TOWN OF NANTUCKET NATURAL RESOURCES DEPARTMENT

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EXECUTIVE SUMMARY

TOWN OF NANTUCKET LONG POND/MADAKET HARBOR 2019 MEP SCENARIOS

INTRODUCTION:

In 2015, the Massachusetts Department of Environmental Protection (MassDEP) finalized a nitrogen Total Maximum Daily Load (TMDL) for Madaket Harbor/Long Pond estuary system that established nitrogen limits/thresholds to restore water and habitat quality throughout the system. A TMDL is a regulatory limit required under the federal Clean Water Act for all surface waters that are impaired and failing to meet state standards. The Madaket Harbor/Long Pond system was identified as having impaired water quality due to excessive nitrogen through a 2010 Massachusetts Estuaries Project (MEP) report that provided the scientific basis for the Madaket Harbor System habitat assessment and the MassDEP TMDL. The County & Town of Nantucket (Town) has been discussing options to reduce watershed nitrogen loads to and nitrogen concentrations within the Madaket Harbor/Long Pond system.

STATEMENT OF PROBLEM:

As increasing numbers of people occupy coastal watersheds, the associated coastal waters receive increasing pollutant loads. Coastal embayments throughout the Commonwealth of Massachusetts are becoming nutrient enriched. The primary nutrient causing the increasing impairment of our coastal embayments is nitrogen, with its primary sources being wastewater disposal, and nonpoint source runoff that carries nitrogen *(e.g.*, fertilizers) from a range of other sources.

Analyses of the Madaket Harbor / Long Pond embayment system was performed to assist the Town with upcoming nitrogen management decisions associated with the Towns' current and future wastewater planning efforts, as well as wetland restoration, anadromous fish runs, shell fishery, open-space, and harbor maintenance programs.

One of the key features of the MEP project was the development of estuary-specific linked watershed/embayment water quality models that were validated with collected water data in each estuary system so that the models could be reliably used to predict the water quality impacts of watershed or in-system changes. Recently, the Town asked the School for Marine Science and Technology at UMass-Dartmouth (SMAST) to evaluate five additional scenarios in the Madaket Harbor/Long Pond system. The results of these five scenarios are listed below.

Results:

	Scenario	Description	TMDL (goal 0.450 mg/L)
1	Landfill Change *(based upon an updated N load by CDM)*	Evaluated the impact of reduced nitrogen loads from recent upgrades at the Town landfill on the MEP results.	0.489 mg/L
2	Innovative/alternative (I/A) System Use and Landfill Change	Evaluated the combined impact of reduced nitrogen loads from the Town landfill and watershed-wide installation of nitrogen-reducing I/A septic systems.	0.468 mg/L
3	Updated Land Use	Evaluated the change in watershed nitrogen loading since the MEP analysis by reviewing changes in watershed land uses. *Scenarios 1 and 2 used MEP "existing conditions" watershed land use and accompanying nitrogen loads with the specified changes to the landfill load and wastewater treatment, respectively.*	0.499 mg/L
4	Enhanced Aquaculture	Evaluated the impact of deploying shellfish in Hither Creek for nitrogen removal when combined with the other nitrogen management changes in Scenarios 1, 2, and 3.	0.466 mg/L
5	Dredging of Hither Creek	Evaluated the impact of dredging Hither Creek on nitrogen concentrations when combined with the nitrogen changes based on the updated watershed nitrogen loading developed in Scenarios 1 and 3.	0.497 mg/L

MAJOR FINDINGS:

Zero scenarios attained the Madaket Harbor nitrogen TMDL of 0.450 mg/L.

CONCLUSIONS:

Though none of the scenarios attained the Madaket Harbor nitrogen TMDL, comparison between the scenario results provided several insights for the Town to consider for future development of nitrogen management strategies:

- Watershed nitrogen loads have not increased since the MEP assessment (based on 2009 land use). *Wastewater loads did increase, but this was offset by nitrogen loading reductions at the Town landfill.*
- The scenarios with results closest to the TMDL were those that included reduction of wastewater nitrogen loads. *These scenario results, suggest that wastewater nitrogen reductions provide the most significant improvements in TN concentrations in the Harbor.*
- Enhanced aquaculture would need to be more extensive than what was applied in Scenario 4. The total nitrogen concentrations in Scenario 4 were essentially the same as Scenario 2, which did not include the enhanced aquaculture, likely due to the aquaculture area being so close to Madaket Harbor and the system inlet. *The proposed enhanced aquaculture removed ~10% of the overall watershed wastewater N load.*
- Dredging within Hither Creek had minimal impact on total nitrogen concentrations.