TMDLs. Need to know peak flow of facility and would be best to know future peak flow (see Part I).	This is more prudent to address as part of a CWMP and the potential for higher flows and lower nutrient limits.
6	UV • Coat walls with anti-microbial coating.	Need to know peak flow of facility and would be best to know future peak flow to verify capacity (see Part I).	Address as funds are available
7	Equalization tank • Install new level sensors. • Potential inadequate volume and or pumping capacity.	This should be addressed with the filters and UV when peak flows are known.	This is more prudent to address as part of a CWMP and the potential for higher flows and lower nutrient limits.
8	Effluent Disposal	Investigate restoration of two abandoned discharge beds.	Not required now, but this could be addressed as funds are available.
9	Unthickened sludge tanks • Replace level sensors.		If CWMP proceeds, these items could be addressed as part of maintenance budget

Issue No.	Issue	Discussion	Recommendation
	• Replace pumps in unthickened tanks. • Add a valve vault.		or plant upgrade that may result from the CWMP
10	Recycle Pump Station • Add VFDs to pumps (replace pumps). • Expand volume of tank. • Add pinch valve to protect basement.	This work should be done with the effluent filter changes as this area will be impacted.	This is more prudent to address as part of a CWMP and the potential for higher flows and lower nutrient limits.
11	Chemical Feed System • Replace hypochlorite pumps.		If CWMP proceeds, these items could be addressed as part of maintenance budget or plant upgrade that may result from the CWMP
12	Odor Control • Provide pump to drain odor sump and replace system at Duke's County Ave		If CWMP proceeds, these items could be addressed as part of maintenance budget or plant upgrade that may result from the CWMP
13	Remote Pump Stations • Address floodplain issues with Dukes County Ave, Lake Ave, and Bath House.		If CWMP proceeds, these items could be addressed as part of that effort.
14	SCADA • Provide redundant SBR PLC processor • Provide redundant SCADA system computer. • Connect the influent flow meter to the SCADA system. • Connect remote pump stations to the plant SCADA system—five raw sewage and two effluent pump stations. This could be done using a Mission		Purchase a spare PLC processor immediately so that a backup to the SBR program exists. Other items could be addressed as part of the CWMP effort.

Issue No.	Issue	Discussion	Recommendation
	system (cellular) or a wireless radio system. • Remove the wall-mounted dialer unit and transfer all remaining alarms to the SCADA system. • Procure two uninstalled PLC CPUs as backups. • Add Wi-Fi to the Garage.		
15	HVAC • Replace main ventilator in Operations Building. • Balance HVAC system.		**Although not related to the functioning of the plant, these items should be explored as soon as possible.**

It should be noted that if the CWMP proceeds, many of the issues identified above could be included in a potential future plant upgrade.

Some of the items identified above—SBRs, Filters, EQ Tank, UV system, and Recycle Wet Well,—all require future flows and nitrogen limits to be defined. It should be noted that these are all pressing issues that should be delayed only if a CWMP/TWMP process were initiated and information on the potential expansion is known approximately within the next fiscal year. As further explanation:

- Filters: It would be prudent to know the future flows and future nitrogen limit before investing money in improving the existing filtration system. If denitrification filters will be needed, the technology is quite different. Thus this is closely linked to plant expansion.
- EQ Tank: The sizing of this tank may be impacted by the number of SBRs and/or the modifications performed to the SBRs to accommodate a plant expansion.
- Recycle Wet Well: This is closely linked to the filters and their backwash and thus linked to any plans for plant expansion.

If the CWMP/TWMP process is expected to be delayed, these processes should be attended to with other items mentioned in the table above in the short-term.

4.3.3 Plant Expansion Needs

The Town recently received TMDLs for two watersheds: Lagoon Pond and Sengekontacket Pond. A CWMP for the Town or TWMP for each watershed are recommended. Specific needs for these upgrades can only be determined once the Needs Assessment and Alternatives Evaluations for the CWMP or TWMPs are completed. Development of future flows is a critical aspect of this task.

Section 6 presents some options for expansion. For planning purposes, a sample schedule for a CWMP or TWMP might look like that shown in the following table. However, it should be noted that this schedule can be highly variable and would depend on the Town input and ease at which a consensus can be achieved. The schedule below is based on input from the Town that at least some additional sewering is expected.

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Table 17 Sample CWMP/TWMP Schedule

Stage	Timeframe
CWMP/TWMP	2 years
CWMP/TWMP Implementation – Design (Phase I – Treatment Plant Expansion)	1 year
CWMP/TWMP Implementation – Bidding & Construction (Phase I – Treatment Plant Expansion)	2 years
CWMP/TWMP Implementation – Design (Phase II – Sewering)	1 year
CWMP/TWMP Implementation – Bidding & Construction (Phase II – Sewering)	2 years

Actual number of phases will depend on the outcome of the CWMP/TWMP.

It should be noted that the cost for plant expansion and associated sewering is highly dependent on the increase in flow. Plant expansion costs due to additional sewering for nitrogen TMDL compliance alone could be in the range of $20 million (this value is not based on a specific plan, but is mentioned to merely provide an order of magnitude cost).

4.3.4 Renewal and Replacement Needs

The existing facility and related remote mechanical infrastructure (pump stations) is approaching its design life of 20 years. This does not mean it will cease to function at 20 years, but a plan should be implemented to address this infrastructure as part of any plant expansion or to start a renewal and replacement program of mechanical equipment in five years. This should be done through the implementation of an asset management system, which is a requirement for communities to have as part of any future SRF funded project. Any costs associated with renewal and replacement of equipment would be in addition to the costs incurred as part of the plant expansion and these costs can be considerable when much of the plant pumps, blowers, SBR equipment, etc. will require replacement in the near future.

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5. MassDEP Requirements

MassDEP issued a draft groundwater discharge permit in February 2015 for both effluent disposal sites—the existing Ocean Park Subsurface Disposal Area and the new Lombardo Disposal Area.

5.1 Engineering Report

As part of the groundwater discharge permit, MassDEP requires that an engineering report be prepared by a registered professional engineer and submitted to MassDEP for approval. The engineering report should outline the modifications required to ensure the plant can remain in compliance with the groundwater discharge permit in the next 5-year permit term (i.e. through year 2020 and beyond).

5.2 Additional Requirements

Section 4 outlined the most immediate needs for the wastewater infrastructure. Issues that are related to the permit include the following items.

1. Processes with capacity issues are summarized below:
   (1) Pending confirmation of plant flows, the effluent filters may be over capacity (the EQ tanks and recycle pump station are closely linked to the filters).
   (2) Pending confirmation of the plant flows, the UV system may be at capacity.
   (3) The SBRs are close to capacity but are projected to be slightly under 90% at this time.

In addition, Section 4.3.2 outlined a series of other short-term improvements, many of which would help improve plant operations.

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6. Future Modifications

The future includes two potentially major decisions for the Town. The first is how to address nitrogen TMDLs. The second is how to address renewal and replacement needs of the existing facility. These are listed in this order because addressing the long-term nitrogen TMDL issues will help to determine what infrastructure is impacted. The remainder of the infrastructure that is not impacted, but still needed, would have to be replaced under what is recommended to be a renewal and replacement program. Both of these concepts were reviewed in Sections 4.3.3 and 4.3.4.

Expansion is possible at the existing facility. The table below presents options available for expansion of the various treatment processes.

Table 18 Expansion Options

Issue No.	Process	Expansion Options
1	Pump Stations	Larger pumps
2	Preliminary Treatment	Screen seems to have more capacity remaining, so expansion needs is not an issue yet.
3	Primary Clarifiers	Tanks seems to have more capacity remaining, so expansion needs is not an issue yet.
4	SBRs	SBRs can be expanded in several ways including: • Adding two additional SBRs adjacent to the four existing (increase capacity by approximately 50%). • Utilize a BioMag process to expand the capabilities of the existing SBR tanks (increase capacity by approximately 100%).
5	Effluent Filters	At the very least one additional filter is needed and with expansion in mind, two additional filters would be more prudent. In addition, depending on the future nitrogen limit, denitrification filters may be needed.
6	UV	A new UV system will be needed soon, especially if more capacity is needed. Trojan no longer markets the existing UV 4000 unit and a replacement would be needed.
7	Equalization Tank	Additional tank volume is needed.
8	Effluent Disposal	If effluent disposal capacity beyond that which exists is needed, the following could be considered: • Investigate restoration of two abandoned discharge beds in Ocean Park. • Consider hydraulic load tests and hydrogeological modeling which may allow more flow to be added to the Leonardo beds (it should be noted that this would re-open the permit and may lead to reconsideration of the Total Organic Carbon (TOC) limit which has been removed from the permit).

Issue No.	Process	Expansion Options
		• Additional disposal area.
9	Unthickened Sludge Tanks	Once future flows are known, additional storage tanks may be needed and onsite sludge processing should be evaluated to determine its cost-effectiveness.
10	Recycle Pump Station	May need to be larger if more filters are added or new filters are installed.

Figure 13 shows a site plan with areas where some expansion may occur on the site.

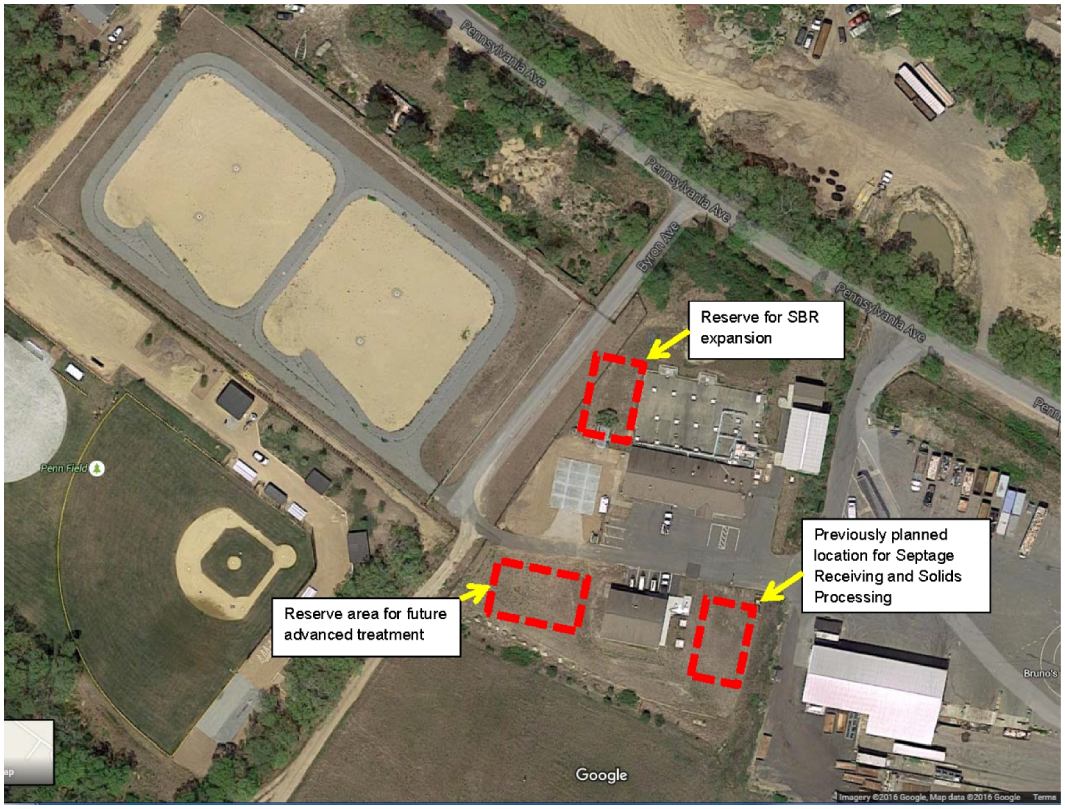

Figure 13 Site Plan with Expansion Areas

7. Implementation Schedule

7.1 Summary Plan

The table below is a suggested schedule that brings together a number of issues—plant evaluation results, TMDLs, etc. This is provided for discussion purposes.

Table 19 Suggested Schedule

Fiscal Year	Suggested Action
FY 2017	• Consider implementing a simple asset management system to allow for the creation of a renewal and replacement system (this is now an SRF requirement). • Conduct an I/I study by December 2017 to satisfy DEP requirements. • Pursue funding to mitigate flooding concerns at the coastal pump stations—Lake Ave, Our Market, and Dukes County Ave Pump Stations. If funded complete work. • Flow verification: – Effluent flow meter calibration – Connecting influent flow meter to the SCADA system; verify peaks – Increase influent sampling in Summer 2017 to help verify influent design loads
FY 2018	• Initiate CWMP/TWMP (If CWMP/TWMP process does not proceed or is stalled, then other identified "Plant Improvements" should proceed and future flows estimates will need to be developed in an alternative manner.)
FY 2019	• Complete CWMP/TWMP. • Initiate design of Plant Expansion
FY 2020	• Initiate construction of Plant Expansion.
FY 2021	• Town should consider initiating a renewal and replacement program for equipment that has exceeded its life expectancy.
Sewering work is not included in the schedule above.	

7.2 Funding Opportunities

The primary funding opportunities for the Town are state SRF and federal USDA rural development. Both programs would fund many of the projects listed above, except for the CWMP/TWMP process. The Town could also pursue smaller water quality grants that may help with CWMP/TWMP funding. Applications for SRF funding are due each August. USDA has a rolling application process.

8. References

1. New England Interstate Water Pollution Control Commission, TR-16: Guides for the Design of Wastewater Treatment Works, 2011 Edition.
2. Water Environment Federation, Manual of Practice No. 8: Design of Municipal Wastewater Treatment Plants, Fifth Edition, McGraw-Hill, 2010.
3. Young, T, Crosswell, S, and Wendle, J, "Comparison of Nitrogen Removal Performance in SBR Systems", presented at WEFTEC Conference, 2008.
4. Wright-Pierce, Record Drawings for Contract No. 2 - Wastewater Treatment Facility, April 2002.
5. Stearns & Wheler LLC (now GHD Inc.), Record Drawings for Contract No. 4 - Oak Bluffs Wastewater Treatment Facility Influent Screening and Primary Clarifier Upgrade, January 2010.
6. GHD Inc., Construction Contract Drawings for Contract No. 5 – Oak Bluffs Wastewater Treatment Facility Effluent Disposal Improvements, January 2011.
7. GHD Inc., Construction Contract Drawings for Contract No. 6 – Effluent Pumping Station and Other Plant Modifications, February 2013.
8. Wright-Pierce, "Operations Manual for Wastewater Treatment Facility – Volume I", August 2001.

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Appendix A – Inventory of Major WWTF Equipment and Process Tanks

Dukes County Avenue Pump Station	
Number of pumps	2 (1 service, 1 standby)
Pump type	Non-clog submersible
Rated pump capacity	900 gpm at 128 feet TDH
Drive	Constant speed
Motor size	88 horsepower
Raw Sewage Screening and Primary Clarification System	
Mechanical Screen	
Number of units	1
Type	Inclined cylindrical screen
Opening size	6 mm
Channel width	24 inches
Screen hydraulic capacity	1.7 MGD
Motor size	2 HP
Primary Clarifiers	
Number of primary clarifiers	1
Clarifier dimensions	
Width	13’-6”
Length	36’-0”
Side water depth	11.9 feet
Clarifier surface settling area	486 square feet
Clarifier effluent weir length	32 feet
Primary sludge pumps	
Number of pumps	2 (1 service, 1 standby)
Pump type	Double disc sludge
Size (suction/discharge connection)	6-inch/4-inch
Rated capacity	150 gpm at 28.5 feet TDH
Primary scum pumps	
Number of pumps	1
Pump type	Submersible recirculating chopper
Size (discharge connection)	4-inch
Rated capacity	150 gpm at 13.6 feet TDH
Sequencing Batch Reactor System	
Sequencing Batch Reactors	
Number of reactors	4
Reactor dimensions	
Width	16’-5”
Length	67’-8”
Operating water depth (minimum/maximum)	13.6 feet/16 feet
SBR reactor volume	0.13 MG
Total reactor volume	0.53 MG

Number of cycles per day (each SBR)	4
Cycle Time	
Fill Time (anoxic)	1.5 hours
React Time (50% aerobic:50% anoxic)	3.0 hours (50% aerobic)
Settle Time	0.75 hours
Decant Time	0.35 hours
Idle Time	0.4 hour
Total Cycle Time	6.0 hours
Blowers	
Number of blowers (service/standby)	3 (2 service/1 standby)
Type	Rotary lobe
Blower capacity	267 scfm
Discharge pressure (maximum)	6.97 psig
Motor size	15 horsepower
Drive	Constant speed (RVSS)
Jet Mix Pumps	
Number of jets per SBR	8
Number of pumps	4
Pump type	Centrifugal (dry pit)
Rated capacity	1465 gpm at 25 feet TDH
Motor size	15 horsepower
Wastewater Flow Equalization System	
Equalization Tank	
Number of tanks	1
Tank Dimensions	
Width	6’-2”
Length	33’-4”
Side water depth (maximum)	11 feet
Volume (maximum)	16,900 gallons
Equalization Pumps	
Number of pumps	3 (2 service, 1 standby)
Pump type	Submersible non-clog
Pump size (discharge connection)	4 inches
Pump speed	1700 rpm
Drive	Constant speed
Rated capacity (each pump)	400 gpm at 30 feet TDH
Motor size	5 horsepower
Effluent Filtration System	
Effluent Filters	
Number of filters	2
Filter type	Traveling bridge
Filter media	Silica sand
Media depth	10.25 inches
Filter dimensions	
Width	12 feet
Length	24 feet

Filter area (each filter)	108 square feet
Total filter area	216 square feet
Filter Backwash/Washwater Pumps	
Number of pumps	2
Type	Wet Pit Submersible
Rated capacity	100 gpm at 16 feet TDH
Motor size	3 HP
Effluent Ultraviolet Disinfection System	
UV Channels	
Number of channels	1
Channel width	2’-9”
Channel length	37’-8”
UV Equipment	
Number of UV modules	
Number of UV lamps per module	
Lamp type	High intensity, medium pressure
Effluent Pump Station	
Number of pumps	2
Pump type	Wet Pit Submersible
Rated pump capacity (each)	400 gpm at 40 feet TDH
Drive	Constant speed
Motor size	7.5 horsepower
Sludge Processing System	
Un-Thickened Sludge Storage Tanks	
Number of tanks	4
Tank dimensions	
Width	16’-6”
Length	21’-8”
Side water depth	16 feet
Storage volume (each tank)	43,000 gallons
Total storage volume	170,000 gallons
Un-Thickened Sludge Pumps	
Number of pumps	2
Pump type	Submersible
Pump size (discharge connection)	4 inches
Pump speed (maximum)	1700 rpm
Drive	VFD
Rated capacity (at maximum speed)	610 gpm
Motor size	3 horsepower
Thickened Sludge Storage Tanks	
Number of tanks	2
Tank dimensions	
Width	16’-6”
Length	14’-2””
Side water depth	16 feet

Storage volume (each tank)	28,000 gallons
Total storage volume	56,000 gallons
Thickened Sludge Pumps	
Number of pumps	2
Pump type	Submersible recirculating chopper
Pump size (discharge connection)	4 inches
Pump speed (maximum)	1750 rpm
Drive	Constant speed
Rated capacity (at maximum speed)	610 gpm
Motor size	3 horsepower

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Appendix B – Groundwater Discharge Permit

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Individual Groundwater Discharge Permit
Fact Sheet

I. APPLICANT, FACILITY INFORMATION, and DISCHARGE LOCATION

Name and Address of Applicant:

Town of Oak Bluffs
56 School St.
Oak Bluffs, MA 02557

Name and Address of Facility where discharge occurs:

Oak Bluffs Municipal Wastewater Treatment Facility
17 Pennsylvania Ave.
Oak Bluffs, MA 02557

Discharge Information:

Groundwater Discharge Permit Number: 2-674M

The Groundwater Discharge Permit will allow the applicant to discharge a maximum of 370,000 gallons per day of treated sanitary wastewater from municipal wastewater treatment facility to groundwaters of the Commonwealth. The permit allow for disposal at two sites: Ocean Park and the Leonardo Property. The Leonardo Property is located in the Zone II of a public water supply well. The discharge has a time of travel of greater than two years to the well.

II. LIMITATIONS AND CONDITIONS

Discharge permit limitations are as listed in the ground water permit and are in conformance with 314 CMR 5.00, the Groundwater Discharge Permit Program.

III. PERMIT BASIS AND EXPLANATION OF EFFLUENT LIMITATIONS

An Individual Groundwater Discharge permit is required for this discharge in accordance with the Massachusetts Clean Water Act, M.G.L. c. 21, s. 26-53 and 314 CMR 5.03.

This information is available in alternate format. Call Donald M. Gomes, ADA Coordinator at 617-556-1057. TDD# 1-866-539-7622 or 1-617-574-6868.

MassDEP on the World Wide Web: http://www.mass.gov/dep

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Effluent limitations are based upon the location of the discharge, the level of treatment, consideration of human health protection criteria and protection of the groundwaters of the Commonwealth.

The permittee has demonstrated that the Leonardo Property, while located in the Zone II of the Farm Neck public water supply wells, is not within a two-year travel time to the wells and is not within a zone of contribution. Therefore, in accordance with 314 CMR 5.10(4A)(3)a, MassDEP has determined that use of the Leonardo Property for effluent disposal will not require an effluent limitation for Total Organic Carbon (TOC).

IV. COMMENT PERIOD, HEARING REQUESTS, AND PROCEDURES FOR FINAL DECISIONS

The public comment period for this permit is thirty (30) days following public notice in *The Environmental Monitor.* The public notice for this Individual Groundwater Discharge Permit occurred on May 20,2015.

Requests for an adjudicatory hearing must be submitted within thirty (30) days of the issuance/denial of the permit, by any person who is aggrieved by such issuance/denial.

A final decision on the issuance/denial of this permit will be made after the public notice period, and review of any comments received during this period.

V. STATE CONTACT INFORMATION

Additional information concerning the draft permit may be obtained between the hours of 9:00 a.m. and 5:00 p.m. Monday through Friday excluding holidays, from:

Brian A. Dudley
MassDEP
3195 Main St.
Barnstable, MA 02630
(508)946-2814
brian.dudley@state.ma.us

Brian A.Dudley
Wastewater Management Program

_____
DATE

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

July 20, 2015

Mr. Robert Whritenour, Town Administrator
Town of Oak Bluffs
56 School St.
Oak Bluffs, MA 02557

RE: OAK BLUFFS – BRPWP11, Oak Bluffs Wastewater Treatment Facility, 17 Pennsylvania Avenue, Permit No. 2-674M
Transmittal No. X261321

Dear Mr. Whritenour:

In response to your application for a permit to discharge into the ground a treated effluent from the proposed treatment works at the Oak Bluffs Wastewater Treatment Facility, 17 Pennsylvania Avenue, Oak Bluffs, Massachusetts, and after due public notice, I hereby issue the attached final permit.

Since no comments were received by the Department during the public comment period related to the terms of the permit, the permit becomes effective upon issuance.

Parties aggrieved by the issuance of this permit are hereby advised of their right to request an Adjudicatory Hearing under the provisions of Chapter 30A of the Massachusetts General Laws and 314 CMR 1.00, Rules for the Conduct of Adjudicatory Proceedings. Unless the person requesting the adjudicatory hearing requests and is granted a stay of the terms and conditions of the permit, the permit shall remain fully effective.

If you have any questions, please contact me at (508)946-2814.

Very truly yours,

Brian A. Dudley
Bureau of Water Resources

BAD/
Enclosure (1 Permit, 1 Fact Sheet)

This information is available in alternate format. Call Michelle Waters-Ekanem, Diversity Director, at 617-292-5751. TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

cc: Mr. James Monteith
Wastewater Treatment Facility
c/o Town Hall
56 School St.
Oak Bluffs, MA 02557
(with enclosures – 1 permit, 1 fact sheet)

Mr. Ade Solarin
Town Hall
56 School St.
Oak Bluffs, MA 02557
(with enclosures – 1 permit, 1 fact sheet)

Mr. Marc Drainville
GHD, Inc.
1545 Iyannough Rd.
Hyannis, MA 02601
(w/ enclosures– 1 permit, 1 fact sheet)

ecc: DEP/Boston
Attn: Marybeth Chubb

DEP/SERO
Attn: Laura Black
Christos Dimisioris
Enclosure (1 Permit, 1 Fact Sheet)

P:/bdudley/gwdp/oak bluffs/Final Permit Cover Letter.docx

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

Charles D. Baker
Governor

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Commissioner

INDIVIDUAL GROUNDWATER DISCHARGE PERMIT

Name and Address of Applicant: Oak Bluffs Board of Selectmen, Town of Oak Bluffs, 2 Oak Bluffs Avenue, Oak Bluffs, Massachusetts 02557

Date of Application: December 11, 2009

Application/Permit No. #2-674M

Date of Issuance: September 13, 2010

Date of Modification: July 20, 2015

Date of Expiration: September 13, 2019

Effective Date: July 20, 2015

AUTHORITY FOR ISSUANCE

Pursuant to authority granted by Chapter 21, Sections 26-53 of the Massachusetts General Laws, as amended, 314 CMR 2.00, and 314 CMR 5.00, the Massachusetts Department of Environmental Protection (the Department or MassDEP) hereby issues the following permit to: **Oak Bluffs Board of Selectmen** (hereinafter called "the permittee") authorizing discharges to the ground from the on site wastewater treatment facility located at **Oak Bluffs Municipal Wastewater Treatment Facility, 17 Pennsylvania Avenue, Oak Bluffs, Massachusetts 02557** such authorization being expressly conditional on compliance by the permittee with all terms and conditions of the permit hereinafter set forth.

_____ _____ _____ _____

Brian A. Dudley
Bureau of Water Resources

Date

This information is available in alternate format. Call Michelle Waters-Ekanem, Diversity Director, at 617-292-5751. TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

I. SPECIAL CONDITIONS

A. Effluent Limits

The permittee is authorized to discharge into the ground from the wastewater treatment facilities for which this permit is issued a treated effluent whose characteristics shall not exceed the following values:

Ocean Park Subsurface Disposal Area

Effluent Characteristics	Discharge Limitations
Flow	340,000 gallons per day maximum to Ocean Park
Total Daily Flow*	not to exceed 370,000 gallons per day
Oils & Grease	15 mg/L
Total Suspended Solids	30 mg/L
Biochemical Oxygen Demand, 5-day @ 20C	30 mg/L
Total Nitrogen (NO_2 + NO_3 + TKN)	10 mg/L daily max
Nitrate Nitrogen	10 mg/L
Settleable Solids	0.1 mL/L
Fecal Coliform Bacteria	200 cfu/100 mL
Total Dissolved Solids	1000 mg/L

*Combined flow to both the Ocean Park Disposal Area and Leonardo Disposal Area and represents maximum design capacity of the Wastewater Treatment Facility

Leonardo Disposal Area

Effluent Characteristics	Discharge Limitations
Flow	250,000 gallons per day maximum to Leonardo Property*
Total Daily Flow**	not to exceed 370,000 gallons per day
Oils & Grease	15 mg/L
Total Suspended Solids	10 mg/L
Biochemical Oxygen Demand, 5-day @ 20C	30 mg/L
Total Nitrogen (NO_2 + NO_3 + TKN)	10 mg/L daily max
Nitrate Nitrogen	10 mg/L
Fecal Coliform Bacteria	200 cfu/100 mL
Turbidity	5 NTU

* See Supplemental Condition 6

**Combined flow to both the Ocean Park Disposal Area and Leonardo Disposal Area and represents maximum design capacity of the Wastewater Treatment Facility

a) The pH of the effluent shall not be less than 6.5 nor greater than 8.5 at any time or not more than 0.2 standard units outside the naturally occurring range.

b) The discharge of the effluent shall not result in any demonstrable adverse effect on the groundwater or violate any water quality standards that have been promulgated.

c) The monthly average concentration of BOD and TSS in the discharge shall not exceed 15 percent of the monthly average concentrations of BOD and TSS in the influent into the permittee's wastewater treatment facility.

d) When the average annual flow exceeds 80 percent of the permitted flow limitations, the permittee shall submit a report to the Department describing what steps the permittee will take in order to remain in compliance with the permit limitations and conditions, inclusive of the flow limitations established in this permit.

B. Monitoring and Reporting

1) The permittee shall monitor and record the quality of the **influent** waste stream to the facility according to the following schedule and other provisions:

Parameter	Minimum Frequency of Analysis	Sample Type
pH	Daily	Grab
BOD_5	2 x Monthly	24-Hour Composite
Total Suspended Solids	Monthly	24-Hour Composite
Oil and Grease	2 x Monthly	Grab
Ammonia Nitrogen	Monthly	24-Hour Composite
Sodium	Monthly	Grab
Chloride	Monthly	Grab
Volatile Organic Compounds*	Quarterly	Grab

* USEPA Method #624

2) The permittee shall monitor and record the quality of the **effluent** from the facility at the point of discharge to the disposal areas according to the following schedule and other provisions:

Ocean Park Subsurface Disposal Area

Parameter	Minimum Frequency of Analysis	Sample Type
Flow*	Continuously	Meter Reading
pH	Daily	Grab
Total Nitrogen (NO_2+NO_3+TKN)	2x Monthly	24-Hour Composite
Total Suspended Solids	Monthly	24-Hour Composite
Settleable Solids	Monthly	Grab
Oil and Grease	Monthly	Grab
BOD_5	2x Monthly	24-Hour Composite
Fecal Coliform	Weekly	Grab
Nitrate Nitrogen	2x Monthly	24-Hour Composite
NH_3 as Nitrogen	2x Monthly	24-Hour Composite
Total Dissolved Solids	Monthly	Meter Reading
UV Intensity	Continuously	Meter Reading
Total Phosphorus (as P)**	Annually	24-Hour Composite
Orthophosphate (as P)**	Annually	24-Hour Composite
Volatile Organic Compounds***	Semiannually	Grab

* Report daily volume discharged to Leonardo Property and/or Ocean Park
** The Department reserves the right to resume more frequent monitoring if the Department determines that phosphorus levels are impacting downgradient receptors.
*** USEPA Method #624

Leonardo Property Disposal Area

Parameter	Minimum Frequency of Analysis	Sample Type
Flow*	Continuously	Meter Reading
pH	Daily	Grab
Total Nitrogen (NO_2+NO_3+TKN)	2x Weekly	24-Hour Composite
Total Suspended Solids	Weekly	24-Hour Composite
Oil and Grease	Monthly	Grab
BOD_5	Weekly	24-Hour Composite
Fecal Coliform	Weekly	Grab
Nitrate Nitrogen	2x Weekly	24-Hour Composite
NH_3 as Nitrogen	2x Weekly	24-Hour Composite
Turbidity	Continuously	Meter Reading
UV Intensity	Continuously	Meter Reading
Total Phosphorus (as P)**	Quarterly	24-Hour Composite
Orthophosphate (as P)**	Quarterly	24-Hour Composite
Volatile Organic Compounds***	Semiannually	Grab

* Report daily volume discharged to Leonardo Property and/or Ocean Park
**After one full year of monitoring the Total Phosphorus and Orthophosphate results, the Department may determine, upon the request

of the permittee, that the frequency of monitoring may be reduced if, in the judgment of the Department, the results of the sampling indicate that existing phosphorus levels will not adversely impact downgradient receptors. If the Department reduces the frequency of monitoring for Total Phosphorus and Orthophosphate, the Department reserves the right to resume more frequent monitoring if the Department determines that phosphorus levels are impacting downgradient receptors.
*** USEPA Method #624

2) The permittee shall monitor, record and report the quality of water in the approved six (6) monitoring wells at the **Ocean Park Subsurface Disposal Area**(upgradient well HW-22 and downgradient wells HW-18, HW-19, HW-20 and HW-21) located as shown on a plan dated June 28, 1999 prepared as part of the Groundwater discharge Permit application and three(3) monitoring wells at the **Leonardo Property** (upgradient well MW 302 and downgradient wells DG1 and DG2) as shown on a plan titled "Monitoring Well Locations, Figure 2A" dated February 17, 2015 prepared by GHD, Inc. and included as Attachment A according to the following schedule and other provisions:

Parameter	Minimum Frequency of Analysis
Static Water Level	Monthly
Specific Conductance	Monthly
pH	Monthly
Total Nitrogen (NO_2+NO_3+TKN)	Quarterly
Nitrate-Nitrogen	Quarterly
Alkalinity	Quarterly
Total Phosphorus**	Annually
Orthophosphate**	Annually
Volatile Organic Compounds*	Annually

* USEPA Method #624
**The Department reserves the right to resume more frequent monitoring if the Department determines that phosphorus levels are impacting downgradient receptors.

3) Static Water Level shall be expressed as an elevation and shall be referenced to the surveyed datum established for the site. It shall be calculated by subtracting the depth to the water table from the surveyed elevation of the top of the monitoring well's PVC well casing/riser.

4) Any grab sample or composite sample required to be taken less frequently than daily shall be taken during the period

of Monday through Friday inclusive. All composite samples shall be taken over the operating day.

The permittee shall submit all monitoring reports within 30 days of the last day of the reporting month. Reports shall be on an acceptable form, properly filled and signed and shall be sent to: the Deputy Regional Director, Bureau of Water Resources, Department of Environmental Protection, Southeast Regional Office, 20 Riverside Drive, Lakeville, MA 02347and to the Department of Environmental Protection, Bureau of Water Resources, Wastewater Management Program, One Winter Street/5th Floor, Boston, MA 02108, and to the Oak Bluffs Board of Health, 56 School St., Oak Bluffs, MA 02557.

Submission of monitoring reports in electronic format is available through eDEP and serves as data submission to both the Regional and Boston offices. To register for electronic submission go to:
http://www.mass.gov/dep/service/compliance/edeponlf.htm

C. Supplemental Conditions

1) The permittee shall notify the Department at least thirty (30) days in advance of the proposed transfer of ownership of the facility for which this permit is written. Said notification shall include a written agreement between the existing and new permittees containing a specific date for transfer of permit, responsibility, coverage and liability between them.

2) A staffing plan for the facility shall be submitted to the Department once every two years and whenever there are staffing changes. The staffing plan shall include the following components:

   a) The operator(s)’s name(s), operator grade(s) and operator license number(s);
   b) The number of operational days per week;
   c) The number of operational shifts per week;
   d) The number of shifts per day;
   e) The required personnel per shift;
   f) Saturday, Sunday and holiday staff coverage;
   g) Emergency operating personnel

3) The permittee is responsible for the operation and maintenance of all sewers, pump stations, and treatment

units for the permitted facility, which shall be operated and maintained under the direction of a properly certified wastewater operator.

4) Operation and maintenance of the proposed facility must be in accordance with 314 CMR 12.00, "Operation and Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Discharges", and, 257 CMR 2.00, "Rules and Regulations for Certification of Operators of Wastewater Treatment Facilities”.

   a) The facility has been rated (in accordance with 257 CMR 2.00), to be a Grade 6 facility. Therefore, the permittee shall provide for oversight by a Massachusetts Certified Wastewater Treatment plant operator (Chief Operator) Grade 6 or higher. The permittee will also provide for a backup operator who shall possess at least a valid Grade 6 license.

   b) The date and time of the operator’s inspections along with the operator’s name and certification shall be recorded in the log book on location at the treatment facility. All daily inspection logs consistent with the O&M Manual requirements shall be kept at the facility for a period of three (3) years.

   c) Records of operation of wastewater treatment facilities or disposal systems required by the Department shall be submitted on forms supplied by the Department or on other forms approved by the Department for such use. Monthly reports shall be certified by the wastewater treatment plant operator in charge and shall be included in the discharge monitoring reports submitted each month.

5) If the operation and maintenance of the facility is contracted to a private concern, the permittee shall submit a copy of the contract, consistent with what is required by the approved Operation & Maintenance manual and signed only by the contractor, to the appropriate MassDEP Regional Office within thirty (30) days of permit issuance. Along with the contract, a detailed listing of all contract operation obligations of the proposed contractor at other facilities shall also be submitted.

6) All tests or analytical determinations to determine compliance with permit standards and requirements shall be done using tests and procedures found in the most recent

version of *Standard Methods for the Examination of Water and Wastewater* and shall be performed by a Massachusetts Certified laboratory.

7) The permittee shall notify the appropriate MassDEP Regional Office, in writing, within thirty (30) days of the following events:

   a) Any interruption of the treatment system operation, other than routine maintenance.
   b) Final shutdown of the treatment system.

9) The permittee shall contract to have any and all solids and sludges generated by the treatment system for which this permit is issued removed off site by a properly licensed waste hauler for disposal at an EPA/MassDEP approved facility. The name and license number of the hauler along with the quantity of wastes removed and the date(s) of removal shall be reported by the permittee in writing to the appropriate MassDEP Regional Office.

10) Simultaneously with the permit renewal application at year fifteen (2015) following the initiation of plant operations, the permittee shall submit to the Department for its review and approval an engineering report, prepared by a registered professional engineer, that outlines in sufficient detail what modifications (if any) to the facility or other changes are required to insure that the facility can remain in compliance with its GWDP and other applicable requirements through the next 5 year permit term (year 2020) and beyond; and

11) In the event that effluent limits are not met, or the discharge is determined to impair groundwater quality in accordance with 314 CMR 5.16(1), the permittee may be obligated to modify, supplement or replace the permitted treatment process so as to ensure that the discharge does not impair the ability of the groundwater to act as an actual or potential source of potable water.

E. Appeal Rights

During the thirty (30) day period following issuance of this permit, a Notice of Claim for an Adjudicatory Appeal may be sent by any person aggrieved (the “Petitioner”) by the issuance to:

Case Administrator
Office of Appeals and Dispute Resolution
Department of Environmental Protection
One Winter Street/2nd Floor
Boston, MA 02108

310 CMR 1.01(6)(b) requires the Notice of Claim to: include sufficient facts to demonstrate aggrieved person status; state the facts which are grounds for the appeal specifically, clearly and concisely; and, state relief sought. The permit shall become or remain effective at the end of the 30 day appeal period unless the person filing the Notice of Claim requests, and is granted, a stay of its terms and conditions. If a permit is modified under 314 CMR 2.10, only the modified terms and conditions may be subject to an Adjudicatory Appeal. All other aspects of the existing permit shall remain in effect during any such Adjudicatory Appeal.

Per 310 CMR 4.06, the hearing request to the Commonwealth will be dismissed if the filing fee is not paid. Unless the Petitioner is exempt or granted a waiver, a valid check payable to the Commonwealth to Massachusetts in the amount of $100.00 must be mailed to:

Commonwealth of Massachusetts
Department of Environmental Protection
P.O. Box 4062
Boston, MA 02211

The filing fee is not required if the Petitioner is a city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority effective January 14, 1994, or any municipal housing authority; or, per MGL 161A s. 24, the Massachusetts Bay Transportation Authority. The Department may waive the adjudicatory hearing filing fee for a Petitioner who shows that paying the fee will create and undue financial hardship. A Petitioner seeking a waiver must file, along with the hearing request, an affidavit setting forth the facts believed to support the claim of undue financial hardship.

II. GENERAL PERMIT CONDITIONS

The following conditions from 314 CMR 5.16 apply to all individual and general permits:

(1) No discharge authorized in the permit shall cause or contribute to a violation of the Massachusetts Surface Water Quality Standards (314 CMR 4.00) or any amendments thereto. Upon promulgation of any amended standard, this permit may be revised or amended in accordance with such standard and 314 CMR 2.10 and 3.13 or 5.12. Except as otherwise provided in 314 CMR 5.10 (3)(c), 310 CMR 5.10(4)(a)2 and 314 CMR 5.10(9), no discharge authorized in the permit shall impair the ability of the ground water to act as an actual or potential source of potable water. Evidence that a discharge impairs the ability of the ground water to act as an actual or potential source of potable water includes, without limitation, analysis of samples taken in a downgradient well that shows one or more exceedances of the applicable water quality based effluent limitations set forth in 314 CMR 5.10. In those cases where it is shown that a measured parameter exceeds the applicable water quality based effluent limitations set forth in 314 CMR 5.10 at the upgradient monitoring well, evidence that a discharge impairs the ability of the ground water to act as an actual or potential source of potable water is deemed to exist if a measured parameter in any downgradient well exceeds the level of that same measured parameter in the upgradient well for the same sampling period. . A statistical procedure approved by the Department shall be used in determining when a measured parameter exceeds the allowable level.

(2) Duty to comply. The permittee shall comply at all times with the terms and conditions of the permit, 314 CMR 5.00, M.G.L. c. 21, §§ 26 through 53 and all applicable state and federal statutes and regulations.

(3) Standards and prohibitions for toxic pollutants. The permittee shall comply with effluent standards or prohibitions established under § 307(a) of the Federal Act, 33 U.S.C § 1317(a), for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

(4) Proper operation and maintenance. The permittee shall at all times properly operate and maintain all facilities and equipment

installed or used to achieve compliance with the terms and conditions of the permit, and the regulations promulgated at 314 CMR 12.00 entitled “Operation and Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Discharges, and 257 CMR 2.00, Rules and Regulations for Certification of Operators of Wastewater Treatment Facilities”.

(5) Duty to halt or reduce activity. Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production or discharges or both until the facility is restored or an alternative method of treatment is provided. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit.

(6) Power Failure. In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

(a) provide an alternative power source sufficient to operate the wastewater control facilities; or

(b) halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

(7) Duty to mitigate. The permittee shall take all reasonable steps to minimize or prevent any adverse impact on human health or the environment resulting from non-compliance with the permit.

(8) Duty to provide information. The permittee shall furnish to the Department within a reasonable time as specified by the Department any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit, or to determine whether the permittee is complying with the terms and conditions of the permit.

(9) Inspection and entry. The permittee shall allow the Department or its authorized representatives to:

(a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records required by the permit are kept;

(b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit;
(c) Inspect at reasonable times any facilities, equipment, practices, or operations regulated or required under the permit; and
(d) Sample or monitor at reasonable times for the purpose of determining compliance with the terms and conditions of the permit.

(9A) The permittee shall physically secure the treatment works and monitoring wells and limit access to the treatment works and monitoring wells to those personnel required to operate, inspect and maintain the treatment works and to collect samples.

(9B) The permittee shall identify each monitoring well by permanently affixing to the steel protective casing of the well a tag with the identification number listed in the permit.

(10) Monitoring. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. Monitoring must be conducted according to test procedures approved under 40 CFR Part 136 unless other test procedures are specified in the permit.

(11) Recordkeeping. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and all records of all data used to complete the application for the permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time. Records of monitoring information shall include:
(a) The date, exact place, and time of sampling or measurements;
(b) The individual(s) who performed the sampling or measurement;
(c) The date(s) analyses were performed;
(d) The individual(s) who performed the analyses;
(e) The analytical techniques or methods used; and
(f) The results of such analyses.

(12) Prohibition of bypassing. Except as provided in 314 CMR 5.16(13), bypassing is prohibited, and the Department may take enforcement action against a permittee for bypassing unless:

(a) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if the permittee could have installed adequate backup equipment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
(c) The permittee submitted notice of the bypass to the Department:

1. In the event of an anticipated bypass, at least ten days in advance, if possible; or
2. In the event of an unanticipated bypass, as soon as the permittee has knowledge of the bypass and no later than 24 hours after its first occurrence.

(13) Bypass not exceeding limitations. The permittee may allow a bypass to occur which does not cause effluent limitations to be exceeded, but only if necessary for the performance of essential maintenance or to assure efficient operation of treatment facilities.

(14) Permit actions. The permit may be modified, suspended, or revoked for cause. The filing of a request by the permittee for a permit modification, reissuance, or termination, or a notification of planned changes or anticipated non-compliance does not stay any permit condition.

(15) Duty to reapply. If the permittee wishes to continue an activity regulated by the permit after the expiration date of the permit, the permittee must apply for and obtain a new permit. The permittee shall submit a new application at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Department in writing.

(16) Property rights. The permit does not convey any property rights of any sort or any exclusive privilege.

(17) Other laws. The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, nor does it relieve the permittee of its obligation to comply with any other applicable Federal, State, and local laws and regulations.

(18) Oil and hazardous substance liability. Nothing in the permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under § 311 of the Federal Act, 33 U.S.C. § 1321, and M.G.L. c. 21E.

(19) Removed substances. Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed in a manner consistent with applicable Federal and State laws and regulations including, but not limited to, the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26 through 53 and the Federal Act, , 33 U.S.C. § 1251 *et seq*, the Massachusetts Hazardous Waste Management Act, M.G.L. c. 21C, and the Federal Resource Conservation and Recovery Act, 42 U.S.C. § 6901, *et seq.*, 310 CMR 19.000 and 30.000, and other applicable regulations.

(20) Reporting requirements.

(a) Monitoring reports. Monitoring results shall be reported on a Discharge Monitoring Report (DMR) at the intervals specified elsewhere in the permit. If the permittee monitors any pollutant more frequently than required by the permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.

(b) Compliance schedules. Reports of compliance or non-compliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of the permit shall be submitted no later than 14 days following each schedule date.

(c) Planned changes. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility or activity which could significantly change the nature or increase the quantity of pollutants discharged. Unless and until the permit is modified, any new or increased discharge in excess of permit limits or not specifically authorized by the permit constitutes a violation.

(d) Anticipated non-compliance. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in non-compliance with permit requirements.

(e) 24 hour reporting. The permittee shall report any non-compliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the

circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the non-compliance, including exact dates and times, and if the non-compliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the non-compliance. The following shall be included as information which must be reported within 24 hours:

1. Any unanticipated bypass which exceeds any effluent limitation in the permit.

2. Violation of a maximum daily discharge limitation for any of the pollutants listed by the Department in the permit to be reported within 24 hours.

(f) Other non-compliance. The permittee shall report all instances of non-compliance not reported under 314 CMR 5.16(20)(a), (b), or (e) at the time monitoring reports are submitted. The reports shall contain the information listed in 314 CMR 5.16(20)(e).

(g) Toxics. All manufacturing, commercial, mining, or silvicultural dischargers must notify the Department as soon as they know or have reason to believe:

1. That any activity has occurred or will occur which would result in the discharge of any toxic pollutant listed in 314 CMR 3.17 which is not limited in the permit, if that discharge will exceed the highest of the following notification levels:

a. 100 micrograms per liter (100 ug/l);

b. 200 micrograms per liter (200 ug/l) for acrolein and acrylonitrile; 500 micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

c. Five times the maximum concentration value reported for that pollutant in the permit application; or

2. That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the permit application.

(h) Indirect dischargers. All Publicly Owned Treatment Works shall provide adequate notice to the Department of the following:

1. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to § 301 or 306 of the Federal Act, 33 U.S.C. § 1311 or 1316, if it were directly discharging those pollutants; and

2. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

(i) Information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.

(21) Signatory requirement. All applications, reports, or information submitted to the Department shall be signed and certified in accordance with 314 CMR 3.15 and 5.14.

(22) Severability. The provisions of the permit are severable, and if any provision of the permit, or the application of any provision of the permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of the permit, shall not be affected thereby.

(23) Reopener clause. The Department reserves the right to make appropriate revisions to the permit in order to establish any appropriate effluent limitations, schedules of compliance, or other provisions which may be authorized under the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26 through 53 or the Federal Act, 33 U.S.C. §1251 *et seq* in order to bring all discharges into compliance with said statutes.

(24) Approval of treatment works. All discharges and associated treatment works authorized herein shall be consistent with the terms and conditions of this permit. Any modification to the approved treatment works shall require written approval of the Department prior to the construction of the modification.

(25) Transfer of Permits.

(a) RCRA facilities. Any permit which authorizes the operation of a RCRA facility which is subject to the requirements of 314 CMR 8.07 shall be valid only for the person to whom it is issued and may not be transferred.

(b) Transfers by modification. Except as provided in 314 CMR 5.16(25)(a) and (c), a permit may be transferred by the permittee to a new owner or operator provided that the permit has been modified or revoked and reissued or a minor modification is made to identify the new permittee in accordance with 314 CMR 5.12(3) and (4).

(c) Automatic transfers. For facilities other than Privately Owned Wastewater Treatment Facilities (PWTFs)

that treat at least some sewage from residential uses, hospitals, nursing or personal care facilities, residential care facilities, and/or assisted living facilities, PWTFs that have been required to establish financial assurance mechanism(s) pursuant to 314 CMR 5.15(6), and RCRA facilities subject to the requirements of 314 CMR 8.07, a permit may be automatically transferred in accordance with 314 CMR 5.12(5).

(26) Permit Compliance Fees and Inspection Information. Except as otherwise provided, any permittee required to obtain a surface water or ground water discharge permit pursuant to M.G.L. c. 21, § 43 and 314 CMR 3.00 and 5.00, shall be required to submit the annual compliance assurance fee established in accordance with M.G.L. c. 21A, § 18 and 310 CMR 4.00 as provided in 314 CMR 2.12. The requirement to submit the annual compliance fee does not apply to any local government unit other than an authority. Any permittee required to obtain a surface water or ground water discharge permit pursuant to M.G.L. c. 21, §43 and 314 CMR 3.00 and 5.00 may be required to submit inspection information annually as a condition of the permit as provided in 314 CMR 2.12.

Appendix C – Basis of Design Memorandum

DRAFT

To	Oak Bluffs Wastewater Dept	
Date	December 22, 2014 – original January 25, 2015 – first revision February 28, 2015 – second revision	
From	Marc Drainville, GHD Inc.	
Subject	Oak Bluffs CZM Grant Basis of Design Memo—Pump Stations	Job No.

PURPOSE OF MEMO

The purpose of this memo is to provide a Basis of Design for the above referenced project

CODES AND STANDARDS

The following design guidelines and standards have been adopted for this project:

- Massachusetts Building Code
- TR-16: Guides for the Design of Wastewater Treatment Works; New England Interstate Water Pollution Control Commission, 2011 Edition.
- NFPA 820: Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
- Mass Bldg Code
- FEMA Flood Maps
- American Society of Civil Engineers Standard 24-05

BACKGROUND

Three wastewater pump stations in the Town of Oak Bluffs now lie in a 100 year flood plain. These pump stations are – Our Market, Lake Ave and Dukes County. According to the FEMA flood maps, all pump stations lie in a Zone AE flood zone with an elevation of 8.0. All three of these stations were designed when the 100 year floodplain was much lower and thus this infrastructure is now in a compromised position.

DESIGN WATER LEVEL

There are three factors that come into play when developing a design water level for these pump stations. These factors are: 1) the 100 year flood level, 2) sea level rise due to climate change and 3) freeboard considerations. Each of these factors will be detailed below.

100 Year Flood Zone

First, the AE flood zone refers to “Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply,” according to FEMA. The base flood elevation is shown on the maps and this base flood elevation considers waves between 1 and 3 feet above the still water elevation. For the area of these pump stations, all are in an AE (EL 8) flood zone (1988 NGVD datum).

Sea Level Rise

With respect to future sea level rise, there are several factors that need to be considered. First, "Sea Level Rise: Understanding and Applying Trends and Future Scenarios for Analysis and Planning" contains several sea level rise scenarios. It is clear that the "Lowest" scenario is not a prudent one to presume will reflect reality. This leaves three scenarios. It would seem that a moderate approach to the sea level rise would be reflected in the "Intermediate-high" scenario. This has a project sea level rise of up to 3.9 feet by Year 2100. However, the infrastructure that is involved in this grant has varying life expectancy as follows:

- Mechanical equipment, wooden buildings – 20 years
- Concrete and masonry – 50+ years

The installation/construction dates should be considered also as follows:

- Existing infrastructure – 2000
- New infrastructure - 2015

With varying life expectancies and installation/construction date, the expected sea level rise is as follows::

- 2020 (life expectancy of existing mechanical equipment and wooden structures) – 0.3 ft
- 2035 (new mechanical equipment) – 0.4 ft

Freeboard

There are various sources for maintaining proper freeboard for wastewater infrastructure in a 100 year flood plain. First is TR-16 which states the following: "Wastewater pumping stations, including all electrical and mechanical equipment, should be protected from physical damage by waters at or above the 100-year flood elevation." Further, "All entrances and/or unsealable openings of a station should be above the 100-year flood elevation."

Another resource is the American Society of Civil Engineers Standard 24-05, Flood Resistant Design and Construction, which is referenced by FEMA. This document requires infrastructure to be classified according to how essential it is and then a freeboard is assigned. The infrastructure in this grant is not specifically defined, but it is assumed that it would be categorized under Category III as "other municipal facilities." This reference recommends a 1 foot freeboard above the base flood elevation.

Summary

Summarizing the three factors yields the following:

- Base Flood Elevation – 8.0 (NGVD 88 datum)
- Sea Level Rise - 0.3-0.4 ft (depending on infrastructure)
- Freeboard – 1 feet

This yields a design elevation of 9.5 (rounded to nearest 0.5 ft).

NEEDS

The three above referenced pump stations all lie at elevations below the base flood elevation identified in the most recent FEMA flood maps. Needs for the pump stations are as follows:

Our Market

- Existing electrical is mounted too low and needs to be protected by raising or by sealing in an immersible structure
- Electrical wiring and other accessories in the pump station will need to be investigated to determine suitability for being submerged

Lake Ave

- Existing electrical panel is mounted too low and needs to be better protected by relocating to Dukes County Ave Pump Station
- Electrical wiring and other accessories in the pump station will need to be investigated to determine suitability for being submerged

Dukes County Ave

- Pump Station won't be accessible during a flooding event. Provide new emergency generator mounted at proper height
- Existing building is wooden and in the flood zone. Structure requires better protection from flooding including protection of electrical equipment

PROPOSED CHANGES

The recommended changes for the current grant are as follows:

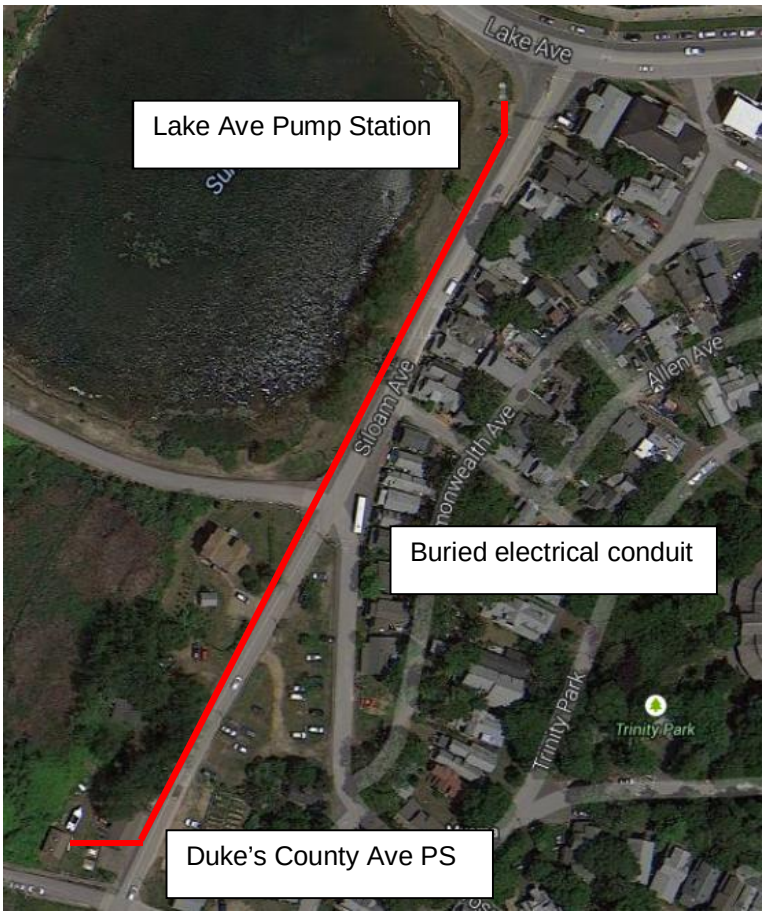
Our Market

- Proposed Changes: Protect controls by installing them in an immersible enclosure.
- Location and proposed changes are shown below

Install immersible panel

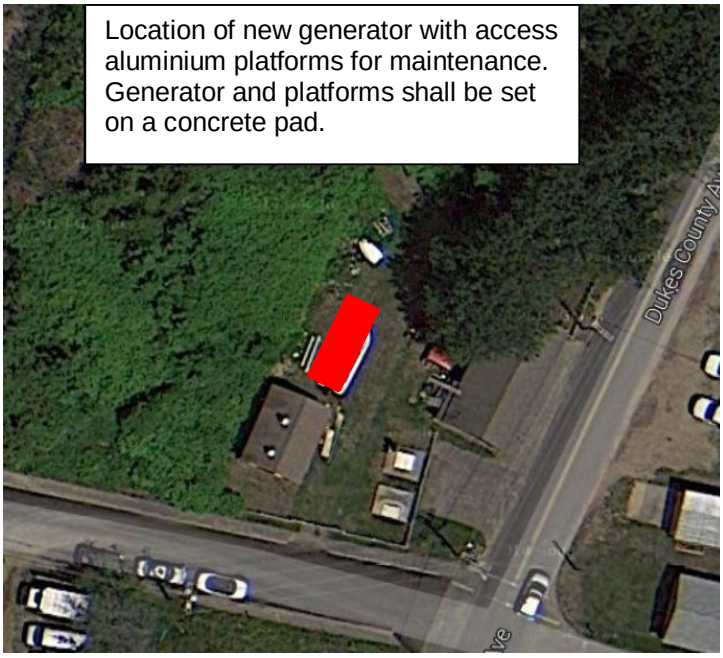
Lake Avenue

- Proposed Changes
    - Mount new control panel inside Dukes County Ave Pump Station (Town has an new panel),
    - install power conduit from Duke's County Ave station to Lake Ave (excavate and backfill trench on side of road) to power Lake Ave from Duke's County,
    - provide local shutoff at Lake Ave. Mount new panel with bottom at elevation 10.5.
- Location and proposed changes are shown below



Duke's County Ave

- Installation of a generator within the existing pump station was pursued vigorously to avoid visual impacts. However, code and design guideline issues prevented this from being able to occur. The design turned to focus on installing a new diesel generator on site with bottom at elevation 10.5. The generator will have an aluminum platform around it for maintenance access.



ELVATIONS RELATIVE TO SURVEY DATA

A survey was conducted and revealed several items:

- The original drawings likely used the 1929 datum
- The as-built elevations varied from the as-designed elevations

Specific elevation discussion is below for each station:

Dukes County Ave.

The finished floor elevation of the pump station on the design drawings indicate a finished floor elevation of 6.0 (datum not specified). The survey elevation of this same floor per the survey is 4.33 (1988 datum). The grade adjacent to the pump station was detected to be El 3.6 (1988 datum). Per previous calculations, the protected height of the equipment on this project should be El 9.5 (1988 datum) or 6 feet above grade.

Lake Ave

The concrete wet well and vault at this station were surveyed at an elevation of El 4.17 (1988 datum). Per previous calculations, the protected height of the equipment on this project should be El 9.5 (1988 datum) or 5.3 feet above grade.

Our Market

The concrete slab that supports the electrical equipment at this location was surveyed at an elevation of El 4.55 (1988 datum). Per previous calculations, the protected height of the equipment on this project should be El 9.5 (1988 datum) or 5 feet above grade.

PERMITS

By December, we had exhausted any possibility of placing the new generator in the existing Dukes County Pump Station. It was then clear that permitting would potentially need to be pursued. This process commenced immediately in December and concluded in February.

By February 1, we had received notification that two agency/organizational reviews were successful. The first was a review of the project with the Oak Bluffs Conservation Commission which issued a Determination of Applicability on January 22 that took effect on February 1 when no appeals were received. The second review was by the Martha's Vineyard Camp Meeting Association (MVCMA) which issued a permit on January 21 contingent on reducing the visual impact of the new generator.

PROJECT BIDDING AND DIVISION OF WORK

Since this project does not involve building work as defined in Chapter 149, the work will be bid as a 30-39 M project. This reduces the bidding timeframe.

In addition, the Town is in the process of installing sidewalks in the area where conduit will need to be run to power the Lake Ave station. As a result, we are in discussions with the Highway Dept. to add conduit installation as part of that work (meeting scheduled for 3/5/15). As a result, two construction projects are anticipated.

SCHEDULE

The schedule has been impacted by the need to go to the Conservation Commission for project approval as well as the severe winter weather which has impacted the ability of local generator manufacturers to supply design information. The schedule has been helped by the change in the type of bidding. The current schedule is shown below and the net impact of the schedule changes is that the shows the need for additional time. Based on discussions with CZM, the current plan will be to complete the design, bid the project and then have a discussion with CZM about the potential of getting an extension before the Town signs the Notice to Proceed.

The anticipated scheduled is as follows:

Tentative Construction Schedule

	Main Project	**Highway Dept conduit installation to Lake Ave PS (tentative)**
Submit to Central Register	March 10, 2015	
Appears in Central Register	March 18, 2015	
Bid Opening	April 2, 2015	
Issue Notice of Award	April 8, 2015	
Signed Contract/ Notice to Proceed	April 22, 2015	March, 2015
Anticipated date for longest lead item to be on site (generator)	July 1, 2015	
Installation Complete	August 1, 2015	
Startup Complete	September 1, 2015	June, 2015
Final Payment	September 15, 2015	July, 2015

LEGEND

National Flood Hazard Layer

Zone

- AE- An area inundated by 100-year flooding, for which BFEs have been determined.
- X500 - An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding

Paper Size ANSI A

0 0.0125 0.025 0.05 Miles

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

N

TOWN OF OAK BLUFFS, MA
Oak Bluffs CCR Grant

Lake Ave Pump Station
National Flood Map

Job Number
Revision A
Date 25 Feb 2014

Figure 1

1545 Iyannough Road, Hyannis Massachusetts 02601 USA T 1 508 362 5680 F 1 508 362 5684 E hyamail@ghd.com W www.ghd.com

C:\Proposals\Oak Bluff\2014\Figure 1 Lake Ave PS.mxd

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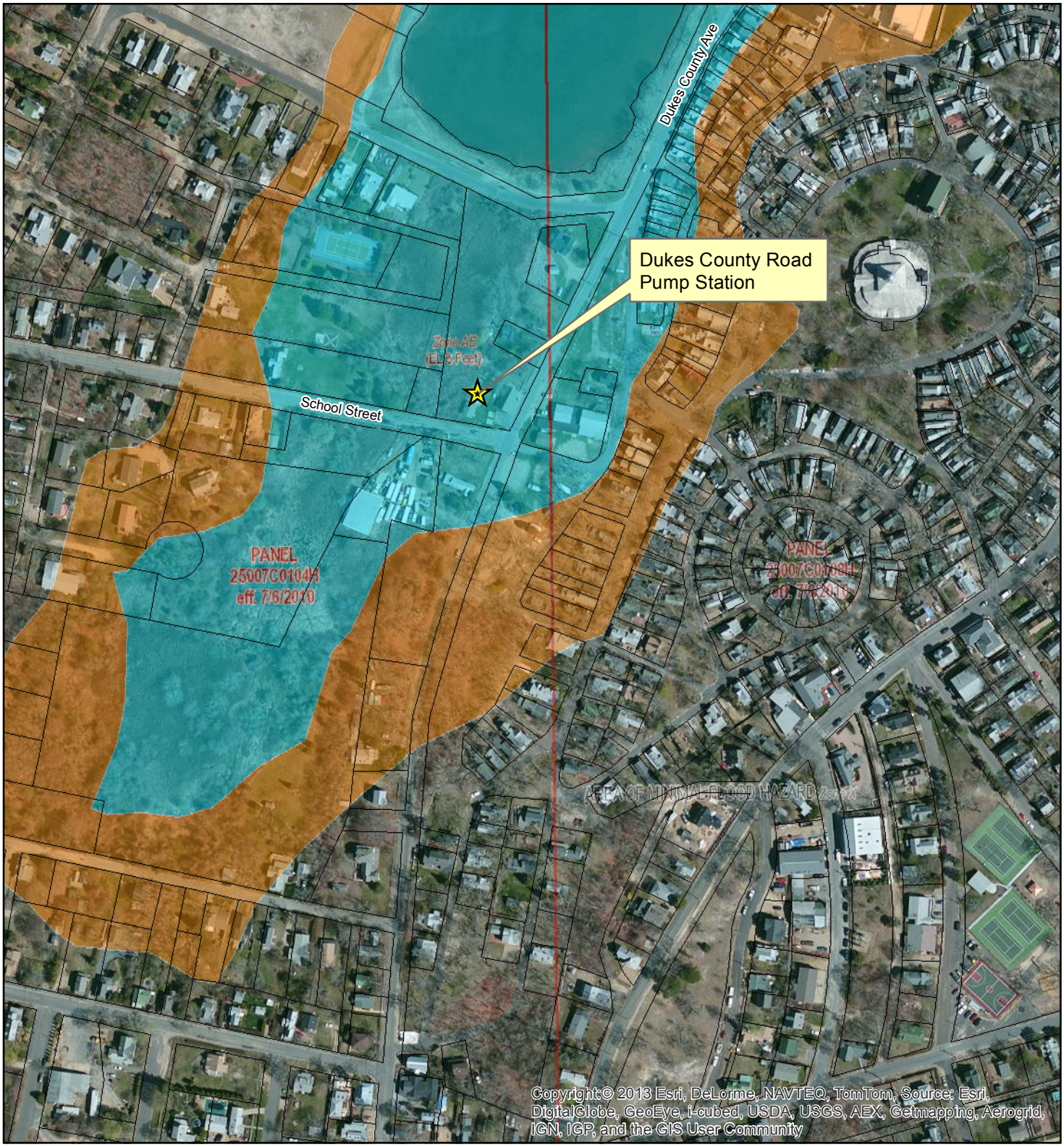

LEGEND

National Flood Hazard Layer
Zone

- AE- An area inundated by 100-year flooding, for which BFEs have been determined.
- X500 - An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding

Paper Size ANSI A

0 0.0125 0.025 0.05 Miles

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

N

TOWN OF OAK BLUFFS, MA
Oak Bluffs CCR Grant

Job Number
Revision A
Date 25 Feb 2014

Dukes County Avenue Pump Station
National Flood Map

Figure 2

1545 Iyannough Road, Hyannis Massachusetts 02601 USA T 1 508 362 5680 F 1 508 362 5684 E hyamail@ghd.com W www.ghd.com

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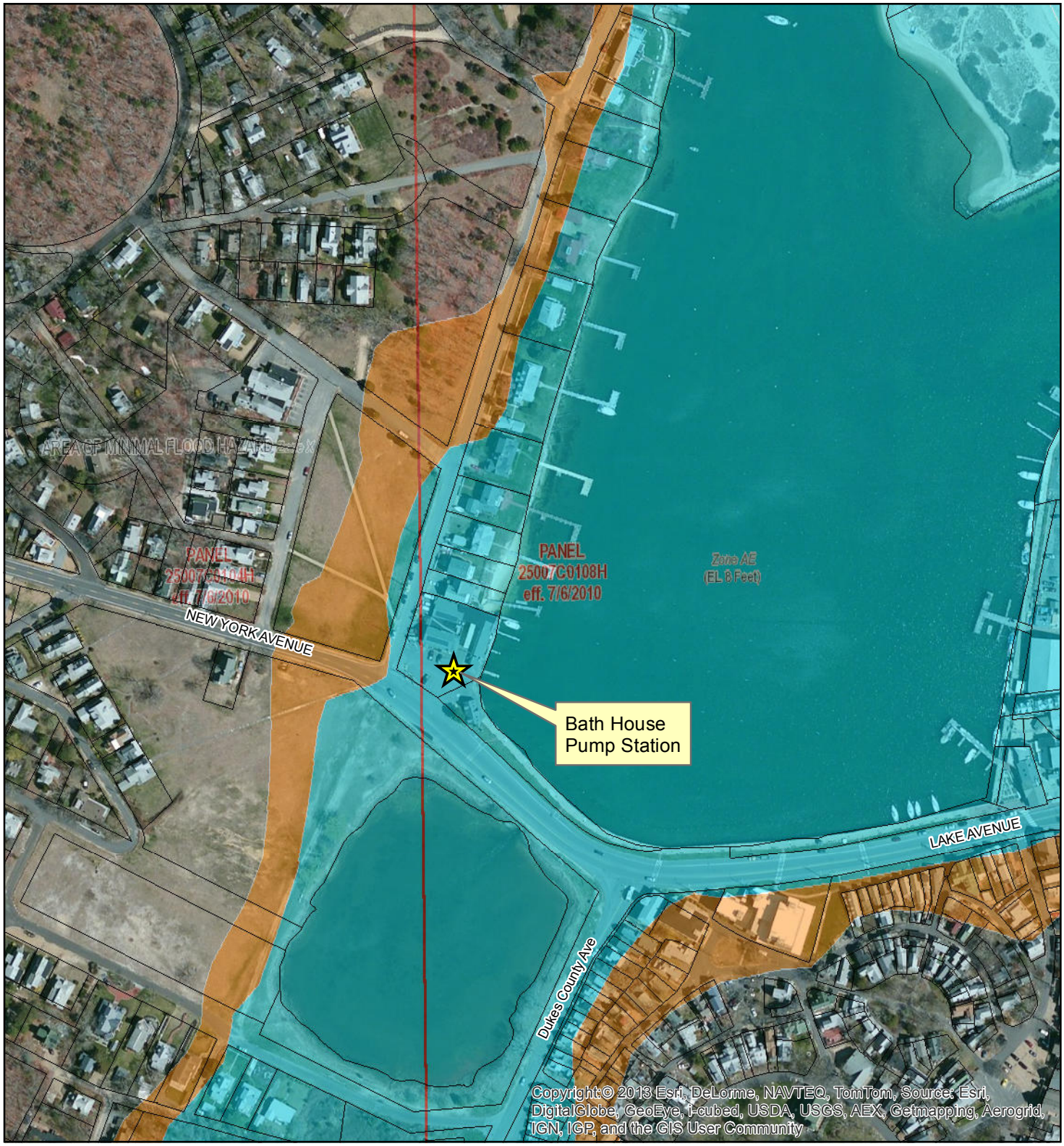
Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:jjobrien



LEGEND

National Flood Hazard Layer
Zone

AE- An area inundated by 100-year flooding, for which BFEs have been determined.

X500 - An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding

Paper Size ANSI A

0 0.0125 0.025 0.05 Miles

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

N

TOWN OF OAK BLUFFS, MA
Oak Bluffs CCR Grant

Bath House Pump Station
National Flood Map

Job Number
Revision A
Date 25 Feb 2014

Figure 3

1545 Iyannough Road, Hyannis Massachusetts 02601 USA T 1 508 362 5680 F 1 508 362 5684 E hyamail@ghd.com W www.ghd.com

C:\Proposals\Oak Bluff\2014\Figure 3 Bath House PS.mxd

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Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:jjobrien

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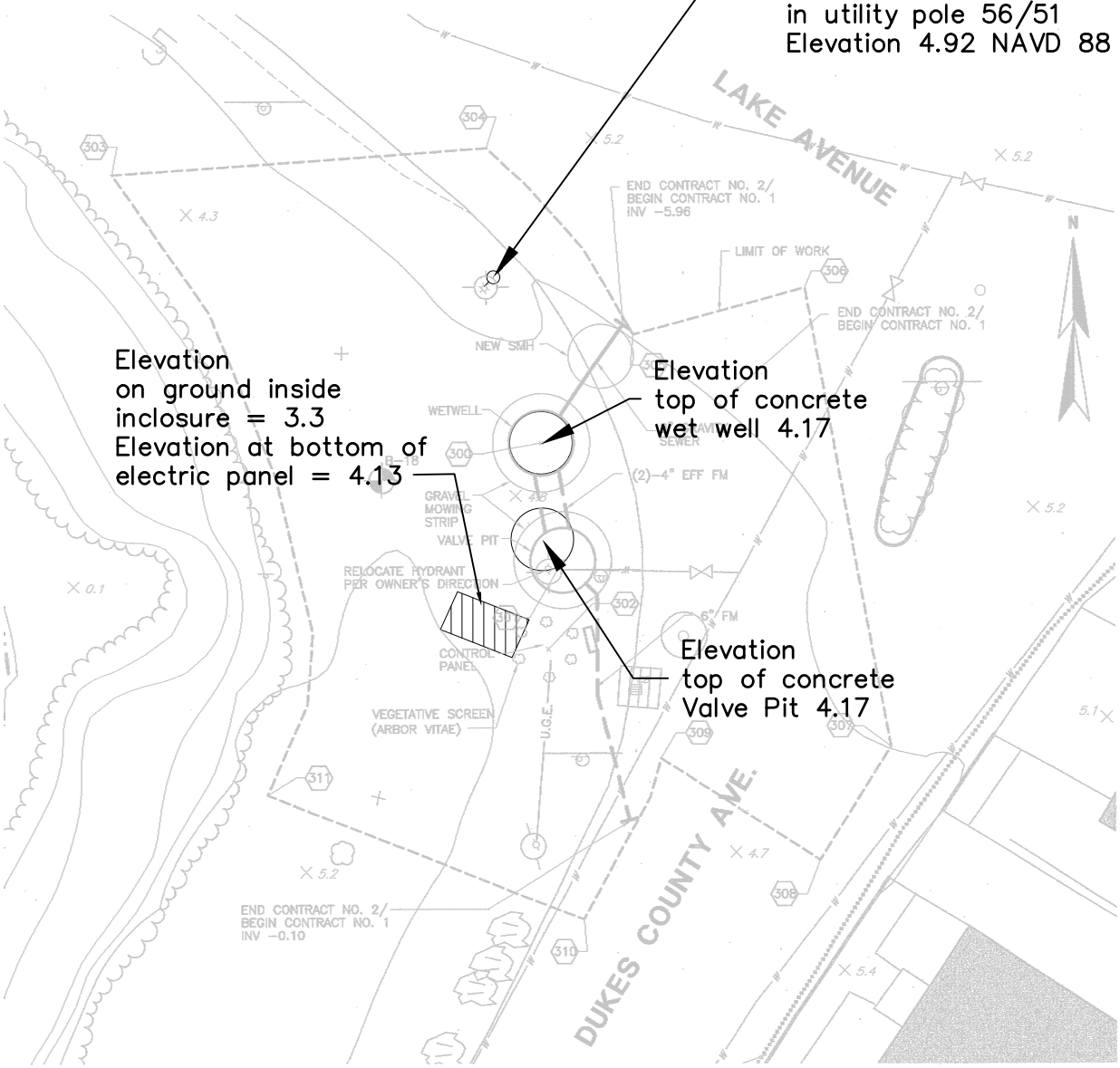
310	166485.5535	1623601.4236	LIMIT OF WORK
311	166500.6737	1623562.6121	LIMIT OF WORK

NOTE:
COORDINATES PROVIDED ARE MASS. STATE PLANE COORDINATE SYSTEM.
SEE GENERAL SITE LAYOUT NOTE NO. 1, DWG C-1 .



NOTES:
1. RETAIN EXISTING TREES AND SHRUBS TO THE EXTENT PRACTICLE. REPLACE ANY TREES AND SHRUBS IN KIND, IF THEY ARE REMOVED FOR WORK.
2. RESTORE ORIGINAL GRADES.
3. LOAM AND SEED ALL DISTURBED AREAS WITHIN LIMITS OF WORK, AND DISTURBED AREAS OUTSIDE LIMITS OF WORK IN ACCORDANCE WITH SPECIFICATION SECTION 02480.

LAKE AVENUE SITE PLAN

Project: GHD1-2276-0001

Green Seal Environmental, Inc.
114 State Road, Building B
Sagamore Beach, MA 02562
Tel: (508) 888-6034
Fax: (508) 888-1506
www.gseenv.com

PROJECT NAME: Oak Bluffs Coadtal Zone Resiliency Project	DRAWING TITLE: Site Elevations	CAD TECH: SGL	
		CHECKED BY: RK	
LOCUS: Lake Ave @ Siloam Ave	PREPARED FOR: GHD Inc. 1545 Iyannough Road Route 132 Hyannis, MA 02601	SCALE: 1"=20'	
		DATE: 01/23/15	
		SHEET 2 OF 3	

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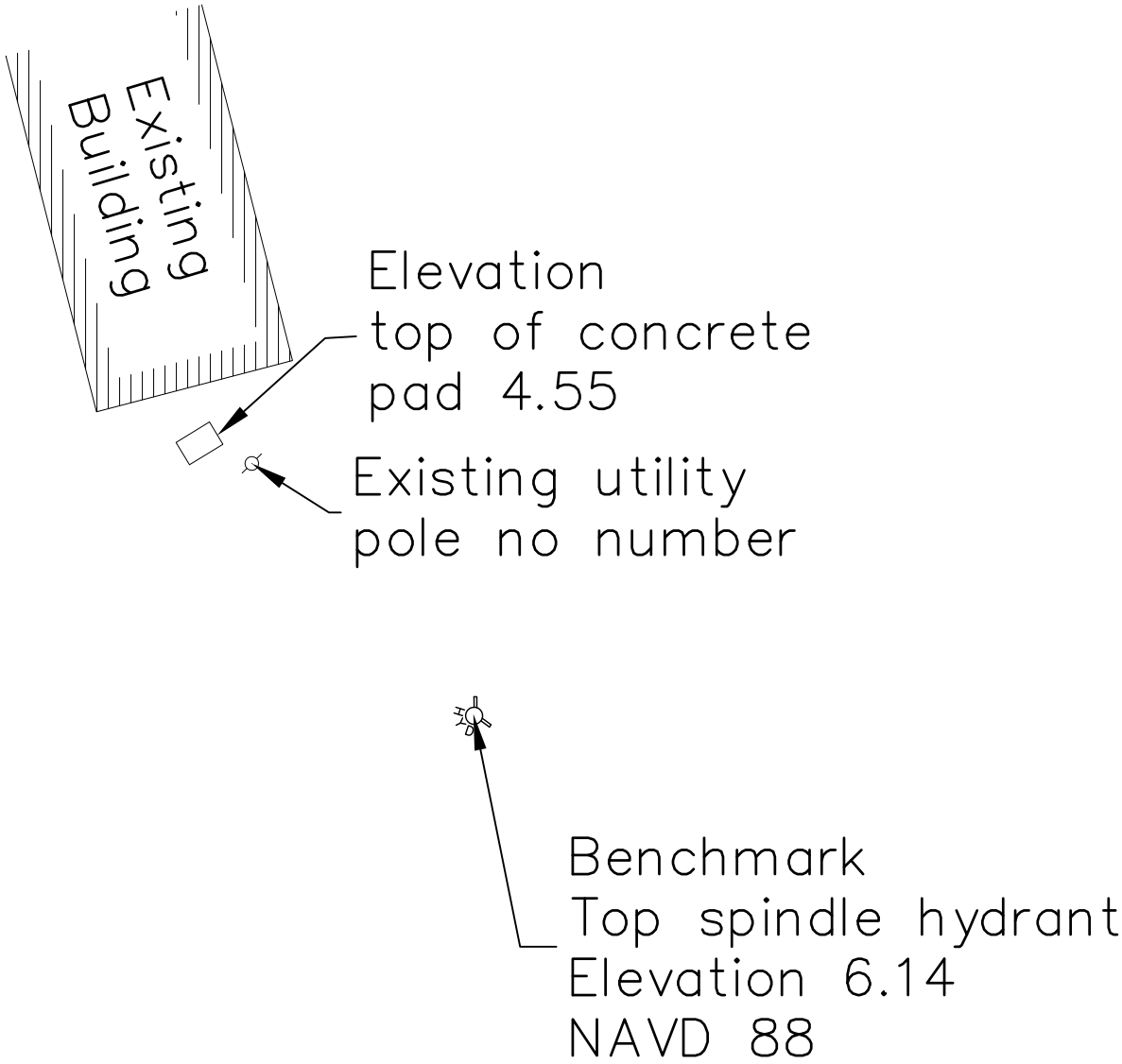
Adobe PDF



Project: GHD1-2276-0001

Green Seal Environmental, Inc.
114 State Road, Building B
Sagamore Beach, MA 02562
Tel: (508) 888-6034
Fax: (508) 888-1506
www.gseenv.com

PROJECT NAME: Oak Bluffs Coadtal Zone Resiliency Project	DRAWING TITLE: Site Elevations	CAD TECH: SGL	
		CHECKED BY: RK	
LOCUS: Bath House, Lake Ave	PREPARED FOR: GHD Inc. 1545 Iyannough Road, Route 132, Hyannis, MA 02601	SCALE: 1"=20'	
		DATE: 01/23/15	
		SHEET 3 OF 3	

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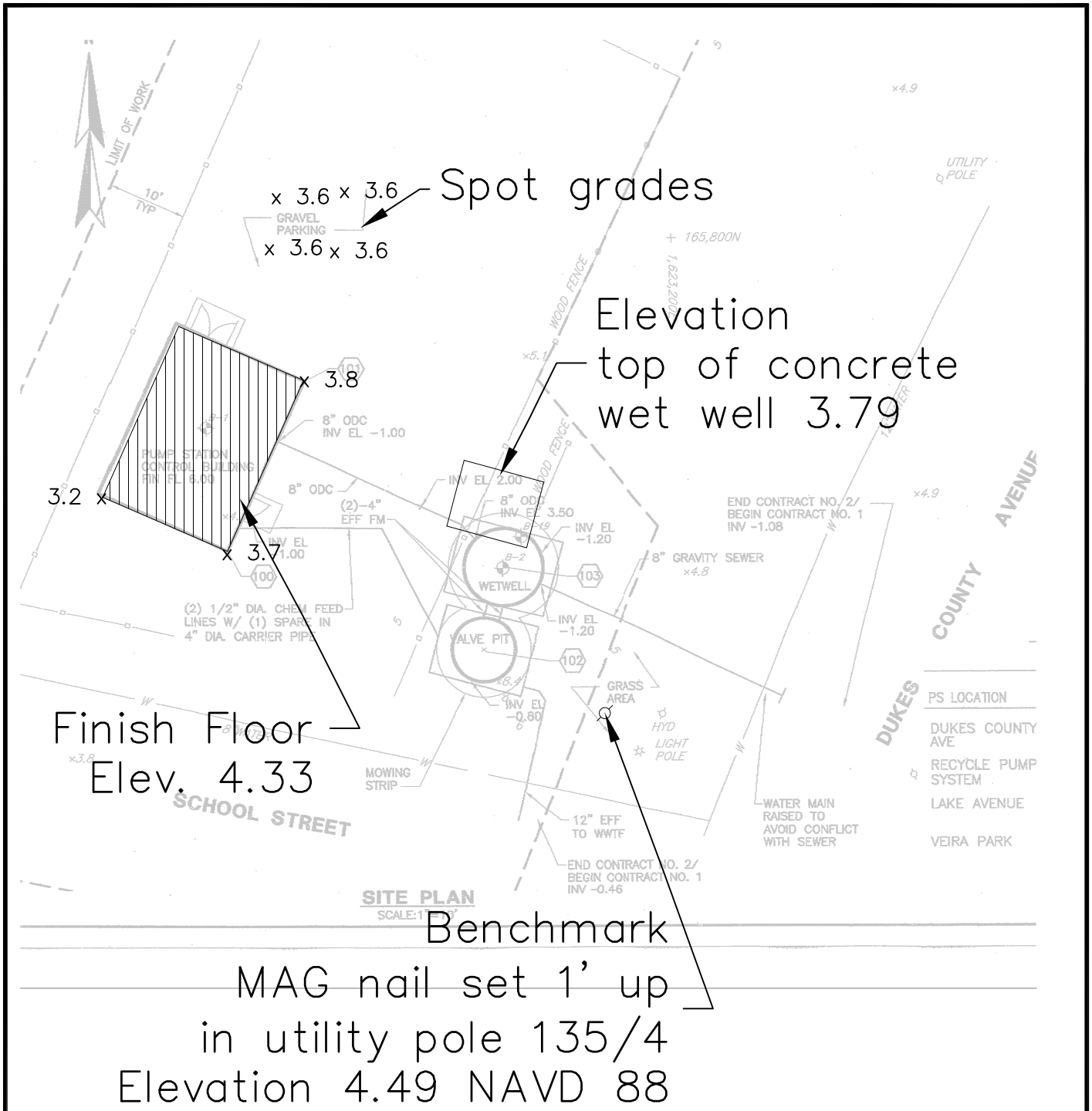

Project: GHD1-2276-0001

Green Seal Environmental, Inc. 114 State Road, Building B Sagamore Beach, MA 02562 Tel: (508) 888-6034 Fax: (508) 888-1506 www.gseenv.com	PROJECT NAME: Oak Bluffs Coadtal Zone Resiliency Project	DRAWING TITLE: Site Elevations	CAD TECH: SGL CHECKED BY: RK
	LOCUS: Dukes County Ave @ School St	PREPARED FOR: GHD Inc. 1545 Iyannough Road Route 132 Hyannis, MA 02601	SCALE: 1"=20' DATE: 01/23/15 SHEET 1 OF 3

S:\Clients\GHD Inc\GHD1-2276-0001\CAD\GHD1-2276 OAK BLUFFS.dwg, Dukes County, 1/23/2015 3:49:50 PM, Adobe PDF

DRAFT

GHD Inc

1545 Iyannough Road
Hyannis MA 02601

T: 774-470-1630 F: 774-470-1631 E: hyamail@ghd.com

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DRAFT

www.ghd.com

Appendix D
Infiltration and Inflow Analysis – Inventory of Existing Conditions

Memorandum

December 15, 2017

To:	Brian Dudley, MassDEP	Ref. No.:	11144141
From:	Anastasia Rudenko PE, BCEE, ENV SP Marc Drainville PE, BCEE, LEED AP	Tel:	774-470-1637 774-470-1637
cc:	James Monteith, Town of Oak Bluffs		
Subject:	**Infiltration and Inflow (I/I) Analysis – Inventory of Existing Conditions**		

1. Purpose

The purpose of this memorandum is to summarize the Oak Bluffs Inventory of Existing Conditions, as outlined in the 'Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation Survey, prepared by MassDEP – dated May 2017.'

2. Inventory Sources of Information

The following sources of information were reviewed in the development of this memorandum:

- 'Wastewater Collection, Treatment and Disposal Facilities for Oak Bluffs, Massachusetts Preliminary Design Report' prepared for the Town of Oak Bluffs by Wright-Pierce in association with Horsley & Witten, dated March 1999.
- 'Town of Oak Bluffs, Massachusetts Wastewater Facilities Wastewater Collection System – Contract No. 1 Record Drawings March 2002 CWSRF-610,' prepared by Wright-Pierce.
- 'Force Main Extension in Oak Bluffs, Mass. Prepared for Town of Oak Bluffs – MV-8889,' prepared by Schofield, Barbini & Hoehn, Inc., dated June 2003.
- 'Sewer Layout Oak Bluffs, Mass. Prepared for Ocean View Restaurant – MV-9475,' prepared by Schofield, Barbini & Hoehn, Inc., dated January 2004.
- 'Proposed Sewer Extension – Martha's Vineyard Hospital Project. Prepared for Town of Oak Bluffs – MV-5046,' prepared by Schofield, Barbini & Hoehn, Inc., dated December 2005.
- 'Site Plan SP-1 Oak Bluffs, Mass. Prepared for Gwendolyn Wharton – MV-7633,' prepared by Schofield, Barbini & Hoehn, Inc., dated September 2006.
- 'Proposed Sewer Extension Beach Road Project Oak Bluffs, Mass. Prepared for Town of Oak Bluffs – MV-8269,' prepared by Schofield, Barbini & Hoehn, Inc., dated January 2009.

- ‘Proposed Sewer Connection Oak Bluffs, Mass. Prepared for Marcia Graham – MV-10541,’ prepared by Schofield, Barbini & Hoehn Inc., dated January 2009.
- ‘As-Built Sewer Extension Oak Bluffs, Mass. Prepared for Town of Oak Bluffs – MV-10541,’ prepared by Schofield, Barbini & Hoehn Inc., dated March 2009.
- ‘Proposed Sewer Extension Martha’s Vineyard Regional High School Project Oak Bluffs, Mass. Prepared for Martha’s Vineyard Regional High School – MV-5752-D,’ prepared by Schofield, Barbini & Hoehn, Inc., dated December 2009.
- ‘As-Built Sewer Extension MV Camp Meeting Association Oak Bluffs, Mass. Prepared for Town of Oak Bluffs – MV-10526,’ prepared by Schofield, Barbini & Hoehn, Inc., dated June 2010.
- ‘As Built Plans of Sewer Extension Martha’s Vineyard Regional High School Project Oak Bluffs, Mass. Prepared for Town of Oak Bluffs Wastewater Department – MV-5752-S,’ prepared by Schofield, Barbini & Hoehn Inc., dated September 2010.
- ‘Town of Oak Bluffs Wastewater Treatment Facility Evaluation – Final Draft Report,’ prepared by GHD, dated June 2017.

The following sources of data were not available for this analysis:

- Geographical Information System (GIS) data of the wastewater system
- Computer models of the collection system
- Streamflow monitoring level data

3. Inventory of Existing Conditions

The Town of Oak Bluffs has a separate sewerage collection system that conveys flow to the Oak Bluffs Wastewater Treatment Facility (WWTF). The Oak Bluffs collection system is shown in the attached drawing. The WWTF is a relatively new system, which was constructed in 2002. Several small extensions have been added to the collection system since its original construction. The system does not have any underdrain systems. The collection system is a hybrid low pressure and gravity system.

Wastewater discharged by users of the sewer system is conveyed by gravity and/or pumping to the Dukes County Avenue Pump Station and then is conveyed to the Oak Bluffs WWTF through a 12-inch diameter force main. Three small pump stations discharge directly into the force main that conveys wastewater to the treatment facility. The gravity portion of the system is comprised of approximately 7,000 linear feet of 8-inch PVC. The low-pressure system piping material is high-density polyethylene.

The collection system has three flow meters—an influent flow meter, and two effluent flow meters (one at Ocean Park and one at the WWTF at a V-notch weir located after the UV system). Interviews with WWTF personnel were conducted as part of the inventory of existing conditions. The system does not have a history of infiltration/inflow (I/I) related overflows, bypasses or surcharging. The staff perform operations and maintenance tasks on the collection system on a regular basis.

As outlined in the Oak Bluffs Wastewater Treatment Facility Evaluation submitted to DEP on August 29, 2017, an analysis of effluent flows over the 67-month period of January 2009 through July 2014 did not

indicate significant variability attributable to wet-weather operating conditions suggesting that the sewer collection system is a relatively tight system with minimal infiltration and inflow. Additionally, an analysis of plant data shows influent concentrations for BOD and TKN (Tables 1 and 2) within the range considered typical for medium-to-strong sewage, indicating minimal dilution from I/I entering the collection system.

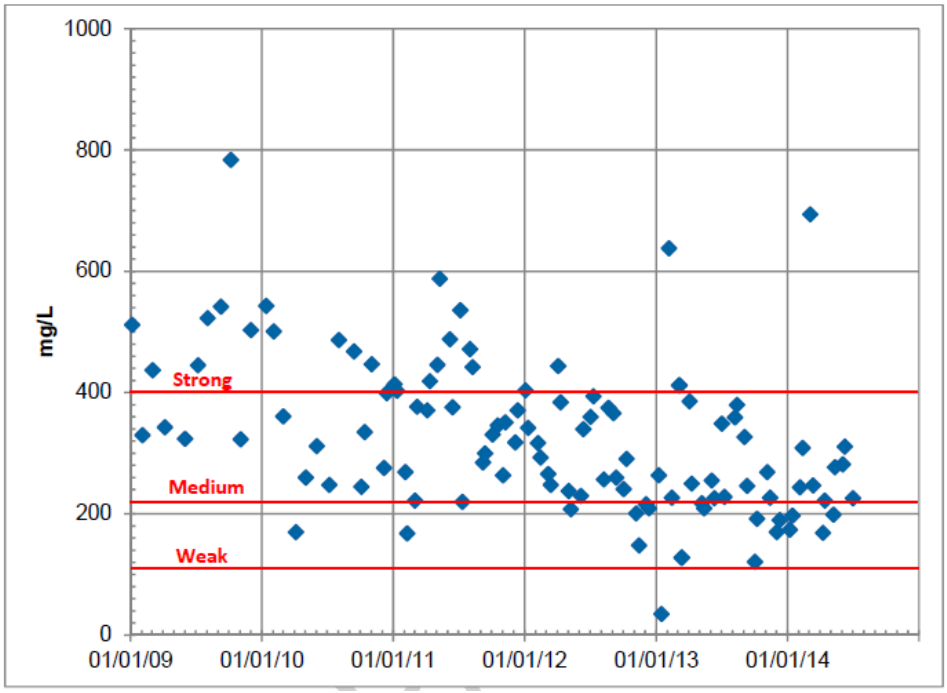

Table 1 – Influent BOD Concentration

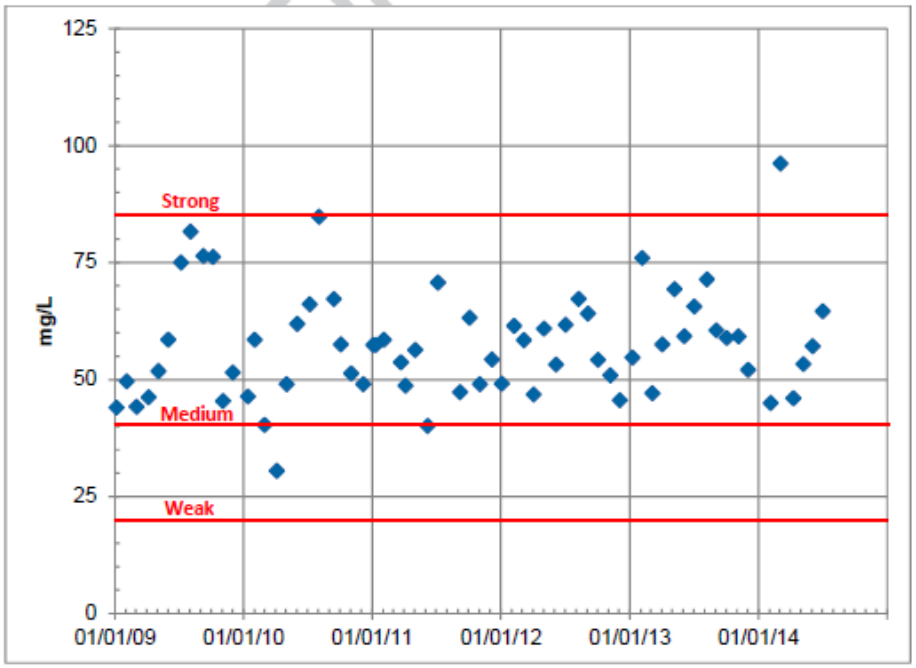

Table 2 – Influent TKN Concentration

As part of the Comprehensive Wastewater Management Planning effort initiated in 2017, a water balance was developed to determine the percentage of water that enters the Town's collection system as wastewater and to estimate I/I in the system. The water balance used the following equation:

(Water Usage) x (Water to Wastewater Conversion Factor) + (Sludge Wasting) + (I/I) + (Septage) = (Wastewater Effluent Flow)

The Town does not accept septage at the WWTF. Water usage flow and wastewater flow were obtained from the following data sets that were provided by the Town:

- Bi-annual water usage data for years 2014 through 2016 was used to calculate an average daily water usage flow rate for properties connected to the public water system and public sewer. Average water uses by land use type were calculated and used to estimate water usage for properties served by private wells and connected to the public sewer.
- WWTF wastewater effluent flow data for years 2014 through 2016 was used to calculate an average daily wastewater flow rate.
- Sludge flow data from 2015 was used to calculate an average daily sludge wasting flow rate.

The two unknown variables in the equations above were derived by iteration using the following initial assumptions:

- 80% of water consumption was assumed to be discharged as wastewater, in accordance with the MassDEP 'Guidelines for the Design, Construction, Operation and Maintenance of Small Wastewater Treatment Facilities with Land Disposal', dated November 2014.
- Due to relatively young age of the collection system the normal range of infiltration recommended in TR-16 (250 – 500 gpd/in .diameter/mile) was used as an initial estimate of infiltration.

Three iterations of the water balance are shown below, estimating I/I as the TR-16 recommended design allocation (250 – 500 gpd/in. diameter/mile) and no infiltration. As shown in the three scenarios, the water balance becomes closer as less infiltration is estimated in the system, indicating that I/I in the system is likely below the normal range of infiltration provided in the TR-16 guidelines.

Parameter	Average Flow (gpd) – Infiltration estimated at 500 gpd/in.dia/mile	Average Flow (gpd) – Infiltration estimated at 250 gpd/in.dia/mile	Average Flow (gpd) – Infiltration estimated at 0 gpd/in.dia/mile	Source
Water to Wastewater Conversion Factor	0.8	0.8	0.8	Guidelines for the Design, Construction, Operation and Maintenance of Small Wastewater Treatment Facilities with Land Disposal', MassDEP – November 2014
Septage	0	0	0	Facility does not accept septage
Infiltration	5,400	2,700	0	Estimate
Sludge Wasting	1,100	1,100	1,100	2015 WWTF data

Parameter	Average Flow (gpd) – Infiltration estimated at 500 gpd/in.dia/mile	Average Flow (gpd) – Infiltration estimated at 250 gpd/in.dia/mile	Average Flow (gpd) – Infiltration estimated at 0 gpd/in.dia/mile	Source
Water Usage – Properties on Public Water System and Public Sewer	124,400	124,400	124,400	January 2014 – December 2016 Water Use Date (provided by Oak Bluffs Water Department)
Water Usage – Properties on Private Wells and Public Sewer	4,700	4,700	4,700	Estimate based on water use data for properties served by public water system
Effluent Wastewater Flow	97,300	97,300	97,300	January 2014 – December 2016 WWTF Effluent Flow Data
Influent Wastewater Flow	**98,400**	**98,400**	**98,400**	**Effluent Flow + Sludge Wasting**
WW Flow (Calculated Through the Water Balance)	**108,680**	**105,980**	**103,280**	
Percent Difference	**10%**	**8%**	**5%**	

As noted above the water balance balances very well and this balance is at its best with little to no infiltration.

4. Flow Analysis

The previous summary demonstrated no excessive infiltration and inflow. This was demonstrated by the following:

- Very small length of gravity sewer in the collection system
- No evidence of wet weather flow impacts at the wastewater treatment facility (per the 'Town of Oak Bluffs Wastewater Treatment Facility Evaluation Final Draft Report' dated June 2017)
- Medium to strong concentration of influent TKN and BOD indicating minimal dilution from I/I
- Small amount of infiltration and inflow indicated by the water balance

Based on the evaluation described above, it is anticipated that a continuous flow monitoring program will provide minimal value for use in identifying potential sources of I/I within the Town's collection system. The Town requests that the analysis of available plant data described above, which demonstrates that the existing system has far less I/I than the typical design allowance outlined in TR-16, be used as an

“alternative approach” to implementing a continuous flow monitoring program, in accordance with the May 2017 MassDEP I/I guidelines.

This alternative approach is being proposed because it meets the specified goal from the MassDEP I/I Guidelines of “identifying and removing excessive I/I” through an alternative (desktop) evaluation. Due to the relatively young age of the system, which only consists of one small sewer-shed, the desktop evaluation conducted as part of this “Inventory of Existing Conditions” demonstrates limited quantities of I/I are present in the subject collection system. For this collection system, continuous flow monitoring is not considered a cost effective approach to determining excessive I/I, especially since the multiple analyses explained above demonstrate limited I/I is present.

5. I/I Analysis Schedule

The schedule for the I/I analysis is outlined below:

1. Compile and submit Inventory of Existing Conditions prior to December 31, 2017 (funding restrictions prevented the Town from being able to conduct flow monitoring during the wet spring season in 2017).
2. It is requested that a meeting be held with MassDEP in the first week of January 2018 to review the proposed alternative approach outlined in this report. GHD will coordinate the meeting date and time. If the alternative approach proposed in this memorandum is deemed unacceptable by MassDEP by January 10, 2018, a revised approach will be submitted for review by January 20, 2018.

DRAWING INDEX

SHEET NO	DWG NO	TITLE
CIVIL –		COVER
1	C–1	INDEX SHEET
2	C–2	GENERAL NOTES AND LEGEND
3	C–3	EFFLUENT/FER FORCE MAINS STA 100+00 TO 111+00
4	C–4	INFLUENT/EFFLUENT FORCE MAINS STA 111+00 TO 122+00
5	C–5	INFLUENT/EFFLUENT FORCE MAINS STA 122+00 TO 133+00
6	C–6	INFLUENT/EFFLUENT FORCE MAINS STA 133+00 TO 144+00
7	C–7	INFLUENT/EFFLUENT FORCE MAINS STA 144+00 TO 155+00
8	C–8	INFLUENT/EFFLUENT FORCE MAINS STA 155+00 TO 166+00
9	C–9	INFLUENT/EFFLUENT FORCE MAINS STA 166+00 TO 176+00
10	C–10	INFLUENT/EFFLUENT FORCE MAINS STA 176+00 TO 184+74
11	C–11	EFFLUENT FORCE MAIN STA 200+00 TO 205+78 STA 300+00 TO 305+00
12	C–12	EFFLUENT FORCE MAIN STA 305+00 TO 317+00
13	C–13	EFFLUENT FORCE MAIN STA 317+00 TO 325+00
14	C–14	EFFLUENT FORCE MAIN STA 325+00 TO 334+00
15	C–15	WAMSUTTA AVENUE GRAVITY SEWER STA 10+00 TO 16+43.5
16	C–16	INFLUENT FORCE MAIN AND GRAVITY SEWER STA 20+00 TO 20+30, STA 20+30 TO 29+00 STA 30+00 TO 32+00
17	C–17	LAKE AVENUE GRAVITY SEWER STA 31+00 TO 43+97.03
18	C–18	OAK BLUFFS AVENUE GRAVITY SEWER STA 50+00 TO 55+15
19	C–19	CIRCUIT AVE EXT, NORTH BLUFF LANE, PASQUE AVE, GRAVITY SEWER STA 60+00 TO 65+89.30, STA 67+00 TO 68+71.25, 69+00 TO 70+36.54
20	C–20	OCEAN AVENUE GRAVITY SEWER STA 70+00 TO 77+14
21	C–21	KENNEBEC AVENUE GRAVITY SEWER STA 80+00 TO 86+49.76
22	C–22	CENTRAL AVENUE GRAVITY SEWER STA 90+00 TO 96+23.77 STA 97+00 TO 98+79, STA 99+00 TO 99+77
23	C–23	LOW PRESSURE SEWER SYSTEM
24	C–24	LOW PRESSURE SEWER SYSTEM
25	C–25	LOW PRESSURE SEWER SYSTEM
26	C–26	LOW PRESSURE SEWER SYSTEM
27	C–27	LOW PRESSURE SEWER SYSTEM
28	C–28	LOW PRESSURE SEWER SYSTEM
29	C–29	LOW PRESSURE SEWER SYSTEM
30	C–30	LOW PRESSURE SEWER SYSTEM
31	C–31	LOW PRESSURE SEWER SYSTEM
32	C–32	LOW PRESSURE SEWER SYSTEM
33	C–33	LOW PRESSURE SEWER SYSTEM
34	C–34	LOW PRESSURE SEWER SYSTEM
35	C–35	LOW PRESSURE SEWER SYSTEM
36	C–36	LOW PRESSURE SEWER SYSTEM
37	C–37	DETAILS I
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40	E–1	ELECTRICAL LEGEND AND GENERAL NOTES
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PROGRESS PRINTS
ISSUED FOR REVIEW: SEPT 1999
ISSUED FOR BIDDING: DEC 1999
VAULT LOCATION:
LAST WORKED ON:
FILENAME:

NO	REVISIONS	APP'D	DATE
1	RECORD DRAWING		1/03

DRAWN BY: JJM
CHECKED BY: KCS
DATE: DEC. 1999
APPROVED BY: MDC
DATE: DEC. 1999
BOOK NO.
PROJECT NO. 6667F
SCALE: 1"=400'

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OAK BLUFFS WASTEWATER FACILITIES
OAK BLUFFS, MASSACHUSETTS
CONTRACT NO. 1
WASTEWATER COLLECTION SYSTEM

INDEX SHEET

DWG C–1

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