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Subject **Town of Orleans, MA**
Water Quality and Wastewater Planning
Task Number 8.1 – Preplanning - Treatment and Disposal Site Investigations
Deliverable 8.1.1.D – DRAFT Technical Memorandum – Pleasant Bay -
Composite Wastewater Management Analysis

Project Number 60476644

From Thomas Parece, P.E., AECOM Project Manager

Date October 25, 2016

1. Background

This Technical Memorandum documents a summary of Composite Wastewater Management Analysis performed for the Pleasant Bay Watershed. The analysis summarizes the existing total nitrate load, target nitrate load and nitrate load reduction by technology (traditional and non-traditional) for each of Pleasant Bay’s subwatersheds.

2. Introduction

The focus of this Composite Wastewater Management Analysis is to provide a summary of the nitrate load reduction by technology for each sub-estuary within the Pleasant Bay Watershed. The goal of the analysis is to list the Town’s nitrate load reduction by technology meeting the Town’s nitrate load responsibility.

3. Composite Wastewater Management Analysis

The Composite Wastewater Management Analysis spreadsheet summarizes the following watershed and subwatershed loads for the Pleasant Bay Watershed:

- Attenuated Watershed Load
- Threshold Watershed Load
- Orleans Removal Required

The analysis spreadsheet also summarizes the following nitrate load reduction technologies:

- Traditional (WWTF)
- Fertilizer Management
- Aquaculture
- Coastal Habitat Restoration
- Permeable Reactive Barriers (PRB)
- On Site I/A Technologies – i.e. nitrate reduction barrier (NRBs)

A copy of the completed Composite Wastewater Management Analysis spreadsheet summarizing the Town's proposed nitrate load reduction for Pleasant Bay is provided in Attachment A.

ATTACHMENT A

Summary of Nitrate Load Reduction by Subembayment
Composite Wastewater Management Analysis
Pleasant Bay - Hybrid Approach
Orleans, MA

Subembayment	Load Description	Technology	Estimated Load - Orleans (kg/yr)
Meetinghouse Pond	Attenuated Watershed Load		2,256
	Threshold Watershed Load		386
	Removal Required - Orleans		1,876
		Traditional (WWTF)	1,841
		Fertilizer Management	35
		Aquaculture	0
		Coastal Habitat Restoration	0
		Permeable Reactive Barrier (PRB)	0
		On Site I/A Technologies (i.e. NRBs)	0
	Total Load Removal Remaining - Orleans		1,876 0
Lonnies Pond (Kescayo Gansett Pond)	Attenuated Watershed Load		838
	Threshold Watershed Load		566
	Removal Required - Orleans		284
		Traditional (WWTF)	0
		Fertilizer Management	10
		Aquaculture	274
		Coastal Habitat Restoration	0
		Permeable Reactive Barrier (PRB)	0
		On Site I/A Technologies (i.e. NRBs)	0
	Total Load Removal Remaining - Orleans		284 0
Areys Pond	Attenuated Watershed Load		367
	Threshold Watershed Load		265
	Removal Required - Orleans		113
		Traditional (WWTF)	0
		Fertilizer Management	4
		Aquaculture	109
		Coastal Habitat Restoration	0
		Permeable Reactive Barrier (PRB)	0
		On Site I/A Technologies (i.e. NRBs)	0
	Total Load Removal Remaining - Orleans		113 0
The River - Upper	Attenuated Watershed Load		1,012
	Threshold Watershed Load		634
	Removal Required - Orleans		378
		Traditional (WWTF)	175
		Fertilizer Management	15
		Aquaculture	0
		Coastal Habitat Restoration	0
		Permeable Reactive Barrier (PRB)	0
		On Site I/A Technologies (i.e. NRBs)	188
	Total Load Removal Remaining - Orleans		378 0
The River - Lower	Attenuated Watershed Load		1,416
	Threshold Watershed Load		892
	Removal Required - Orleans		524
		Traditional (WWTF)	0
		Fertilizer Management	22
		Aquaculture	0
		Coastal Habitat Restoration	502
		Permeable Reactive Barrier (PRB)	0
		On Site I/A Technologies (i.e. NRBs)	0
	Total Load Removal Remaining - Orleans		524 0
Namequoit River	Attenuated Watershed Load		1,390
	Threshold Watershed Load		882
	Removal Required - Orleans		348
		Traditional (WWTF)	0
		Fertilizer Management	14
		Aquaculture	0
		Coastal Habitat Restoration	0
		Permeable Reactive Barrier (PRB)	0
		On Site I/A Technologies (i.e. NRBs)	334
	Total Load Removal Remaining - Orleans		348 0
Paw Wah Pond	Attenuated Watershed Load		935

	Threshold Watershed Load	599	
	Removal Required - Orleans	413	
			Traditional (WWTF)
			Fertilizer Management
			Aquaculture
			Coastal Habitat Restoration
			Permeable Reactive Barrier (PRB)
			On Site I/A Technologies (i.e. NRBs)
	Total Load Removal	413	
	Remaining - Orleans	0	
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Quanset Pond			
	Attenuated Watershed Load	679	
	Threshold Watershed Load	266	
	Removal Required - Orleans	227	
			Traditional (WWTF)
			Fertilizer Management
			Aquaculture
			Coastal Habitat Restoration
			Permeable Reactive Barrier (PRB)
			On Site I/A Technologies (i.e. NRBs)
	Total Load Removal	227	
	Remaining - Orleans	0	
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Round Pond			
	Attenuated Watershed Load	0	
	Threshold Watershed Load	0	
	Removal Required - Orleans	0	
			Traditional (WWTF)
			Fertilizer Management
			Aquaculture
			Coastal Habitat Restoration
			Permeable Reactive Barrier (PRB)
			On Site I/A Technologies (i.e. NRBs)
	Total Load Removal	0	
	Remaining - Orleans	0	
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Muddy Creek Upper			
	Attenuated Watershed Load	0	
	Threshold Watershed Load	0	
	Removal Required - Orleans	0	
			Traditional (WWTF)
			Fertilizer Management
			Aquaculture
			Coastal Habitat Restoration
			Permeable Reactive Barrier (PRB)
			On Site I/A Technologies (i.e. NRBs)
	Total Load Removal	0	
	Remaining - Orleans	0	
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Muddy Creek Lower			
	Attenuated Watershed Load	0	
	Threshold Watershed Load	0	
	Removal Required - Orleans	0	
			Traditional (WWTF)
			Fertilizer Management
			Aquaculture
			Coastal Habitat Restoration
			Permeable Reactive Barrier (PRB)
			On Site I/A Technologies (i.e. NRBs)
	Total Load Removal	0	
	Total Load Removal	0	
	Remaining - Orleans	0	
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Ryder Cove			
	Attenuated Watershed Load	0	
	Threshold Watershed Load	0	
	Removal Required - Orleans	0	
			Traditional (WWTF)
			Fertilizer Management
			Aquaculture
			Coastal Habitat Restoration
			Permeable Reactive Barrier (PRB)
			On Site I/A Technologies (i.e. NRBs)
	Total Load Removal	0	
	Remaining - Orleans	0	
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Crows Pond			
	Attenuated Watershed Load	0	
	Threshold Watershed Load	0	
	Removal Required - Orleans	0	
			Traditional (WWTF)
			Fertilizer Management
			Aquaculture
			Coastal Habitat Restoration
			Permeable Reactive Barrier (PRB)
			On Site I/A Technologies (i.e. NRBs)
	Total Load Removal	0	
	Remaining - Orleans	0	
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Bassing Harbor			
	Attenuated Watershed Load	0	
	Threshold Watershed Load	0	

	Removal Required - Orleans		0
		Traditional (WWTF)	0
		Fertilizer Management	0
		Aquaculture	0
		Coastal Habitat Restoration	0
		Permeable Reactive Barrier (PRB)	0
		On Site I/A Technologies (i.e. NRBs)	0
	Total Load Removal		0
	Remaining - Orleans		0
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Frost Fish Creek			
	Attenuated Watershed Load		0
	Threshold Watershed Load		0
	Removal Required - Orleans		0
		Traditional (WWTF)	0
		Fertilizer Management	0
		Aquaculture	0
		Coastal Habitat Restoration	0
		Permeable Reactive Barrier (PRB)	0
		On Site I/A Technologies (i.e. NRBs)	0
	Total Load Removal		0
	Remaining - Orleans		0
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Pochet			
	Attenuated Watershed Load		3,073
	Threshold Watershed Load		1,505
	Removal Required - Orleans		1,569
		Traditional (WWTF)	0
		Fertilizer Management	55
		Aquaculture	0
		Coastal Habitat Restoration	780
		Permeable Reactive Barrier (PRB)	0
		On Site I/A Technologies (i.e. NRBs)	734
	Total Load Removal		1,569
	Remaining - Orleans		0
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Peasant Bay (Including Little Pleasant Bay)			
	Attenuated Watershed Load		3,538
	Threshold Watershed Load		2,275
	Removal Required - Orleans		1,257
		Traditional (WWTF)	0
		Fertilizer Management	68
		Aquaculture	500
		Coastal Habitat Restoration	450
		Permeable Reactive Barrier (PRB)	0
		On Site I/A Technologies (i.e. NRBs)	239
	Total Load Removal		1,257
	Remaining - Orleans		0
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Chatham Harbor			
	Attenuated Watershed Load		0
	Threshold Watershed Load		0
	Removal Required - Orleans		0
		Traditional (WWTF)	0
		Fertilizer Management	0
		Aquaculture	0
		Coastal Habitat Restoration	0
		Permeable Reactive Barrier (PRB)	0
		On Site I/A Technologies (i.e. NRBs)	0
	Total Load Removal		0
	Remaining - Orleans		0
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All Subembayments			
	Attenuated Watershed Load		15,504
	Threshold Watershed Load		8,270
	Removal Required - Orleans		6,989
		Traditional (WWTF)	2,016
		Fertilizer Management	241
		Aquaculture	883
		Coastal Habitat Restoration	1,812
		Permeable Reactive Barrier (PRB)	0
		On Site I/A Technologies (i.e. NRBs)	2,037
	Total Load Removal		6,989
	Remaining - Orleans		0

Notes: Technology nitrate load reductions are preliminary and subject to change based on demonstration project results and adaptive management.
Technology nitrate load reductions are based on OWQAP meeting presentation, proposed demonstration projects, and the draft ACWMP.