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## Scope of Work

# Technical Support of the Town of Barnstable Water Quality Monitoring and Wastewater Planning Program

## *Pond, Lake and Estuarine Support*

May 21, 2020

December 20, 2020 (amended) – FY22

### Overview

The Town of Barnstable has been significantly invested in water quality management planning for several decades. This effort has involved substantial work by the town staff and volunteers, engineering consultants, CSP/SMAST, state, federal and county agencies, NGOs, and other parties. Information gathering and synthesis have been broad ranging and complex involving extensive water quality and benthic monitoring, groundwater monitoring, hydrographic studies, computer modeling, and numerous other technical activities in support of the Town's restoration and management of its aquatic resources.

Over the past few years, the Town has been preparing and refining an updated Wastewater Management Plan in order to restore nutrient impacted estuaries, as well as addressing USEPA/MassDEP TMDL and 208 compliance. As part of this on-going effort, the Town has recently completed an update of the Massachusetts Estuaries Project (MEP) land use models and used the MEP linked models to compare the current Wastewater Management Plan to the nitrogen TMDLs for the Town's estuaries.<sup>1</sup> Implementation of the plan will require regular water quality monitoring and review of monitoring results to assess performance and document compliance with regulatory standards. This implementation will result in improved water and habitat quality of the Town's estuaries and ponds and lakes. Tracking of improvements and TMDL compliance requires an integrated quantitative program, including regular synthesis, refinement, and updating of collected water quality information and assessment of benefits and limitations of management strategies.

The Coastal Systems Program from the School for Marine Science and Technology at UMass-Dartmouth (CSP/SMAST) has been integrally involved in previous Town assessments and the Town has again asked CSP/SMAST to assist in developing and implementing an integrated water quality sampling and feedback system for the town's ponds, lakes, and estuaries. This scope is an FY22 amendment to initial tasks in the FY21 task order, including work to refine and standardize monitoring and management strategies, compile and synthesize all fresh pond data (one time task), and collect data gap information for the development of a lake management plan for Shubael Pond. These tasks helped the Town to establish water quality baselines that will allow the Town to track

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<sup>1</sup>Howes, B.L, E. Eichner, J. Ramsey. Technical Memorandum to Barnstable DPW (Draft), December 5, 2019. MEP Scenarios: Town of Barnstable Wastewater Plan and Land Use Updates, 33 p.

water and habitat quality changes as the Town implements management actions over coming years, particularly those related to the Wastewater Management Plan. In FY22, the Town will build on the ongoing work and use the collected information to gradually address water quality problems in freshwater systems throughout the Town and support both adaptive management actions and the necessary quantitative documentation of regulatory compliance under the Clean Water Act and Commonwealth water quality standards. This Scope is divided into two parts, Part 1 focusses on fresh pond data synthesis and management plans and Part 2 on estuarine water quality monitoring.

## **PART 1: Fresh Ponds**

### **Task 1–Integrated Pond and Lake Water Quality Monitoring and Management Plans**

This task focusses on implementing a Town-wide integrated pond and lake management strategy with development and review of a pond and lake water quality database, development of pond management plans, and on-going pond water quality monitoring. During FY21, data gaps surveys were completed in Shubael Pond in preparation for the completion of a pond management plan in FY22. In order to address the next prioritized pond, the Town has asked to complete the Long Pond (Marstons Mills) data gap surveys and development of the pond management plan in FY22, as well.

#### **Subtask 1A. Annual Pond and Lake Management Plans**

Pond and lake management plans detail a recommended water quality management strategy or strategies for a specific pond. A plan typically includes a diagnostic assessment of the water quality and key features of the pond that impact the water quality, such as sediment nutrient loads, watershed development, basin configuration, rooted plant and mussel distributions and water depth. Information about these features are developed through targeted data collection as part of the diagnostic assessment. The management plan will also include a review of available water quality management options and their potential implementation costs and details on why the recommended strategy is proposed including the pros and cons of implementing each option in the target pond.

Town staff will work with Project staff to annually select one pond for development of a diagnostic assessment and management plan. Development of a diagnostic assessment will involve collection of targeted data needed to supplement the standard water column data that is generally available through PALS Snapshots. Targeted data lists will be refined based on the initial analysis completed in the Integrated Pond and Lake Water Quality Database (Subtask 1A) and will vary depending on the individual characteristics of each pond, but will often include collection and incubation of sediment cores for nutrient regeneration, phytoplankton (including blue-green algae), freshwater mussel, and rooted plant surveys, stream measurement of flow and nutrients for one hydroyear, measurement of direct stormwater discharges, and continuous measures of dissolved oxygen, temperature, and chlorophyll a. The results of this targeted data will be incorporated with other assessments, such as watershed and phosphorus loading analysis, into the pond diagnostic assessment. This assessment will then be used to develop and review management alternatives to address the water quality concerns, including potential costs for implementation. The diagnostic assessment and management alternatives and their review will be summarized for each pond in a pond-specific management plan. The management plan will be developed in draft form, reviewed with Town staff, presented in a public forum, and then finalized. Implementation of the plan, including regulatory filings, will occur in a separate budget cycle. Project staff will be available to assist the Town in obtaining any necessary permits.

Depending on the natural features of a given pond, completion of a pond management plan typically takes two (2) years: one year for targeted data collection/system characterization (especially if there is a stream input or output) and a second year for the development and finalization of the management plan. Selected ponds could complete the process in one year, if the features are not complex. The two year approach can allow multiple ponds to be within the assessment/management plan process at the same time, such that the management plan for Pond A is being developed at the same time as targeted data is being collected for Pond B.

Initial discussions with the Town suggested that this task would be completed annually until all prioritized ponds have management plans; annual costs would vary depending on size and characteristics of ponds and Town goals for implementation. Permitting support is not included in the present costing but typically runs about \$15,500 per pond, but this will vary depending on each pond and likely regulatory complexity. Past experience has suggested that the first couple of years may require additional meetings to ensure that the public and managers have adequate familiarity with potential management approaches.

The Town decided to initially prioritize Shubael Pond and Long Pond (Marstons Mills) for the completion of targeted data collection and development of a pond water quality management plans. During FY21, targeted data collection has occurred at Shubael Pond. During FY22, targeted data collection will occur at Long Pond (Marstons Mills) and management plans will be developed for Shubael Pond and Long Pond (Marstons Mills).

Planned FY22 data collection at Long Pond will include:

- Collection of a minimum of 15 sediment cores in April-May with accompanying 90-110 day incubation to measure sediment nutrient regeneration and water column sampling and measurement shortly before, and after core collection
- Surveys of bathymetry, aquatic plants, and freshwater mussels
- Monthly water column sampling and measurement monthly for April 2021 to October 2021; samples to assayed for nutrients, chlorophyll, pH, phytoplankton
- Installation of a minimum of four sondes at different depths (two in each basin) for continuous reading of temperature, conductivity, D.O. and Chlorophyll a matching monthly water column sampling and measurement
- NO stormwater or stream measurements are indicated (Town has identified 3 stormwater outfalls, but these will be eliminated by April 2021).

**Cost FY2022: \$ 34,451 Shubael Pond Management Plan & Diagnostic Assessment**  
**\$103,634 Long Pond (Marstons Mills) data collection and**  
**Management Plan & Diagnostic Assessment**  
**Total Cost FY2022: \$138,085**

### **Deliverables**

- Shubael Pond Management Plan and Diagnostic Assessment: draft, final, two meetings, one presentation. Draft Plan will be delivered in November 2021. The Plan will summarize targeted data collection (collected during FY21) and review, historic data review, water quality options, and recommended plan
- Long Pond (Marstons Mills) Management Plan and Diagnostic Assessment: draft, final, two meetings, one presentation. Draft Plan will be delivered in April 2022. The Plan will

- summarize targeted data collection (collected during FY22) and review, historic data review, water quality options, and recommended plan
- One meeting and one presentation of the draft management plan for each pond. Draft plan will be publicly presented, reviewed, and final version will be developed based on public and Town feedback.

**Subtask 1B. Pond and Lake Monitoring Support and Chemical Assays**

Consistent with pond and lake sampling completed during FY21, the SMAST Coastal Systems Analytical Facility will assay collected water quality samples and provide laboratory and field results in an excel-based spreadsheet. The results format will be consistent with the FY21 Integrated Pond and Lake Water Quality Database format. Collected samples will be assayed for standard PALS constituents: total phosphorus, total nitrogen, pH, alkalinity, pigments (chlorophyll a + phaeophytin). Field collected data will be dissolved oxygen and temperature profiles and clarity (Secchi). Town staff will work to ensure that samples are collected from all 26 Great Pond ponds and lakes at a minimum and samples will be collected twice each year (April and August/September) using PALS Snapshot sampling protocols. Completion of this task will be coordinated with existing pond monitoring activities through Barnstable Clean Water Coalition, Indian Ponds Association, Lake Wequaquet Protective Association, and other volunteer pond monitoring activities in Town. Project staff will coordinate the timing of sample collection and the transfer of collected samples to the SMAST Coastal Systems Analytical Facility.

**Cost FY2022: \$16,400 (based on Town list of Great Ponds to be sampled)**

**Deliverable**

- Annual pond water quality assay results in a sortable excel-based format consistent with the FY21 Integrated Pond and Lake Water Quality Database format

**Part 1: Lake and Pond Support**

**TOTAL ANNUAL COSTS: FY2022: \$154,485**

## **PART 2: Estuary Water Quality Sampling Results**

Consistent with water quality monitoring activities undertaken for the Town of Barnstable in the previous years (2013-2019), the Coastal Systems Analytical Facility will analyze estuarine water quality samples from the Barnstable Town-wide Water Quality Monitoring Program. The samples will be from: a) Barnstable Harbor, b) Centerville River / Harbor / Halls Creek, c) Lewis Bay, d) Three Bays, and e) Rushy Marsh. The samples will be collected during four (4) sampling events: 2 events in July and 2 events in August in the summer of 2021.

### **Task 1: Water Quality Analysis**

Samples will be assayed for: Ammonium, Nitrate+Nitrite, dissolved organic nitrogen, particulate organic nitrogen (and carbon), ortho-phosphate, chlorophyll a and pheophytin a, and salinity.

Stations to be sampled in each of the Town of Barnstable estuaries are depicted in the attached maps:

Barnstable Harbor: total of **12 sampling stations**: BM-1,2,3 (surface and bottom), BM-10,11,12,13,14,15 (mid); 12 samples per sampling event; 48 samples during summer 2021 sampling season

Centerville River/Harbor: total of **22 sampling stations**: BC-1,2,3,4,5,6,7,13,14,15 (mid) and BC-8,9,10,11,12,T (surface and bottom); 22 samples per sampling event; 88 samples during summer 2021 sampling season

Lewis Bay: total of **12 sampling stations**: BH-1,2,3,5,6 (surface and bottom) and BH-4,7 (mid); 12 samples per sampling event; 48 samples during summer 2021 sampling season

Three Bays: total of **14 sampling stations**: TB-1,2,3,4,6,9,E (mid), TB-13,18 (surface and bottom), TB-5 (surface, mid, bottom); 14 samples per sampling event; 56 samples during summer 2021 sampling season

Rushy Marsh: total of **4 sampling stations**: RM-1,2,3,4 (mid), 4 samples per sampling event; 16 samples during summer 2021 sampling season

In addition to standard samples, reliable sampling protocols require that 10% QA samples (*i.e.*, field duplicate samples) **MUST** also be collected during any sampling event. In addition, while the Town of Barnstable will be sampling specific stations in Lewis Bay, any sampling in Lewis Bay ***must be coordinated*** with Town of Yarmouth sampling. Yarmouth will be collecting samples from 6 sampling stations in Lewis Bay (MC-1,2 and BY-1,2,3,4) all located on the Yarmouth side of the estuarine systems. Both Barnstable and Yarmouth sampling in Lewis Bay must be on the same day and same ebb tide to ensure the data is meaningful.

#### **Deliverable**

- Annual estuary water quality assay results in a sortable excel-based format consistent with past reported data

## **Part 2: Estuary Water Quality Results**

### **TOTAL ANNUAL COSTS**

**FY2022: \$32,000**

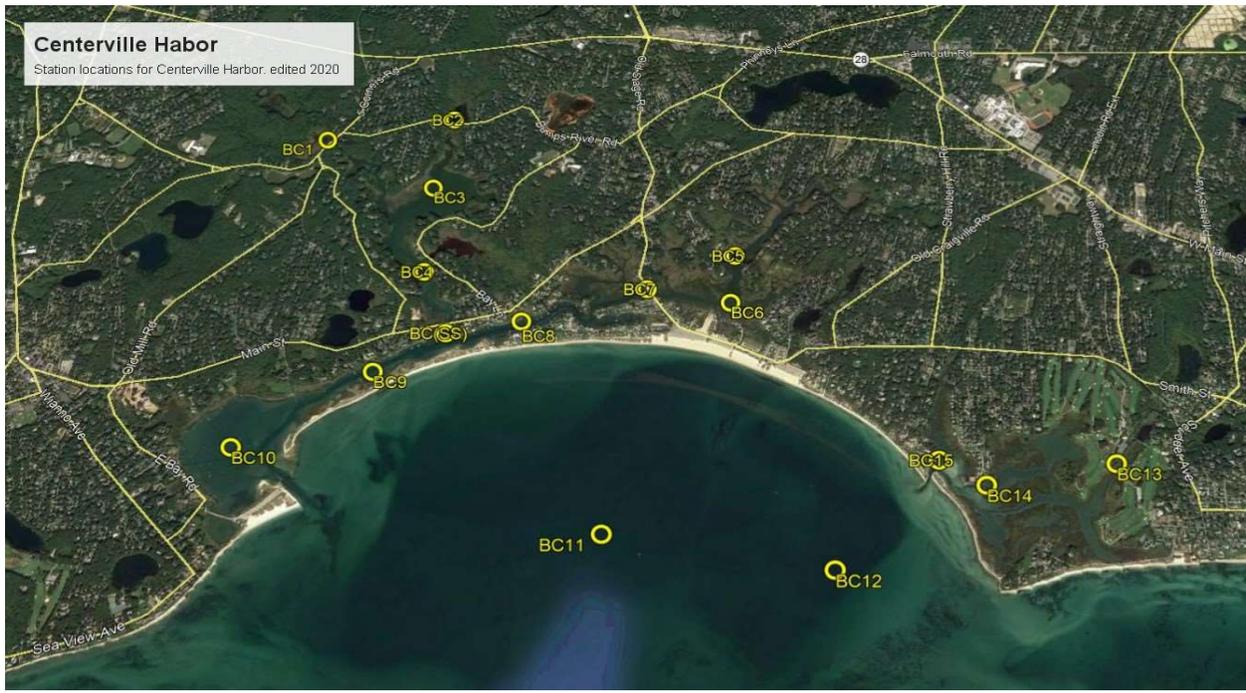
<b>Summer 2021 Town of Barnstable estuary sampling summary. 4 events (2X in July, 2X in August), 64 sampling stations, 5 systems, and +10% quality assurance (QA) samples.</b>				
includes:	Sampling Stations	Water Quality Samples	+10% QA samples	Total samples
Barnstable Harbor	12	48	5	53
Centerville River/Harbor	22	88	9	97
Lewis Bay	12	48	5	53
Three Bays	14	56	6	62
Rushy Marsh	4	16	2	18
<b>TOTAL</b>	<b>64</b>	<b>256</b>	<b>27</b>	<b>283</b>

Task 1: Total Analytical: 283 samples@ \$110/sample	\$ 31,130
Task 2: Project Management and Coordination	\$ 870
<b>TOTAL Task COST:</b>	<b>\$ 32,000</b>

There will be a single annual billing when the assays are completed.

## **OVERALL BARNSTABLE TECH SUPPORT PROJECT SCOPE COST (FY22)**

<b>PART</b>	<b>Description</b>	<b>Cost</b>
<b>PART 1</b>	<b>Fresh Ponds: Shubael Pond Management Plan Long Pond Data Gap Collections Long Pond Management Plan Pond and Lake Monitoring Support and Chemical Assays (Spring and Summer; 2X per year)</b>	<b>\$154,485</b>
<b>PART 2</b>	<b>Estuary Sampling: 4 events; 5 systems, 283 samples</b>	<b>\$ 32,000</b>
<b>TOTAL</b>		<b>\$186,485</b>



Water quality stations in Centerville River/Harbor.



Water quality stations in Lewis Bay (includes both Barnstable and Yarmouth stations).





Water quality stations in Rushy Marsh