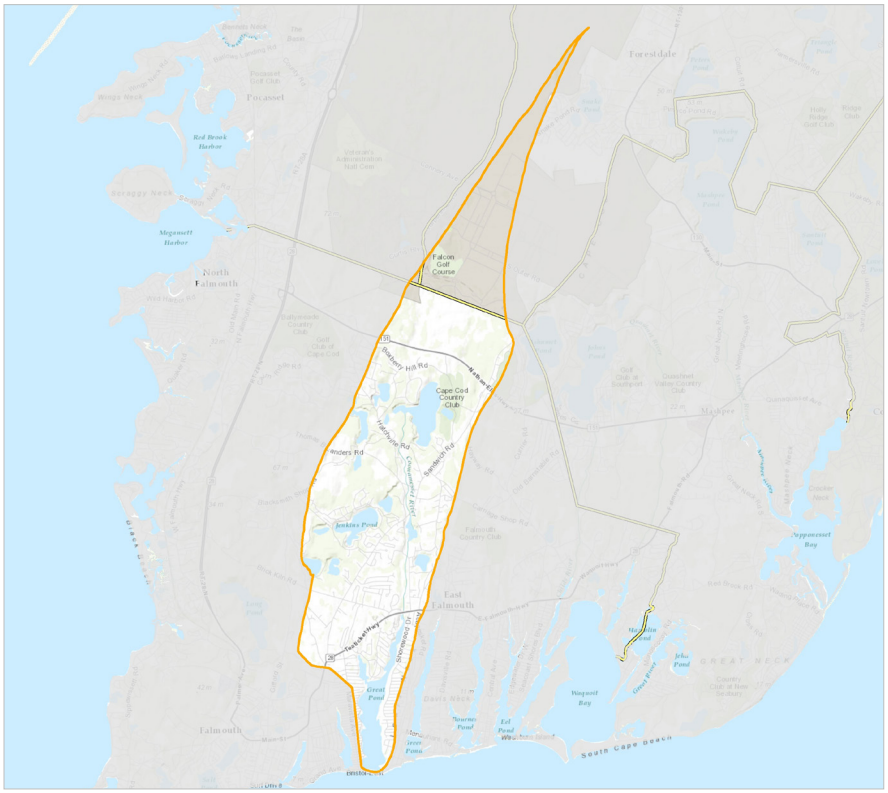
WATERSHED REPORT: UPPER CAPE

Great Pond

FALMOUTH

WATER THREAT LEVEL

HIGH



Great Pond 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.

Great Pond

FALMOUTH

WATER THREAT LEVEL
HIGH

Great Pond has shoreline located entirely in the Town of Falmouth. It is a linear coastal pond that is approximately ¼ mile wide and extend approximately 2 miles to its headwater with groundwater fed streams. Contributing areas to Great Pond are located in Falmouth. The estuary 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 Great Pond system exceeds its critical threshold for nitrogen, resulting in impaired water quality. A MEP technical report has been completed and a Total Maximum Daily Load (TMDL) for nitrogen has been developed and approved by MassDEP and US EPA.

- **MEP TECHNICAL REPORT STATUS:** Final
- **TMDL STATUS:** Final TMDL

Watershed nitrogen load characteristics were published in the 2005 MEP report, reflecting current conditions at the time of writing:

- **TOTAL ATTENUATED NITROGEN LOAD (MEP CHAPTER VIII):** 19,349 kg/Y
- **SOURCES OF ATTENUATED WATERSHED NITROGEN LOAD:**
  - 82% Septic Systems
  - 7% Fertilizer
  - 9% Stormwater From Impervious Surfaces
  - 2% Wastewater Treatment Facilities* (*MEP assumed contribution from the MMR Ashumet Plume)

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):

- **TOTAL WASTEWATER FLOW:** 219 MGY (million gal year)
  - Treated Wastewater Flow: 0 MGY
  - Septic Flow: 219 MGY
- **TOTAL ATTENUATED NITROGEN LOAD (WMVP):** 20,570 kg/Y
  (The wMVP watershed load presented is the load remaining after implementation of the Little Pond sewering project.)

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.

- **FALMOUTH:** 99%
- **SANDWICH (JBCC):** <1%*

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

outside of the watershed. Under existing conditions, the load contributed by Sandwich is so small that reductions are not necessary at this time; however, growth management measures should be taken to ensure that the contribution does not increase. Contributions will be reevaluated at least every five years, based on updated data.

THE MEP RESTORATION SCENARIO

- **WATERSHED TOTAL ATTENUATED NITROGEN REDUCTION TARGET:** 63%
- **WATERSHED SEPTIC REDUCTION TARGET:** 82% (The scenario represents the aggregated sub-embayment percent removal targets from the MEP technical report)

GREAT POND ESTUARY

- **EMBAYMENT AREA:** 282 acres
- **EMBAYMENT VOLUME:** 54 million cubic feet
- **2014 INTEGRATED LIST STATUS:** Category 4a for fecal coliform, estuarine bioassessments and nitrogen
  - Category 4a: TMDL is completed
  - www.mass.gov/eea/docs/dep/water/resources/07v5/14list2.pdf

GREAT POND WATERSHED

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

- **WATERSHED CHARACTERISTICS:**
  - Acres: 7,962
  - Parcels: 4,901
  - % Developed Residential Parcels: 84%
  - Parcel Density: 1.6 acres per parcel (approx.)

Freshwater Sources

PONDS

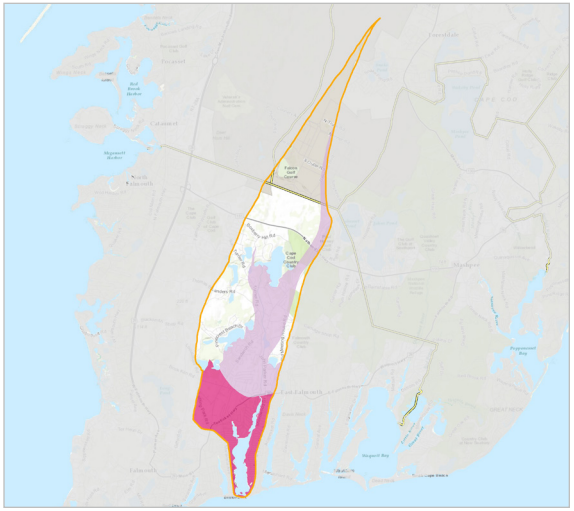
- **IDENTIFIED SURFACE WATERS:** 31
- **NUMBER OF NAMED FRESHWATER PONDS:** 16
- **PONDS WITH PRELIMINARY TROPHIC CHARACTERIZATION:** 2
- **2014 INTEGRATED LIST STATUS:** None listed

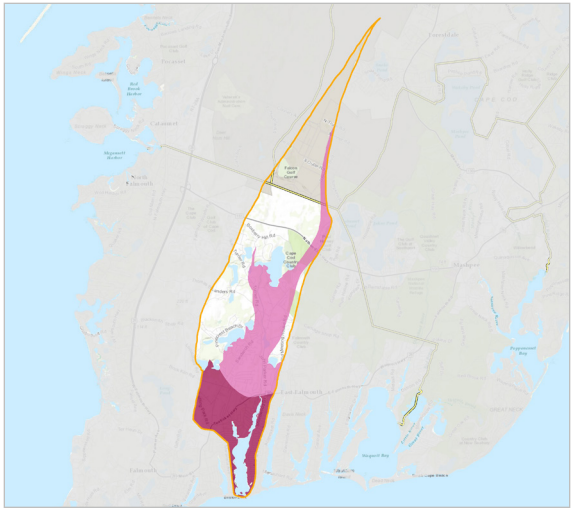
STREAMS

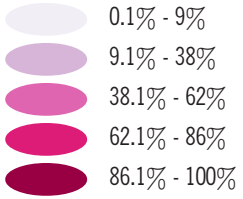
- **SIGNIFICANT FRESHWATER STREAM OUTLETS:** 1

  Coonamesset River:
  - Average Flow: 26,593 m3/d
  - Average Nitrate Concentrations: 0.565 mg/L

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







Subwatersheds with Total Attenuated Watershed Removal Targets

(Left) Benthic and atmospheric loads directly on embayments are not included.

Subwatersheds with Septic Attenuated Nitrogen Removal Targets

(Right)

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

DRINKING WATER SOURCES

- **WATER DISTRICTS:** 1
  - Falmouth Water Department
- **GRAVEL PACKED WELLS:** 3
  - 1 has nitrate concentrations between 0 and 0.5 mg/L
  - 1 has nitrate concentrations between 0.5 and 1 mg/L
  - 1 have no nitrate concentration data
- **SMALL VOLUME WELLS:** 6

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 and Areas of Need

For the purposes of the Section 208 Plan Update, areas of need are primarily defined by the amount of nitrogen reduction required as defined by the TMDL and/or MEP technical report. These were referred to above as 82% of the septic load and 63% of the total nitrogen load for Great Pond. The MEP technical report also provides a specific targeted amount of nitrogen reduction required by sub-watershed, as shown in the figures, Subwatersheds with Total Attenuated Watershed Nitrogen Removal Targets and Subwatersheds with Septic Attenuated Nitrogen Removal Targets.

The nitrogen load from the watershed exceeds the threshold or TMDLs, resulting in impaired water quality. The ecological health of a water body is determined from water quality, extent of eelgrass, assortment of benthic fauna, and dissolved oxygen and ranges from severe degradation, significantly impaired, moderately impaired, or healthy habitat conditions.

MEP ECOLOGICAL CHARACTERISTICS AND WATER QUALITY

The MEP report provides the following characterization of the estuary's health:

- **OVERALL ECOLOGIC CONDITION:** Moderately Impaired to Severely Degraded
- **UPPER GREAT POND:** Significantly Impaired
- **PERCH POND:** Significantly Impaired/Severely Degraded
- **LOWER GREAT POND:** Moderately Impaired
- **SENTINEL STATION:**
  - Total Nitrogen Concentration Threshold: 0.40 mg/L
  - Total Nitrogen Concentration Existing: 0.59 mg/L (As reported at the MEP sentinel water-quality monitoring station)

Town of Falmouth Local Progress

The Town of Falmouth continues to implement the recommendations of its Water Quality Management Committee and its South Coast Watersheds Comprehensive Wastewater Management Plan (CWMP)/Targeted Watershed Management Plan. In addition, it is partnering with the Town of Mashpee and the Cape Cod Water Protection Collaborative on the analysis of flushing of the Moonakis System in Waquoit Bay.

The Town of Falmouth completed the Massachusetts Environmental Policy Act (MEPA)/Development of Regional Impact (DRI) process for the West Falmouth Harbor Wastewater Facilities Plan (WWFP) in 2001. The WWFP focused on a necessary upgrade to the existing treatment facility in order to achieve better nutrient-removal rates. The sensitivity of West Falmouth Harbor to nitrogen loading was not well understood when the facility was permitted in the 1980s. The upgrade is now complete and water quality conditions within the groundwater have improved significantly. However, the disposal location has limited capacity due to sensitivity of the estuary to nitrogen inputs.

The Falmouth wastewater treatment facility (WWTF) was upgraded from a lagoon treatment process to include Sequencing Batch Reactors (SBR) and denitrification filters in 2005. The facility is currently permitted with an effluent flow restriction of 0.8 million gallons per day (MGD). The permit limits flows to the WWTF to 0.23 MGD inside the West Falmouth Harbor watershed and 0.57 MGD outside the West Falmouth Harbor watershed. On January 10, 2014 the town received a Certificate of Adequacy from the Secretary of Energy and Environmental Affairs to sewer the Little Pond Service Area and discharge up to 260,000 gallons per day (GPD) at a new disposal site north of the existing beds and outside the West Falmouth Harbor watershed.

The Cape Cod Commission reviewed an Environmental Notification Form (ENF) for the Town of Falmouth CWMP for the South Coastal Watersheds in 2007. The ENF included the Needs Assessment Report and Alternatives Screening Report for Little Pond, Great Pond, Green Pond, Bournes Pond, Eel Pond, and Waquoit Bay. This draft CWMP included collection of wastewater in the south coastal areas, generally south of Route 28, treatment at a proposed regionally-shared facility at Joint Base Cape Cod, and effluent disposal through injection wells. The town appointed a new internal review committee to evaluate additional alternatives, and in 2012 submitted a draft CWMP/Draft Environmental Impact Report (DEIR) for joint MEPA/DRI review.

The 2012 draft CWMP/DEIR represented a significant change from the screened alternatives presented in the 2007 ENF. In addition to plans for sewering specific portions of the south coastal estuaries and upgrading the West Falmouth treatment facility and discharge options, the DEIR included specific opportunities for innovative on-site technologies and non-discharging systems, tidal flushing, aquaculture, permeable reactive barrier demonstration projects, and non-structural nitrogen reduction strategies consisting of fertilizer controls and stormwater management.

Through its review, the Commission supported the additional evaluation of Joint Base Cape Cod as a potential shared regional facility for the Upper Cape as one the town's alternatives.

The town implemented the recommendations of the Review Committee and approved $2.77 million to implement on site demonstrations of alternatives to conventional sewers and fund up to $500,000 for sewer design. Spring 2013 Town Meeting appropriated $5.6 million to provide engineering design for the Little Pond watershed collection system, necessary facility upgrades, and inlet widening of Bournes Pond.

In January 2014, a MEPA Certificate of Adequacy was issued for the Falmouth South Coast Watersheds CWMP. The Commission approved the CWMP as a DRI in February 2014 with conditions to develop an adaptive management plan. Spring 2014 Town Meeting subsequently voted to bond $50 million to construct the Little pond watershed collection system and necessary facility upgrades and to widen Bournes Pond inlet.

Members of the WQMC, town staff, and their consultants (Science Wares, Inc) met with Commission staff to review

Town of Falmouth Local Progress

watershed scenarios and provide input on the non-traditional approaches to be included.

In June 2016, Falmouth received $24,299 from the Commission to support the Bournes Pond shellfish project and a sediment aeration project in Great Pond. Funding was part of $142,149 in local grants made by the Commission in support of 208 Plan implementation.

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

The watershed scenarios that follow outline possibilities for the watershed. A series of non-traditional technologies that might be applicable are included, as well as the amount of residential load that would need to be collected if a traditional collection system and treatment facility was implemented. The pie charts show the load to be collected for treated effluent disposal both inside and outside the watershed.

Site specific analyses of collection areas may result in the need to collect wastewater from more or fewer parcels to meet the nitrogen reduction target. 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.

TOTAL ATTENUATED NITROGEN LOAD VALUES (FROM WMVP)

Great Pond Nitrogen Sources	Total Attenuated Watershed Nitrogen Load (kg-N/yr)
Wastewater[1, 2]	15,011
Fertilizer[3]	2,455
Stormwater	2,430
Other[4]	674
TOTAL WATERSHED LOAD	20,570
Total Watershed Threshold	7,195
TOTAL ATTENUATED LOAD TO BE REMOVED	13,375

1. Includes nitrogen loads from septic systems and wastewater treatment facilities. 2. Wastewater load reflects recent sewering. The wastewater load presented is the load remaining after implementation of the Little Pond sewering project. 3. Includes nitrogen loads from lawns, cranberry bogs, and golf courses. 4. Includes nitrogen loads from landfills and atmospheric deposition to vacant land.

A summary of the approach and methodology that was applied using non-traditional technologies follows at the end of this report.

Traditional & Non-Traditional Scenarios

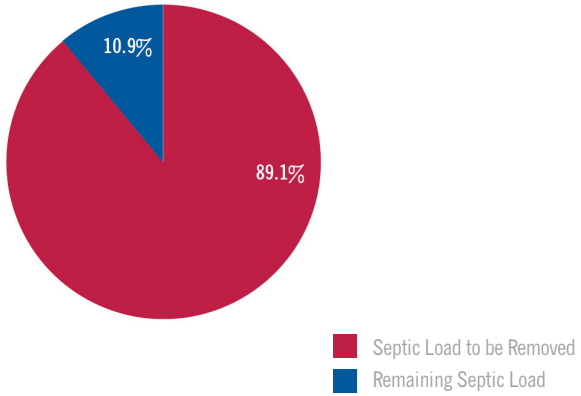
Non-Traditional

UNIT OF APPLIED TECHNOLOGY	ATTENUATED NITROGEN REMOVED IN KG/Y
25 % Nitrogen Reduction - Fertilizer Management	614
25 % Nitrogen Reduction - Stormwater Mitigation	608
300 Linear Feet - Permeable Reactive Barrier (PRB) (Capture load calculated by wMVP: 1,931 kg/Y)	1,400
53 Acres - Fertigation - Turf	105
7 Acres[1] - Aquaculture/Oyster Beds	1,800
2,382 Units[2] - Enhanced I & A Systems	7,365
TOTAL[3]	**11,892**

1. Implementation of aquaculture at this scale may be difficult and must be further evaluated; however, it is difficult to achieve the necessary nitrogen reductions without the use of aquaculture and given the preferences identified by the Water Quality Management Committee. Sewering may be necessary to achieve required reductions. 2. Per the Town of Falmouth request, 2,382 units reflects the number of homes needed to be outfitted with Enhanced I/A systems treating to 10 ppm. If the regionally consistent standard of 13 ppm were used, an additional 484 homes would need to be outfitted. 3. In addition to the 11,892 kg reduction by NT technologies, an additional 955.04 kg/yr is assumed to be removed by the Little Pond sewering project that is currently in the process of being implemented. Even assuming this total 12,847 kg reduction, it is not possible to meet the load reduction required in this watershed using additional NT technologies, given the preferences expressed by the Town's Water Quality Management Committee. Given these preferences, a hybrid solution incorporating additional traditional infrastructure will be necessary.

Traditional

CENTRALIZED TREATMENT
WITH DISPOSAL OUTSIDE THE WATERSHED



Assumes that the load to be collected and treated is removed from the watershed so no offset is required.

These values represent the proportion of remaining wastewater load to be removed following the recent sewering. See note 2 in the Total Attenuated Nitrogen Load Values table on facing page.

The watershed nitrogen threshold cannot be met by collecting 100% of the septic load in the watershed and returning the treated load to the watershed.

Methodology for Selecting Non-Traditional Technology Scenarios

This section summarizes the approach and methodology that was applied during the 208 Update to develop plans for reducing nitrogen loading to estuaries using non-traditional (NT) technologies. It includes descriptions of regional credits for stormwater and fertilizer reductions, regional screening for potential sites for several technologies, and site-specific analyses for others. Nitrogen attenuation rates for each technology were derived from the Technologies Matrix. The nitrogen thresholds for each embayment were determined from the Massachusetts Estuaries Project (MEP).

This section summarizes the approach and methodology that was applied during the 208 Update to develop plans for reducing nitrogen loading to estuaries using non-traditional (NT) technologies. It includes descriptions of regional credits for stormwater and fertilizer reductions, regional screening for potential sites for several technologies, and site-specific analyses for others. Nitrogen attenuation rates for each technology are noted below, based on the Technologies Matrix or newer data. The nitrogen thresholds for each embayment were determined from the Massachusetts Estuaries Project (MEP).

Regional credits were developed for potential stormwater retrofits and fertilizer reductions. They were calculated as a percent reduction of existing nitrogen loads as identified in the MEP reports and updated GIS data developed by the Cape Cod Commission.

- **STORMWATER MANAGEMENT:** Most Cape communities have already begun the process of identifying significant untreated stormwater discharges and developing appropriate mitigation projects. With the prospect of the MS4 regulatory requirements it was assumed that additional mitigation efforts would be implemented. Based upon the evidence developed by the University of New Hampshire Stormwater Center that several vegetated stormwater management practices (including bioretention and constructed wetlands) are able to achieve nitrogen reductions of 50% or more and the assumption that only a portion (estimated at 50%) of identified sites would be retrofitted a 25% nitrogen reduction credit was assumed for each watershed. Specific locations and number of locations were not identified; this was deferred to individual towns to consider as part of the suite of nitrogen management strategies.
- **FERTILIZER REDUCTIONS:** Based upon the success of most Cape Cod towns to implement either regulatory or non-regulatory fertilizer management programs and the efforts of the Cape Cod Extension Service in educating homeowners a 25% reduction in fertilizer applications was assumed for each watershed.

Regional GIS screening methods were developed to identify locations for some non-traditional technologies. A GIS viewer was developed as an on-line tool for staff and consultants to utilize during the watershed planning process.

- **CONSTRUCTED WETLANDS/ PHYTOREMEDIATION:** A GIS-based screening method was developed by the Cape Cod Commission to identify and rank parcels of land that have potential for the location of constructed wetlands and phytoremediation. The ranking utilized parcel size and ownership, depth to groundwater, suitable soils, distance from wetlands, and undeveloped parcels. A nitrogen removal rate of 500 kg/Y/acre and 532 kg/Y/acre was used for Constructed Wetlands and Phytoremediation, respectively.
- **PERMEABLE REACTIVE BARRIERS (PRBS):** A GIS-based screening method was developed to identify existing roads that are proximate to receiving waters, downgradient of high density development, run perpendicular to groundwater flow (to have the highest potential to intercept nutrients in groundwater), and where the depth to groundwater is relatively shallow to maximize the area of saturated thickness treated in the aquifer.

Methodology for Selecting Non-Traditional Technology Scenarios

- **FERTIGATION WELLS:** Golf courses were mapped to identify areas where fertigation wells could be utilized to recapture nitrogen-enriched groundwater and re-apply it to the managed turf areas to serve both irrigation and fertilization needs. Most golf courses were assumed to be eighteen holes with a fertilized area of 75 acres. Fertigation water was assumed to have an average concentration of 5 mg/liter. An uptake/attenuation rate of 80% was applied resulting in an assumed nitrogen reduction of 300 kg/year for each golf course with effectively located fertigation wells. In some cases other irrigated areas (such as athletic fields and cemeteries) were identified as potential fertigation locations. A nitrogen removal rate of 4 kg/Y/acre was used.

The MVP tool and other site-specific tools were utilized to quantify nitrogen load reductions for several potential NT interventions.

- **PERMEABLE REACTIVE BARRIERS:** for each PRB that was identified during the prior GIS-screening process an approximate capture area was identified using available water table maps and the wMVP tool. Upgradient contributing areas were digitized within wMVP and the nitrogen load was calculated. A nitrogen reduction of 72.5% was applied (calculated as an average of the reported attenuation range from the Technologies Matrix).
- **CONSTRUCTED WETLANDS (WITH COLLECTION):** Constructed wetlands were considered as a tertiary, polishing treatment for existing wastewater treatment plants. This included small-scale wastewater treatment systems. A nitrogen removal rate of 500 kg/Y/acre was used.
- **AQUACULTURE/OYSTER REEFS:** Potential areas for aquaculture and/or oyster reef restoration were considered based upon discussions with town representatives and review of maps to identify potential areas for these operations without significant conflicts to navigation. In some cases actual recent aquaculture expansions were included where they were developed after the MEP reports were prepared. An assumption of 1 million oysters per acre was used with a nitrogen removal rate of 250 kg/Y/acres.
- **FLOATING CONSTRUCTED WETLANDS:** Potential areas for floating wetlands were considered in areas where no conflicts with navigation or swimming areas were identified. A nitrogen removal rate of 0.4 kg/Y/sq foot was used.
- **INLET WIDENING AND COASTAL HABITAT RESTORATION:** Only considered in areas where these projects were identified by towns or state agencies and where detailed hydrologic investigations and modeling had been performed due to wide variations in nitrate load reduction, flushing impacts, impacts on flooding, and costs (dredging only, replacing infrastructure, removing and replacing roadways or bridges, etc.). Nitrogen removal rates were based on MEP or other studies.
- **INNOVATIVE & ALTERNATIVE SEPTIC SYSTEMS AND ECOTOILETS:** In most cases specific locations for these technologies were not identified. Rather general estimates for the percent adoption were provided based upon discussions with the stakeholder groups and their views on potential adoption rates. In some watersheds a 5% adoption rate was included based upon this stakeholder input. In a limited number of instances specific locations for these technologies were included based upon town input and suggestions. A nitrogen removal rate of 1.658 kg/Y for each system was used for I&A Septic Systems, and 2.984 kg/Y for enhanced I&A systems. A removal rate of 2.542 kg/Y was used for each home installation of an Ecotoilet, and 0.467 kg/Y for installation of urine diversion toilets in public settings.

Finally, the locations of specific technologies were discussed during the 208 stakeholder engagement process. Stakeholders across the Cape 'groundtruthed' potential NT locations and NT scenarios were adjusted accordingly.