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Memorandum

To	George Meservey, Director of Planning & Community Development Michael Domenica, PE, Program Manager
CC	Betsy Shreve, AICP, AECOM Project Director Sia Karplus, Science Wares, Inc.
Subject	**Town of Orleans, MA** **Water Quality and Wastewater Planning** **Task Number 4.a.2 – Adaptive Management Plan** **Technical Memorandum Outline for Long Term Water Quality Monitoring Program**
Project Number	60476644
From	Thomas Parece, P.E., AECOM Project Manager
Date	02/08/16

1. Background

a. Purpose of Technical Memorandum (TM) on Long Term Water Quality Monitoring Program (1 paragraph)

As solutions for reducing and otherwise controlling nitrogen load are implemented in the estuaries and ponds of Orleans, compliance with regulatory standards must be measured and documented. Changes in ecologic conditions that are occurring over time should also be documented. The purpose of this Technical Memorandum (TM) is to provide the details for a monitoring program that can adequately quantify water quality and benthic conditions over the long term. This program includes locations of additional stations, as well as sampling points at different depth intervals within the water column. The frequency of sampling, methodology and parameters for sampling are described, including benthic analysis. Recommendations for future data collection personnel (both volunteer and paid) as well as a system for long term coordination and management of all data sets generated for Orleans are also presented.

2. Introduction

a. Summarize TM 4.a.1 (Baseline Monitoring) - TM 4.a.1 (Baseline Monitoring) describes current monitoring programs within coastal ponds and embayments of Orleans, and compares data collected since 2003 to the baselines reported in the Massachusetts Estuaries Project (MEP) reports for Pleasant Bay and Nauset Harbor. Groups currently responsible for different monitoring programs and the types of data collected are described. This TM also provides an assessment of whether data sets are complete or whether additional data collection or methods is needed in order to fully evaluate eutrophication levels in these watersheds in order to determine compliance with water quality standards. This gap analysis found…

3. Evaluate Monitoring Programs

a. Describe gaps in the existing monitoring programs for Orleans, such as density and locations of stations, frequency and timing of monitoring, and non-water column assessments that are needed to evaluate compliance and water quality standards attainment.

b. List documentation needs of data sets. This should include:

- GPS coordinates for all sampling stations.
- Field sampling instrumentation or technique as well as laboratory techniques, responsibility for laboratory requirements, filter size for particulates and limits of detection for each parameter sampled.
- Definitions for all terms.
- Conversion factors for:
  - µM to mg/L for nitrogen species, POC, and PO_4
  - Proposed values:
    - µm N x 0.0140067 = mg N/L
    - µm C x 0.012011 = mg C/L
    - µm PO_4 x 0.03097376 = mg P/L
  - Lab salinity
  - Field corrected salinity
  - DI salinity
  - Salinity-corrected DO

4. Analysis: Long Term Water Quality Monitoring Program Needs

a. Monitoring and other assessments that should be added to the current program(s) to enable verification of compliance with water quality standards, and overall ecosystems health.

b. Monitoring and other assessments that should be added to the current program(s) to enable the performance evaluation of demonstration projects in removing Nitrogen and helping to meet water quality standards.

5. Recommended Plan for Long Term Water Quality and Benthic Conditions Monitoring Program

a. Identify locations of new monitoring stations.

b. Prescribe frequency and depth of sampling.

c. List water quality indicators and laboratory analysis options - Water quality parameters that should continue to be sampled for Pleasant Bay and Nauset Harbor include: weather, wind force, wind direction, water condition, secchi depth, DI salinity, field corrected salinity, sample time, sample depth, field dissolved oxygen, field dissolved oxygen percent saturation, field temperature, laboratory salinities, laboratory conductivity, phosphate (PO4), ammonium (NH4), nitrate (NOx), dissolved inorganic nitrogen (DIN), dissolved organic nitrogen (DON), total dissolved nitrogen (TND), particulate organic carbon (POC), particulate organic nitrogen (PON), total organic nitrogen (TON), total nitrogen (TN), chlorophyll a and pheophytin.

d. List evaluations of other indicators such as macroalgae, benthic infauna, and sediment denitrification.

e. Identify responsible parties.

f. List appropriate Quality Assurance Program Plans (QAPP).

g. Review with School for Marine Science and Technology (SMAST) and Center for Coastal Studies for utility in updating existing MEP model and document comments (at Feb workshop).

6. References