



*via electronic delivery*

September 5, 2014

Secretary Maeve Vallely Bartlett,  
Executive Office of Energy and Environmental Affairs  
Attn: MEPA Office – Deirdre Buckley  
100 Cambridge Street, Suite 900  
Boston, MA 02114

**Re: Mashpee Comprehensive Watershed Nitrogen Management Plan  
EEA No. 12615**

Dear Secretary Bartlett:

Mashpee's proposed Comprehensive Wastewater and Nitrogen Management Plan (CWMP) is the first CWMP from a town on Cape Cod the Secretary is reviewing since the release of the Draft Clean Water Act Section 208 Plan for Cape Cod. It is the Association to Preserve Cape Cod's (APCC) hope that the Secretary will accept the core principles of the 208 plan in evaluating CWMPs beginning with this Mashpee plan.

Founded in 1968 and representing more than 5,000 members, the mission of APCC is to promote policies and programs that enhance the protection of the natural resources of Cape Cod. Underlying all of the work that APCC does is the understanding that Cape Cod is a single geographic and hydrogeological unit, and that the Cape's natural resources and economic vitality cannot be adequately protected based on arbitrary political borders.

Mashpee must be applauded for its proactive approach addressing nutrient pollution in a multi-tiered approach that integrates conventional solutions (sewerage), existing infrastructure (Joint Base Cape Cod) and innovative technologies. Most importantly, Mashpee has fully committed itself to adaptive management. While the effort is overall quite laudable, APCC does have a number of comments and concerns we believe the Secretary should consider in allowing this plan to proceed toward permitting.

Targeted Watersheds- One of the core principles of the 208 Plan is a targeted watershed approach. While the Popponesset Bay portion of this plan is arguably a targeted approach (Barnstable remains missing), the portion of the plan addressing Waquoit Bay is anything but a targeted watershed approach. Falmouth has the largest contribution of nitrogen to Waquoit Bay

and is essentially absent from the plan.<sup>1</sup> This is simply not a watershed based plan, but is instead the usual plan based upon municipal boundaries and singular municipal action. Mashpee is not completely at fault here as Falmouth has been reluctant to address Waquoit Bay and has focused more in the central portion of that town. Additionally a Total Daily Maximum Load (TMDL) for Waquoit Bay came late in the Massachusetts Estuaries Program watershed evaluation process. Waquoit Bay is the one Area of Critical Environmental Concern (ACEC) covered by this plan and deserves a fully targeted plan involving Sandwich, Falmouth and Mashpee. The 208 plan and planning process identified both the need and the cost savings for towns to cooperate on a watershed basis as opposed to each town sticking to its municipal boundaries. The Secretary should require a targeted watershed approach for Waquoit Bay—making the three towns work toward a solution for this severely impaired ACEC.

Land use initiatives – The Secretary’s Certificate dated November 1, 2013 stated that “[t]he DEIR include a detailed discussion of potential land use control mechanisms that can be employed to limit secondary growth impacts associated with implementation of the CWMP.”

Mashpee has done a good job in dealing with new development. Currently, Mashpee has several growth management bylaws in place that do go beyond many towns in controlling the rate of growth and protecting natural resource areas. The challenge will be to bring redevelopment and expansion of existing structures and uses into a sound and equitable regulatory environment. Mashpee’s zoning should reflect the goal of directing compact development to targeted areas where infrastructure can support the growth, but at the same time, offset that growth with a balanced, growth-neutral reduction in development potential outside of the targeted growth areas.

The town adopted a permit phasing requirement that allows no more than 20 percent of the lots in a new subdivision to receive building permits each year. The town-wide limit is 90 building lot permits per year. Mashpee has an optional Open Space Incentive Development bylaw for subdivisions on 20 acres or more of land, and a mandatory cluster subdivision bylaw for subdivisions on five or more acres. Both bylaws require a special permit, as opposed to being by right. The minimum open space set-aside for both is 50 percent. A Transfer of Development Rights option is available with the Open Space Incentive Development bylaw.

While these bylaws are more progressive than cluster bylaws in many other Cape towns, there are innovative natural resource protection bylaws being used on the Cape and elsewhere in Massachusetts that are very effective in managing growth and protecting resources. APCC adds the following initiatives to the discussion of Mashpee’s growth management strategy:

#### *Natural Resource Protection Zoning (NRPZ)*

The town should consider adopting a modified Natural Resource Protection Zoning bylaw that protects large areas of open space, reduces density from what current zoning allows, and offers density bonuses based on the level of nitrogen removal from the new development’s wastewater

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<sup>1</sup> APCC is aware that there has been discussion and good cooperation at the wastewater superintendent level but the towns do not have a targeted watershed plan at this point.

treatment. NRPZ is by right, while other types of development, including conventional grid-style subdivision, require a special permit. NRPZ includes a base density reduction from what current zoning allows, cluster development with no minimum lot size requirement, and significant open space preservation of the most environmentally important features of the land. Density bonuses are awarded as incentive for such things as utilization of an advanced wastewater treatment system, and connecting pre-existing neighboring development that currently uses Title 5 to the new development's advanced treatment system to achieve a net nitrogen load reduction for the area. NRPZ can be an effective offset to other regions in town where compact growth is being encouraged due to the presence of supporting infrastructure. A natural resource protection bylaw was adopted in the town of Brewster in 2009 for the purposes of protecting sensitive water resources.

#### *Open Space Residential Design (OSRD)*

Like NRPZ, Open Space Residential Design also relies on cluster and natural resource-based open space preservation. It places an emphasis on protecting natural resources in the design of the subdivision, but OSRD typically does not include a reduction in the current zoning's base density allowances.

#### *Managing Expansion of New and Existing Uses*

Mashpee has a 20 percent lot coverage maximum for residential uses, but this is not necessarily an effective tool for discouraging oversize residential units on very large lots. Potential options for addressing out-of-scale development, or mansionization, are discussed below.

#### *Floor Area Ratio*

Floor area ratio, or FAR, regulates the amount of gross floor area that can be built on a lot. It is a ratio of gross floor area to lot size, or:

$$\text{FAR} = \text{Total floor area of a building on a lot} / \text{lot size}$$

The purpose of FAR is to regulate the above-ground mass of a building that can be seen from the street or a neighboring property. It has been used increasingly in residential situations to discourage mansionization in communities. In regulating the mass, FAR may also help minimize the number of bedrooms that could be accommodated within a residence.

#### *"Sliding Scale" FAR Hybrid (Wellfleet Example)*

Wellfleet has adopted residential size restrictions in the National Seashore for the purpose of minimizing visual impacts. This "sliding scale" site coverage provision relies on several lot area and site coverage fixed thresholds to keep the size of development in balance with its surroundings. A maximum limit is placed on the size that a structure can reach. As an option for Mashpee, expansion beyond the maximum threshold could be made possible through a special permit. As with conventional FAR, a similar bylaw in Mashpee may help limit the number of bedrooms per residence. This could reduce the nitrogen load in unsewered areas, conserve sewer capacity in sewerred areas, and address tendencies for "mansionization" throughout the town.



#### Maximum Site Coverage in the National Seashore Park (Wellfleet)

##### Lot Area Maximum

Less than 10,500 sq. ft. (just under ¼ acre)  
10,501 sq. ft. to 21,000 sq. ft. ( $\approx$  ¼ to .48 acre)

21,001 to 42,000 sq. ft. (.48 to .97 acre)

42,001 to 84,000 sq. ft. (.97 to 1.92 acre)

84,001 to 126,000 sq. ft. (1.92 to 2.89 acres)

126,001 sq. ft. (2.89 acres and above)

##### Site Coverage

5% Maximum Building Coverage

1,050 sq. ft. plus 7.4% of lot area over 10,500

1,825 sq. ft. plus 3.2% of lot area over 21,000

2,500 sq. ft. plus 1.43% of lot area over 42,000

3,100 sq. ft. plus 1.2% of lot area over 84,000

3,600 sq. ft.

#### *Sewer Hookup Cap*

Some Massachusetts towns have adopted or are considering regulations that place a ceiling on the number of allowable sewer hookups within a sewer district. If desired by the town, additional building permits may be allowed only through a special permit. These caps allow for targeted zones of contribution.

#### *Growth Management Bylaw (Provincetown Example)*

The purpose of this bylaw is to maintain a sustainable rate of residential and commercial development in the town in order to ensure that adequate infrastructure continues to be available to meet current and future demand without overburdening the town's natural resources or infrastructure capacity. A limited number of annual permits are issued for any new or expanding uses that will increase Title 5 flow. Issuance of these permits is based on a predetermined hierarchy of priority types of uses, with affordable housing being the highest priority. The types of uses that are higher in priority go to the top of the waiting list.

#### *Wetland Setback Requirements*

Mashpee has a 100-foot setback requirement for development along the Mashpee and Quashnet rivers, while development near other wetlands and water bodies in town must observe a 50-foot setback requirement. The town should consider expanding the 100-foot setback requirement to all ponds and other wetlands. In addition, the board of health should consider expanding the current 100-foot setback requirement for septic leaching systems near ponds and other fresh water bodies to 300 feet.

#### *Special Permits*

The town should evaluate whether the Board of Appeals should be required to make a specific finding of more or less nutrient loading in all special permits decisions related to redevelopment or existing structures and uses in determining whether or not a project is “substantially more detrimental,” with the goal being net reductions.

#### *Mandatory Advanced Wastewater Treatment*

Mashpee should consider a mandatory requirement for advanced wastewater treatment for all upgrades or replacement of existing systems, such as, all cluster or conventional subdivisions of four units or greater must be connected to an advanced wastewater treatment system if those

subdivisions are in areas that do not have sewer service, or that are in designated water protection districts. The Harwich board of health has adopted this requirement in its regulations.

#### *Fertilizer Management*

In addition to examining new growth management bylaw and regulation options, Mashpee hopefully will adopt the Cape Cod Commission's fertilizer management model bylaw at its fall town meeting. The Secretary should send a strong message of the value of adopting this proposed bylaw and its potential for inexpensive water quality improvement.

Reliance on aquaculture – Mashpee has assembled one of the best teams imaginable to carry out its aggressive shellfish program. The cooperation and collaboration of the Mashpee Wampanoag Tribe is an added bonus and an addition to the likelihood of success. Mashpee Shellfish Constable Rick York is regarded as one the preeminent experts on shellfish management and has a track record of success of utilizing shellfish as a tool for water quality improvement. The plan has a heavy reliance upon this approach, which is subject to wide range of challenges from the environment including disease, predation, weather, ocean acidification and climate change. The town has embraced adaptive management and is prepared to move to a more conventional approach if shellfish efforts disappoint. However, how success or failure are to be quantified and determined is not established in the CWMP with the necessary degree of certainty.

That shellfish take up nitrogen and convert it into shell and tissue is not in question. However, the use of shellfish to take up and remove nitrogen from eutrophic coastal waters, on a scale that would provide noticeable improvement in water quality, is a new area of environmental management. It is critical that we advance this potentially important management tool with a clear understanding of the risks and benefits and a sound means of evaluating success and failure. APCC's main concerns relate to: 1) accurately estimating the concentration and amount of nitrogen removed by shellfish, 2) contingency planning to address limitations on nitrogen removal that may occur if shellfish are impacted by disease, predation, harmful algal blooms, climate change, ocean acidification, cessation or slowing of harvesting, 3) the reliability of this method of removing nitrogen from estuaries, and 4) monitoring to ensure performance.

APCC's staff scientists compared some of the Mashpee information with recent studies conducted in Cape Cod waters (Reitsma et al., 2014; Karplus and Falmouth Water Quality Management Committee, 2014 draft data from pilot test). Because of geographic differences in nitrogen uptake that are described in the literature, these Cape Cod studies are most relevant.

*Mashpee's 2012 study is used as the basis for estimating N removal from estuaries by oysters.*

Because estuaries have different characteristics, local pilot studies should be used as the basis for designing shellfish aquaculture projects to remove nitrogen (N), whether nitrogen is removed via uptake into shellfish tissue and shell, or through denitrification and other biogeochemical and microbial processes. In 2012 Mashpee conducted testing to measure weight, size, and nitrogen content of wild and cultured oysters at several locations (see data in the Table entitled "Shellfish Sample Data – Barnstable County Extension"). It appears that the results were used in the CWMP application to estimate the concentration of nitrogen in shellfish (e.g., percent of wet weight due to N in all shellfish tested averaged 0.5 % N), to estimate the amount of N in a 100-

gram oyster ( $0.5\% \text{ N} \times 100 \text{ g/oyster} = 0.5 \text{ g N/oyster}$ ), and finally to estimate the amount of N that could be removed in an estuary. There are several concerns with using these numbers, as described below.

- 1) The 2012 study was performed over one growing season. Pilot tests should be conducted for at least two or more years in order to obtain enough data to yield robust estimates of the amount and concentration of N in shellfish. Two years is also preferable because older shellfish will generally be larger and contain more nitrogen than younger oysters.
- 2) The 2012 study was apparently not used to differentiate nitrogen uptake according to different size classes. Reitsma et al. (2014) and the Falmouth pilot study (Karplus, personal communication) showed that size class is an important factor in determining the percent of nitrogen in shellfish—generally the older the shellfish, the larger it is and the more nitrogen it contains. Using one number for the percent of N could result in over-estimating or under-estimating the amount of nitrogen removed by shellfish, particularly when extrapolated to five million shellfish.
- 3) Mashpee's assumption of 0.5 g of N removed per oyster assumes a 100-g oyster ( $0.5\% \text{ N}$  times 100 g oyster = 0.5 g N per oyster). The 2012 study tested oysters whose whole weights ranged from 37.26 g wet weight to 97.46 g wet weight, with the average being 59 g. If harvested shellfish are smaller than 100 g, the town's assumptions may result in overestimating the amount of N removed. Again, characterization of N content based on size classes would help the town to more accurately estimate the amount of N that could potentially be removed. Reporting of N concentrations and amounts in terms of dry weight would facilitate comparison with published values.
- 4) Variation in N concentration and amount in shellfish should be characterized in order to bracket the upper and lower bounds of N-removal. Variation could occur due to seasonality, size classes (as indicated above), estuary conditions, species, shellfish health, and other factors. This is important for judging whether shellfish aquaculture will meet regulatory standards for N removal.
- 5) When N concentrations, amounts and estimates are being discussed, the narrative should be clear whether this refers to oysters, quahogs or a combination of both.

#### *Recommendation 1:*

Because there is much riding on using shellfish to remove nitrogen, Mashpee should conduct additional pilot testing for at least a second and probably a third year, to provide more accurate estimates of the amount of N to be removed. Additional testing should characterize the mean, median, variation (maximum, minimum, standard deviation) in nitrogen concentration and amount according to species, size class, estuary, seasonality, and growing configuration. The results should be used to re-estimate the amount of nitrogen that may be removed by oysters or shellfish.

*Recommendation 2 Provide backup plan if shellfish cannot be harvested or populations are reduced (in addition to other contingencies).*

Appendix 5.1 in the CWMP expresses confidence that shellfish diseases, storm damage, harmful algal blooms, and ocean acidification will not pose risks to shellfish aquaculture because Mashpee has not experienced these. Nevertheless, environmental conditions are changing throughout the world, locally and regionally. In the Pacific Northwest, beginning in 2007, ocean acidification affected oyster hatcheries and by 2008 the oyster harvest had declined by 80%. Accidents such as major oil spills and harmful algal blooms have occurred elsewhere on Cape Cod, causing closure of shellfish beds. The fact that such events have not happened in the past in Mashpee is no guarantee that they will not happen in the future. The town should develop a specific plan for addressing these potential risks and have a backup plan for removing nitrogen if such disasters were to reduce or eliminate shellfish populations or if harvesting were to be stopped or curtailed for some reason. The backup plan should specify concrete actions to provide backup removal of nitrogen if shellfish aquaculture or harvesting partially or completely halted for some reason. The town's Geographic Response Plan may serve as a basis for identifying appropriate response actions for spills or other disasters. In the event that shellfish are rendered unsafe to consume, backup plans for harvesting inedible shellfish and properly disposing of the inedible harvest should be implemented to prevent dead shellfish from re-entering the nitrogen cycle. Monitoring of suitable parameters should be conducted. The Cape Cod Commission is working with a subcommittee to develop recommendations for monitoring different N-removal alternatives, and Mashpee is urged to adopt these recommendations when they are published.

Adding to the mix is that there are other elements occurring in a changing world that might skew results and cloud the success or failure of aquaculture. Standardized measurements for the success or failure of shellfish aquaculture must be adopted for the region and state. Ultimately, the town must qualify/quantify its success or failure. It is unclear in the plan how Mashpee will determine or measure the success or failure of its proposed shellfish program. APCC recommends that the town create a decision matrix to guide adaptive management decisions and actions.

Stormwater – The nexus of stormwater management to edible, sustainable shellfish does not seem to be captured/appreciated in the plan. APCC believes that a successful shellfish program is dependent upon sound stormwater management. Moreover, protecting water quality is critical to maintaining the integrity of Cape Cod's public water supplies, swimming beaches, and recreational resources. While water pollution is often associated with industrial activities and maritime accidents, stormwater runoff from developed areas is a major contributor to the problem. Excess fertilizers and insecticides and the harmful chemicals that accumulate on roofs, pavement and other impervious surfaces, are transported by stormwater to surface and ground waters. This runoff severely degrades water quality, harming the ecology of coastal waters and threatening public health. While federal and state water quality standards require communities to treat and manage stormwater, municipal stormwater management requires an investment in trained staff, infrastructure improvements, maintenance, and management systems. Finding the



funding to manage stormwater runoff to meet water quality standards is often a challenge. Traditional sources of funding (state and federal grants) are typically not enough to address all of a community's stormwater management needs. In recent years, communities across the country have adopted stormwater utilities as a way to create adequate funding for comprehensive municipal stormwater management programs. These utilities have proven to be a successful way for cities and towns to fund stormwater programs that will bring communities into compliance with federal regulations for non-point source pollution under the Clean Water Act. APCC recommends that Mashpee evaluate the creation of a stormwater utility.

Failure of on-site systems – There is compelling evidence that some on-site septic systems are failing and not being detected as failing. The Silent Spring Institute, which is studying the levels and impacts of pharmaceuticals in the groundwater on Cape Cod, has noted that a functioning Title 5 system does an excellent job of breaking down acetaminophen. The Provincetown Center for Coastal Studies is currently monitoring bays and estuaries surrounding Cape Cod for pharmaceuticals, and has detected acetaminophen in our bays, estuaries and sounds. The only potential source for detectable acetaminophen is from failing on-site systems. There are a number of explanations including the failure of Title 5 to eliminate the use of cesspools. APCC has assembled anecdotal information that the majority of existing cesspools have a direct hydraulic connection with groundwater. APCC believes that CWMPs should address both cesspools and monitoring of on-site systems (which often escape inspection under current regulations). The Secretary can take a lead in this endeavor by ordering an update of Title 5 regulations that phase out cesspools and require periodic inspection of on-site systems (not just at sale or an identifiable problem like frequent pumping).

Sea level rise and the efficacy of on-site systems in low lying areas – While the plan addresses climate change, it overlooks some of the critical dynamics ultimately impacting wastewater decision making. APCC is coordinating a multi-level, multi-year modeling project to determine the impact of sea level rise on groundwater elevation and flow. One of the major climate challenges facing Cape Cod is sea level rise. Cape Cod is one of the global “hot spots” for sea level rise, meaning Cape Cod will face well-above global average sea level rise. This could be as much as a seven-foot increase over the next century. Cape Cod has a sole source aquifer that is significantly affected by sea level. On the outer Cape our freshwater floats entirely on top of salt water. On the upper Cape, sea level will have the same impact as if the fresh water were completely afloat: groundwater elevation will rise as sea level rises. As sea level rises it will impact a wide range of ecosystems and infrastructure. On-site septic systems work because of the separation of leaching fields from groundwater. According to the Department of Environmental Protection, the number one cause of on-site septic system failure is groundwater infiltration. Rising sea level will mean rising groundwater elevations and more on-site septic systems will fail. Working with the U.S. Geological Survey, and the Cape Cod Commission, work is underway in this modeling effort. The model will predict where sea level rise will have the greatest impact on the groundwater dynamic, which includes groundwater elevations, stream flow, pond size, and vernal pools, as well as human infrastructure (e.g. basements, septic systems, roads and underground utilities). Sea level rise will likely increase the rate of on-site

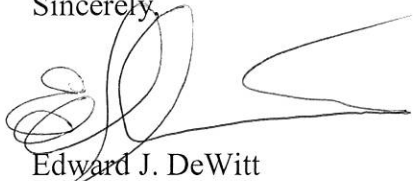


septic systems and add to the cost of all in-ground infrastructure. This reality needs to be better integrated into the plan and priorities may have to be readjusted.

Environmental Justice Issues – The plan should more formally address the affordability challenges facing an older demographic often living on fixed incomes and the low income community in Mashpee. These residents may not be able to carry the full cost of implementation. While the Commonwealth has made adjustments to the state revolving fund program which should benefit those least likely to afford the cost of improvements, the town must take a more creative approach. APCC recommends the town consider income from commercial shellfishing associated with the plan be used to offset some of the financial impacts on those least able to afford costs associated with wastewater improvements.

Thank you for providing an opportunity to review and comment on this important step forward for Cape Cod.

Sincerely,

A handwritten signature in black ink, appearing to read 'Edward J. DeWitt', with a long horizontal flourish extending to the right.

Edward J. DeWitt  
Executive Director

cc: Mashpee Sewer Commission  
Cape Cod Commission

