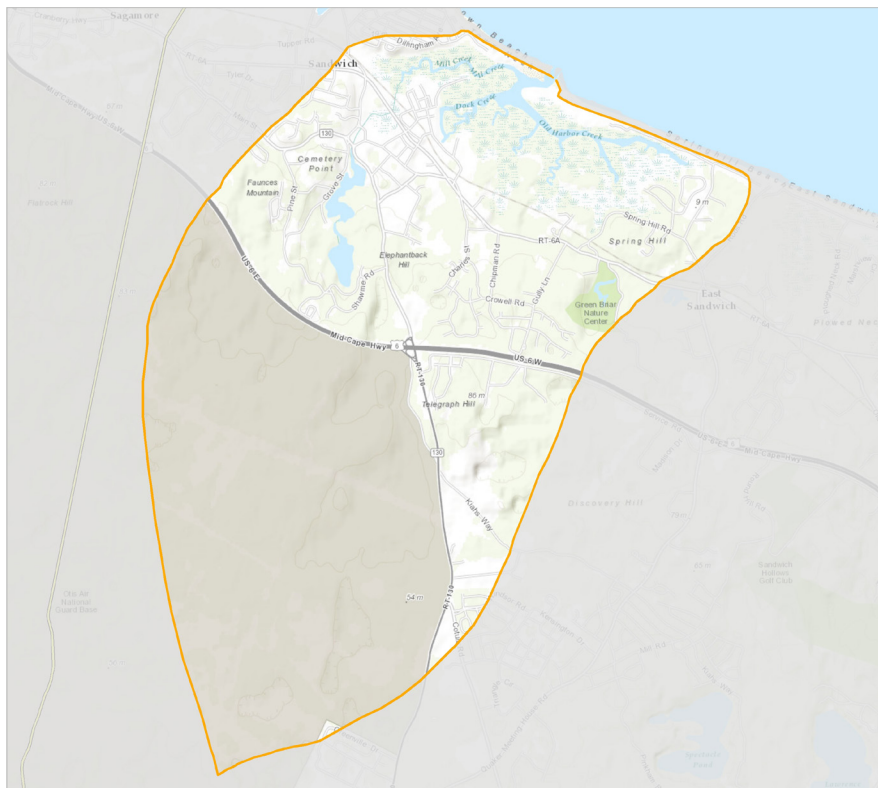
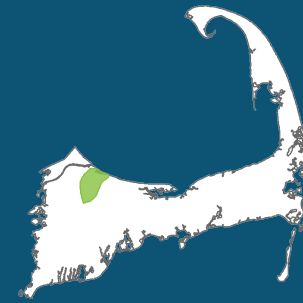


Sandwich Harbor

SANDWICH

LOW



Sandwich Harbor Watershed

Introduction to the Watershed Reports

In 2001, the Massachusetts Estuaries Project (MEP) was established to evaluate the health of 89 coastal embayment ecosystems across southeastern Massachusetts. A collaboration between coastal communities, the Massachusetts Department of Environmental Protection (MassDEP), the School of Marine Science and Technology (SMAST) at the University of Massachusetts-Dartmouth, the US Environmental Protection Agency (US EPA), the United States Geological Survey (USGS), the Massachusetts Executive Office of Energy and Environmental Affairs (EEA), and the Cape Cod Commission, the purpose of the MEP is to identify nitrogen thresholds and necessary nutrient reductions to support healthy ecosystems.

The Cape Cod 208 Plan Update, certified and approved by the Governor of the Commonwealth of Massachusetts and the US EPA in 2015, provides an opportunity and a path forward to implement responsible plans for the restoration of the waters that define Cape Cod.

On Cape Cod there are 53 embayment watersheds with physical characteristics that make them susceptible to nitrogen impacts. In its 2003 report, “The Massachusetts Estuaries Project – Embayment Restoration and Guidance for Implementation Strategies”, MassDEP identifies the 46 Cape Cod embayments included in the

MEP. Thirty-three embayments studied to date require nitrogen reduction to achieve healthy ecosystem function. A Total Maximum Daily Load (TMDL) has been established (or a draft load has been identified and is under review) for these watersheds. For those embayments not studied, the 208 Plan Update recommends planning for a 25% reduction in nitrogen, as a placeholder, until information becomes available.

The 208 Plan Update directs Waste Treatment Management Agencies (WMAs) to develop watershed reports within 12 months of certification of the Plan Update. The Watershed Reports outline potential “bookend” scenarios for each watershed that include two scenarios to meet water quality goals in the watershed – a traditional scenario, which relies completely on the typical collection and centralized treatment of wastewater, and a non-traditional scenario, which uses remediation, restoration, and on-site reduction techniques to remove nutrients from raw and treated wastewater, groundwater and affected waterbodies.

The intent of the Watershed Reports is to outline two distinct approaches for addressing the nutrient problem. The reports are not intended to identify preferred and detailed plans for each watershed, but to facilitate discussions regarding effective and efficient solutions, particularly in watersheds shared by more than one town. In some cases, towns have provided information on collection areas and non-traditional technologies that have been specifically considered by that town.

The 208 Update developed a regionally consistent database of the nitrogen load entering each watershed. This data set includes estimates of wastewater, stormwater and fertilizer loads - similar to methodologies used by the MEP. Using this regionally consistent database, the Watershed MVP tool (wMVP) was developed so that different strategies (i.e., bookend scenarios) to reduce excess nitrogen load

could be evaluated. The Watershed Reports use the MEP recommendations for the required nitrogen load reductions necessary to meet the threshold loads (that serve as the basis for nitrogen management), and then use the wMVP and the regionally consistent database values to develop bookend scenarios. There are variations of load between the MEP and wMVP, primarily due to differences in comparing older and newer databases.

Terms Defined

Total nitrogen load: the nitrogen load from the watershed contributed by septic, wastewater, fertilizer, stormwater, golf course, landfill, and natural sources.

Attenuated nitrogen load: the nitrogen load from the watershed that reaches the embayment after the effect of natural attenuation in wetlands, ponds or streams.

Threshold: the amount of nitrogen that a water body can receive from its watershed and still meet water quality goals; this number is based on MEP technical reports or Total Maximum Daily Load (TMDL) reports.

Reduction target: an approximation of the amount of nitrogen that needs to be removed from the watershed to achieve the threshold; this number is calculated by subtracting the threshold number from the attenuated total watershed load, and is for planning purposes only.

Percent contribution: the percent of attenuated nitrogen load that a town contributes to the watershed.

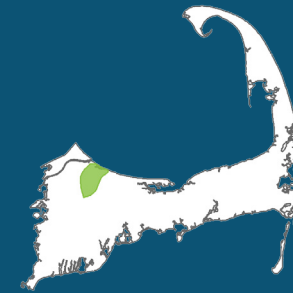
Kilogram responsibility: is calculated by applying the percent contribution to the reduction target and indicates the amount of nitrogen, in kg, that a community is responsible for addressing.

Total Maximum Daily Load: a regulatory term in the Clean Water Act, describing a value of the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards. Establishing a TMDL is necessary when a water body has been listed on the 303D list of impaired waters.

Sandwich Harbor

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The Sandwich Harbor system is an estuary with shoreline located entirely in the Town of Sandwich. It receives tidal flow from Cape Cod Bay, which has an average 9-foot tidal fluctuation, is incised along the north side of the Sandwich Moraine and extends approximately 1.5 to 2 miles inland through salt marsh. The embayment supports a variety of recreational uses including boating, swimming, shell fishing and fin fishing.

The Problem

The Massachusetts Estuaries Project (MEP) technical report (available at <http://www.mass.gov/eea/agencies/massdep/water/watersheds/the-massachusetts-estuaries-project-and-reports.html>) indicates that the Sandwich Harbor system has not exceeded its critical nitrogen threshold and can assimilate additional nitrogen without water quality impairment.

- **MEP TECHNICAL REPORT STATUS:** Final
- **TMDL STATUS:** TMDL not required

Watershed nitrogen load characteristics were published in the 2015 MEP report for Sandwich Harbor, reflecting current conditions at the time of writing:

- **ATTENUATED TOTAL NITROGEN LOAD:** 14,739 Kg/Y (MEP Chapter VIII)
- **SOURCES OF ATTENUATED WATERSHED NITROGEN LOAD:**
 - 74% Wastewater
 - 6% Fertilizer
 - 9% Impervious Surfaces
 - 8% Agricultural Fertilizer
 - 1% Agricultural Animals
 - 2% Landfill/Solid Waste

Since the MEP report, the Commission compiled the following updated water use and nitrogen loads using the regional wMVP database, enabling a more current estimate of nitrogen loading (see figure on page 1 for watershed boundary delineation):

- **WASTEWATER FLOW:** 120 MGY (million gal per year)
- **TOTAL ATTENUATED NITROGEN LOAD (wMVP):** 14,731 Kg/Y

CONTRIBUTING TOWNS

Percent contributions listed below are the aggregate sub-embayment contributions identified in Appendix 8C of the Cape Cod Section 208 Plan Update (contributions are based on attenuated load where available). See Appendix 8C for detailed town allocations by sub-embayment.

A portion of the land area is not in the control of the town as it is part of Joint Base Cape Cod (JBCC), which is served by a wastewater treatment facility and discharged outside of the watershed.

- **SANDWICH:** 100%

SANDWICH HARBOR ESTUARY

- **EMBAYMENT AREA:** 74 acres
- **EMBAYMENT VOLUME:** Unknown

- **2014 INTEGRATED LIST STATUS:** Not Listed

SANDWICH HARBOR WATERSHED

General watershed characteristics according to the current wMVP regional database (see figure on page 1 for watershed boundary) follow.

- **WATERSHED CHARACTERISTICS**
 - Acres: 6,770
 - Parcels: 1,952
 - % Developed Residential Parcels: 74%
 - Parcel Density: 3.5 acres per parcel (approx.)

Freshwater Sources

PONDS

- **IDENTIFIED SURFACE WATERS:** 17
- **NUMBER OF NAMED FRESHWATER PONDS:** 7
- **PONDS WITH PRELIMINARY TROPHIC CHARACTERIZATION:** 2
- **2014 INTEGRATED LIST STATUS:** None Listed

STREAMS

- **SIGNIFICANT FRESHWATER STREAM OUTLETS:** 4
 - Mill Creek
 - Dock Creek
 - Springhill Creek
 - Old Harbor Creek

Stream data from MEP technical report. Nitrate concentrations higher than 0.05 mg/L background concentrations, evident in public supply wells located in pristine areas, provide evidence

of the impact of non-point source pollution on the aquifer and receiving coastal water bodies.

DRINKING WATER SOURCES

- **WATER DISTRICTS:** 1
 - Sandwich Water District
- **GRAVEL PACKED WELLS:** 6
 - 3 have nitrate concentrations between 0 and 0.5 mg/L
 - 3 have nitrate concentrations between 1 and 2.5 mg/L
- **SMALL VOLUME WELLS:** 1

Drinking water data from Cape Cod Commission and MassDEP data sources – nitrate values obtained from drinking water wells are from 2009-2012. The state and federal drinking water limit for nitrate is 10 mg/L. The Cape Cod Commission nitrate loading standard is 5 mg/l.

Degree of Impairment

Based upon all lines of evidence, the estuary has not exceeded its threshold nitrogen level.

Traditional & Non-Traditional Scenarios

SCENARIO DEVELOPMENT

Through the 208 Stakeholder process, the Commission developed “bookend” scenarios – one looking at a possible solution using traditional collection and treatment, the other examining a possible suite of non-traditional technologies – to address the nitrogen management needs in each watershed. These bookend scenarios provide guidance for communities as they continue to discuss alternatives, priorities, and opportunities for identifying well-considered solutions that will address communities’ needs and interests.

REGIONAL DATA

In preparation for this effort, the Commission collected regionally consistent data for the purposes of watershed scenario development. Both parcel data and water use data was identified and collected for the entire region. While the scientific basis for planning is the thresholds identified in the MEP technical reports, each report uses data from different years, and in some cases the MEP data used are 10 or more years old. In addition, there are watersheds on Cape Cod without the benefit of an MEP report; therefore, similar data was not available for planning purposes.

The updated regional data set was used to estimate wastewater, stormwater and fertilizer loads, using the same methodologies as the MEP. This approach allows for a reevaluation of existing development, which may have changed

in the last 10 years. Parcel data included in the regional database is from 2010-2012 and water use data is from 2008-2011, depending on the water supplier and based on best available data. This approach allows for regionally consistent watershed scenario development.

WATERSHED SCENARIOS

Watershed scenarios outline possibilities for the watershed. A series of non-traditional technologies that might be applicable, as well as the amount of residential load that would need to be collected if a traditional collection system and treatment facility was implemented are typically included in watershed reports. The scenarios presented are conceptual and are meant to inform discussions regarding effective and efficient solutions; they are not specific recommendations and should be viewed as resource information for additional and more detailed wastewater management planning.

The Sandwich Harbor watershed has been identified by MEP as having excess nitrogen capacity. No nitrogen reduction is required at this time; therefore, no scenarios are presented. This will be reevaluated as data as regional data sets are updated.

TOTAL ATTENUATED WATERSHED NITROGEN LOAD VALUES (FROM WMVP)

Sandwich Harbor Nitrogen Sources	Total Attenuated Watershed Nitrogen Load (kg-N/yr)
Wastewater ¹	11,207
Fertilizer ²	842
Stormwater	1,864
Other ³	818
TOTAL WATERSHED LOAD	14,731
Total Watershed Threshold	34,947
TOTAL ATTENUATED LOAD TO BE REMOVED⁴	-20,216

1. Includes nitrogen loads from septic systems and wastewater treatment facilities. 2. Includes nitrogen loads from lawns, cranberry bogs, and golf courses. 3. Includes nitrogen loads from landfills and atmospheric deposition to vacant land. 4. The watershed currently has excess capacity and does not require nitrogen removal at this time.

