

Memorandum

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Subject **Town of Orleans, MA
Water Quality and Wastewater Planning
Task Number 4.a.4 – Adaptive Management Plan
Technical Memorandum Outline for Non-Traditional Technology Performance
Analysis**

Project Number 60476644

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

Date 03/25/16

1. Introduction

- a. Purpose of Technical Memorandum (1 paragraph) - The purpose of this Technical Memorandum is to present a systematic program for monitoring three non-structural technologies: Shellfish, Floating Constructed Wetlands (FCW), and Permeable Reactive Barriers (PRBs). Non-structural technologies are also referred to as non-traditional technologies in the Cape Cod Commission Section 208 Plan Update, and the Orleans Consensus Plan and related documents.
- b. There are several different aspects of non-structural demonstration projects to be quantified through monitoring, such as:
 - 1) Nitrogen-removal;
 - 2) Changes in other water quality parameters (ie turbidity and dissolved oxygen, chlorophyll-a;
 - 3) Changes in coupled nitrification-denitrification in underlying and nearby sediments;
 - 4) Survival and growth for shellfish and habitat biological diversity;
 - 5) Standing macrophyte biomass (for FCW);
 - 6) Groundwater quality and characteristics (for PRB);
 - 7) Attributes of carbon substrate such as distribution, performance (for PRB);
 - 8) Project documentation and logistics during installation, operation and maintenance; and
 - 9) Actual capital, operation and maintenance costs.

To enable quantification as well as evaluation of these parameters for shellfish and FCW, the monitoring plans are tailored to specific project locations, and are based on consideration of site's physical features such as water circulation, tidal exchange and residence time, expected nitrogen uptake relative to current nitrogen load and specific size of each project demonstration site. The goals of the monitoring plan for a PRB include soil and ground water sampling, in order to validate patterns of groundwater flow, permeability and nitrate flux, and to establish patterns of substrate distribution and establish the level of nitrate removal that is possible at the selected location.

2. Background

- a. Description of Demonstration Projects (1-2 paragraphs)
- b. Definitions (if needed)

3. Monitoring Plans

- a. Shellfish Demonstration
 - Establish baseline conditions for water quality, habitat biodiversity, disease, predation, and denitrification
 - Monitor all selected indicator parameters during demonstration period
 - Monitor population growth and survival rates
 - Monitor biodiversity changes
 - Monitor disease and predation changes
 - Monitor nitrogen cycling
 - Expense tracking
 - Document unanticipated events
- b. Floating Constructed Wetland (FCW) Demonstration
 - Establish baseline conditions for water quality
 - Monitor biodiversity
 - Macrophyte biomass and epiphyte biofilm nutrient absorption
 - Expense tracking
 - Document unanticipated events
- c. Permeable Reactive Barrier (PRB) Demonstration
 - General water quality and soil monitoring
 - Groundwater monitoring for nitrogen and phosphorous removal

- Microbial process assessment
- Tracking the distribution of carbon substrate
- Expense tracking
- Documenting unanticipated events

4. Data Collection Needs

- a. Timing of sampling for shellfish and FCW
 - Grab samples versus continuous monitoring
 - Special Studies
 - In situ monitoring (e.g. YSI)
- b. Timing of groundwater sampling
- c. Data collection analysis and summary/organizational chart

5. Recommendations

- a. Baseline water quality monitoring
- b. Baseline Disease/predation study
- c. Baseline Biological diversity study