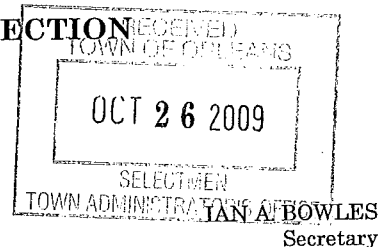




COMMONWEALTH OF MASSACHUSETTS
 EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS
 DEPARTMENT OF ENVIRONMENTAL PROTECTION
 CAPE COD OFFICE

973 Iyannough Road, Route 132, Hyannis, MA 02601
 Phone: 508-771-6003 FAX: 508-771-6155



DEVAL L. PATRICK
 Governor

TIMOTHY P. MURRAY
 Lieutenant Governor

LAURIE BURT
 Commissioner

October 21, 2009

Mr. John Kelly, Town Administrator
 Town Hall
 19 School Road
 Orleans, Massachusetts 02653

RE: Massachusetts Estuaries Project –
 Response to Questions

Dear Mr. Kelly:

MassDEP and SMAST are pleased to have the opportunity to provide the Town of Orleans with this response to the Board of Selectmen’s June 16, 2009 letter regarding the Massachusetts Estuaries Project (MEP) technical report for Pleasant Bay. In addressing the questions and issues raised in your letter, it is hoped that the Town of Orleans will be able to move forward in its phased approach to wastewater management planning with full confidence in the underlying science that serves as the basis of the planning efforts to date.

The (MEP) is a multi-disciplinary, linked modeling approach developed to provide communities with a scientifically valid basis to develop sound nitrogen management strategies in order to protect, preserve and restore the coastal resources of southeastern Massachusetts. The purpose of the MEP is twofold. First, the MEP establishes system specific nitrogen threshold concentrations that are sufficient to support healthy habitat and biota. Second, the MEP creates a linked model for each system to aid communities in developing nutrient management plans by analyzing various nitrogen reduction scenarios and establishing a management plan that best reflects the needs of the communities. The MEP was established to aid communities in reducing costs of nitrogen management through use of a pre-approved technical approach and to control the amount of wastewater infrastructure required by providing refined targets.

This linked modeling approach underwent significant review at the state (MassDEP, CZM) and federal (USEPA) levels before being accepted and funded as part of the MEP. Reviewers at these agencies included staff well versed in marine ecology, wastewater engineering, hydrology, and hydrogeology and thus were qualified to ascertain and confirm the validity of the methodology. MEP partners include renowned modeling experts such as USGS who also reviewed the validity of the approach before agreeing to participate in the MEP. In addition, 32 estuary specific reports have been reviewed by engineers, marine scientists (including scientists from major research institutions and universities) and private citizens over the past 8 years as part of the MEP process and found to be a valid basis for watershed nutrient planning. It is also

important to realize that the MEP linked modeling approach is not a single push button piece of software, but rather a series of independent but related components that mesh together (hence the linked aspect of the approach) to produce output. As such, each of the component sub-models and the related coefficients have been peer reviewed and published in top scientific journals. Equally as important is the fact that the scientists and engineers conducting the modeling and assessments each have 20-30 years of experience in conducting these efforts and are recognized experts in their specific disciplines.

From the beginning, the goal of the MEP was to provide a valid science based approach to wastewater management planning that would afford communities the opportunity to craft strategies that minimized capital outlays. The capability for alternative scenario analysis allows for targeting nitrogen reductions in a cost effective and scientifically justifiable manner. Without such a tool, nitrogen management planning would likely result in overly conservative assumptions resulting in over-management of nitrogen with consequential increased cost. As with any model, there are opportunities for further refinement in specific systems or applications; however, in the broad view, the MEP linked modeling approach provides an appropriate and verifiable methodology to advance cost effective nitrogen management planning.

At the outset, it is clear that a world-wide body of data and evidence supports the premise that cultural eutrophication has accelerated degradation of both water and habitat quality in coastal systems. As nitrogen is the limiting nutrient in coastal waters and the main cause of eutrophication, the MEP focuses on nitrogen management to combat the effects of this accelerated decline. Habitat health is best measured by selecting a sentinel species that is sensitive to changes in its environment, yet robust enough to endure stressed conditions so that trends in its presence can be evaluated over an historical period. In the case of the MEP, eelgrass is the primary sentinel species while infaunal habitat serves as a sentinel indicator in areas where eelgrass has not been historically present.

The concept of indicator, or sentinel, species is well established in a variety of scientific fields. One does not have to look any further than the use of coliform bacteria which serves as a surrogate means of detecting fecal contamination in drinking water or the historical use of canaries in coal mines to indicate the presence of deadly gases to find common examples. The use of eelgrass as a sentinel species is not unique to the MEP and is supported by the scientific community. The following abstract from the refereed journal Bioscience succinctly summarizes this point:

“Seagrasses, marine flowering plants, have a long evolutionary history but are now challenged with rapid environmental changes as a result of coastal human population pressures. Seagrasses provide key ecological services, including organic carbon production and export, nutrient cycling, sediment stabilization, enhanced biodiversity, and trophic transfers to adjacent habitats in tropical and temperate regions. They also serve as “coastal canaries,” global biological sentinels of increasing anthropogenic influences in coastal ecosystems, with large-scale losses reported worldwide. Multiple stressors, including sediment and nutrient runoff, physical disturbance, invasive species, disease, commercial fishing practices, aquaculture, overgrazing, algal blooms, and global warming, cause seagrass declines at scales of square meters to hundreds of square kilometers. Reported seagrass losses have led to increased awareness of the

need for seagrass protection, monitoring, management, and restoration. However, seagrass science, which has rapidly grown, is disconnected from public awareness of seagrasses, which has lagged behind awareness of other coastal ecosystems. There is a critical need for a targeted global conservation effort that includes a reduction of watershed nutrient and sediment inputs to seagrass habitats and a targeted educational program informing regulators and the public of the value of seagrass meadows."^{1,2} (emphasis added).

Regional estuarine research and management organizations also have concluded based upon global and local research efforts that eelgrass is the key sentinel species responsive to nitrogen levels. The USEPA National Estuary Program established the Buzzards Bay Project based in significant part upon their conclusion that:

"Because eelgrass has been recognized as a sensitive indicator of nitrogen loadings and because the distribution and abundance of eelgrass beds can be easily documented with aerial photographs, it is an ideal habitat to tract to monitor overall ecosystem health."³

Similarly, NOAA⁴ conducted a 7 year effort to assess comprehensively the scale, scope and characteristics of nutrient enrichment and eutrophic conditions in the nations estuaries. More than 300 experts on estuarine eutrophication participated in the effort. This comprehensive effort was built upon several indicators of eutrophication, including those used by the MEP: chlorophyll a levels, loss of submerged aquatic vegetation (e.g. eelgrass), macroalgae, dissolved oxygen.

In addition, NOAA oversees 27 National Estuarine Research Reserves, including Waquoit Bay (WBNERR). This research and management organization has concluded that eelgrass loss in Waquoit Bay has been the result of nitrogen overloading from watershed development primarily through on-site septic disposal of wastewater. Furthermore, WBNERR strongly supports nitrogen reduction as the approach to eelgrass restoration. Secondary effects of eelgrass loss have been the loss of associated fisheries, particularly scallops.

Like the estuaries noted above and most others along the Atlantic seaboard, there is clear evidence that eelgrass coverage has declined in Pleasant Bay. While there are numerous causes that can contribute to eelgrass loss across the spectrum of estuaries world-wide, the combined evidence within Pleasant Bay of elevated chlorophyll levels, low dissolved oxygen, presence of nuisance algae and the spatial and temporal pattern of loss indicates that nitrogen over-enrichment is the dominant cause of habitat loss within this system. Conversely, none of the

¹ Orth, Robert J., Tim J. B. Carruthers, William C. Dennison, Carlos M. Duarte, James W. Fourqurean, Kenneth L. Heck, Jr., A. Randall Hughes, Gary A. Kendrick, W. Judson Kenworthy, Suzanne Olyarnik, Frederick T. Short, Michelle Waycott, and Susan L. Williams, December 2006 Abstract from "A Global Crisis for Seagrass Ecosystems", *BioScience*, / Vol. 56 No. 12.

² While nutrient and sediment inputs are important for protection of eelgrass, on Cape Cod nitrogen predominates due to the lack of riverine sediment inputs to estuaries.

³ <http://www.buzzardsbay.org/eelgrass.htm>,

Note that Buzzards Bay includes numerous estuaries on Cape Cod.

⁴ Bricker, S.B., C.G. Clement, D.E. Pirhalla, S.P. Orlando, and D.R. Garrow. 1999. National Estuarine Eutrophication Assessment: Effects of Nutrient Enrichment in the Nations Estuaries, NOAA, National Ocean Service, Special Projects Office and the National Centers for Coastal Ocean Science, Silver Spring, MD. 71 p.

other potential causes are consistent with the temporal and spatial loss of eelgrass within the Pleasant Bay System. Accordingly, nitrogen reduction has been the focus of restoration efforts.

On Cape Cod, West Falmouth Harbor provides a striking example of the correlation between nitrogen loads and eelgrass loss. In the 1980s, the harbor supported luxuriant beds of eelgrass. In 1986, Falmouth started discharging from its wastewater treatment plant which was permitted as a Class III discharge (i.e. up to 50 mg/L total nitrogen) and represented the single largest increase in nitrogen load in the watershed. It was estimated that the travel time of the effluent plume would be about 6 to 7 years before reaching the harbor. Around 1993 elevated concentrations of nitrogen were observed in the harbor and within a year or two there was significant loss of eelgrass in the harbor, a condition from which it has not yet recovered. In 2003, a new treatment plant with advanced nutrient removal capable of meeting a 3 mg/L total nitrogen discharge went online. While this was a major step in meeting nitrogen reduction thresholds, it is still necessary to remove additional nitrogen, not present in the 1980s, from the watershed to meet the target threshold and restore healthy eelgrass habitat to at least the levels found prior to the original treatment plant discharge.

Determining the threshold nitrogen concentration is a highly empirical evaluation and is site specific for each embayment system. Water column nitrogen concentrations in areas of healthy eelgrass beds within each MEP embayment system determine the threshold concentration. Accordingly, the thresholds are highly system specific and are matched to the conditions which exist in the individual embayments. The MEP protocol is to locate healthy eelgrass beds in each system and correlate the water column nitrogen concentrations in those beds. This is the fundamental approach for determining quantitative restoration targets in estuarine systems throughout the United States and provides refinement over the use of "reference" systems.

In light of the site specific nature of the threshold protocol, it isn't really a question of whether restoration has been achieved through the application of a similar threshold, but rather the body of evidence indicating that eelgrass favorably responds to the reduction and/or elimination of stressors causing the initial decline. For example, after nitrogen load reductions and maintenance of chlorophyll a levels, Tampa Bay, Florida has seen a 25% recovery in eelgrass population since 1982.⁵ Locally, the Buzzards Bay Project reports improvements in eelgrass habitat with the cessation of CSO discharges in Clarks Cove, New Bedford which were a significant nitrogen contributor. It is also important to recognize that the ecosystem response to nitrogen load is generally independent of the land source of nitrogen. That is to say, nitrogen from septic systems exerts the same stress as nitrogen from a wastewater treatment plant or fertilizer runoff. It is the cumulative impact of nitrogen from all sources that ultimately determines the impact on an estuarine or embayment system.

The nitrogen threshold value for Pleasant Bay is based on bioactive nitrogen (consisting of dissolved inorganic nitrogen (DIN) and particulate organic nitrogen (PON)) as opposed to other systems where total nitrogen (DIN, PON and dissolved organic nitrogen (DON)) have been the standard. Bioactive nitrogen was used in this system to be consistent with original modeling

⁵ Greening, H. and A. Janicki, 2006 "Toward Reversal of Eutrophic Conditions in a Subtropical Estuary: Water Quality and Seagrass Response to Nitrogen Loading Reductions in Tampa Bay, Florida, USA" Environmental Management, Vol. 38, No. 2, pp. 163-178.

done for Bassing Harbor and Ryders Cove in Chatham, both subsystems of Pleasant Bay. In those systems the DON was found to be a disproportionately high component of the total nitrogen compared to other systems. DON in marine waters, like Bassing Harbor and Ryders Cove is mostly refractory in nature⁶. In other words, the dissolved organic constituents of nitrogen are in such a form that they are not readily broken down into nitrogen species (i.e., dissolved inorganic forms) that would be readily available for plant uptake and primary productivity. PON, on the other hand, while not immediately available for biological uptake, is tied up in biomass and nitrogen is released to the water column in bioavailable forms as the particulate matter rapidly decomposes naturally.

In addition to eelgrass, the MEP also looks at benthic infauna as a secondary check on estuarine habitat health, particularly in those areas of the systems where there is no historical evidence of eelgrass. In the Pleasant Bay system, the numbers and types of infaunal species observed in the stressed basins are consistent with those inhabiting environments displaying organic enrichment due to nutrient overload. The data shows that these stressed areas exhibit oxygen depletion⁷ and high levels of chlorophyll a, both indicators of nitrogen enrichment. Again, this is consistent with available scientific evidence on nitrogen enrichment.

The modeling aspect of the MEP involves several components and inputs: watershed delineation, land use nitrogen loading, hydrodynamic modeling, water quality modeling and benthic regeneration. As stated in the technical reports and reiterated in your letter, the MEP relies on site specific data to populate the model. As with any model, certain assumptions have to be made with regard to inputs or the formulation of complex input data (e.g. nitrogen land use loading). Typically the assumptions within the MEP approach are that the system under consideration operates in a manner like other similar systems in southeastern Massachusetts, where the loading coefficients have been developed or tested previously. When assumptions are made, they are based on best professional judgment and comparisons to other similar systems, and the values derived from those assumptions will tend to be conservative within the site specific constraints of the system (i.e. best estimates). That is not to say, however, that the modeling approach is overly conservative as would be expected from the use of extrinsic safety factors that are often used in prescriptive regulatory codes. Rather, the intent of the MEP is to model the estuarine and embayment systems as accurately and realistically as possible while accounting for the range of variable conditions that can be found within the system.

Land use loading is developed from estimates of nitrogen contributions from onsite sewage treatment and disposal systems (septic systems), wastewater treatment plants (where applicable), fertilizers, stormwater runoff, natural background and atmospheric deposition. In the majority of systems evaluated on Cape Cod, septic systems contribute the largest percentage of nitrogen load and, therefore, the methods of determining that load have been closely examined. Fundamentally, septic system nitrogen loading is based on parcel by parcel water use data and a

⁶ Carbon dating of Buzzards Bay dissolved organic matter showed average ages of >1000yr, although a small portion of the organic matter turns over rapidly.

⁷ It appears from monitoring by the Town of Orleans during the summer 2009, that the upper reaches of the Pleasant Bay System and most of the secondary infaunal "check" stations remain periodically hypoxic. All nine stations fail to meet the Commonwealth's Water Quality Standard, even for SB waters (they are SA). These low oxygen areas include stations not in the terminal kettle basins. So, while nitrogen levels and water quality has improved some what as a consequence of the new breach, as predicted by the MEP, most of these areas remain impaired.

septic coefficient predicated on a per capita nitrogen mass load of 2.1 kg/per/year. All other values such as census data, standard values of per capita water use are used essentially as checks on the validity of the septic coefficient and are not used in the nitrogen loading calculations. Nitrogen loading methodology is clearly described in detail in Chapter IV of the Pleasant Bay report.

Your letter suggests that data from the Arey's Pond subwatershed demonstrates that the MEP analysis overestimates septic system nitrogen load by 20% to 40%. MassDEP and SMAST, as well the Town's consultant, Wright-Pierce, have reviewed the information provided by the Town's Wastewater Management Validation & Design Committee (WMV&DC) and have independently determined that the conclusions are in error due to misunderstanding of the MEP methodology and the fact that protocol used by the WMV&DC is not a valid basis for comparison. The WMV&DC utilized a sample size of 20 properties who responded to owner surveys as opposed to the MEP water use from a sample size of 2000 properties within the Pleasant Bay watershed and 4000 properties in Orleans as a whole. The small sample size of the survey data has a great potential to skew results leading to inaccurate conclusions.

The WMV&DC states that MEP develops its septic nitrogen loading from "(1) municipal water use in each watershed; and (2) estimates of the number of people using the water." Actually, as clearly presented in the technical reports, the MEP relies on a parcel-by-parcel analysis of water use and applies a standard septic coefficient to the individual parcels' metered flow to generate the septic load. As mentioned above, the septic coefficient is based on a mass loading of 2.1 kg/yr/person and an average concentration of 26 mg/L of total nitrogen with a 10% consumptive use factor. In back calculating, this does indeed result in a per capita water use of 64-65 gpd; however, again, it must be emphasized that this value was not used directly in the calculations, but does serve as yet another check on the validity of the results. Correspondingly, Wright-Pierce's evaluation of per capita water use yields a value of 65.3 gpd⁸. This further lends credence to the MEP nitrogen loading values and the approach. The main shortcoming of the WMV&DC analysis is the reliance on a non-random survey of a very small watershed and resultant small data sample size of 20 properties while ignoring the values derived from a town-wide sample set populated with data points from approximately 4000 properties. MassDEP and SMAST consider the septic nitrogen loading values presented in the report to be minimum values and do not concur that the loadings are underestimated to the degree suggested by the WMV&DC:

Several questions have been raised regarding benthic flux in relation to the modeling effort and its impact on nitrogen loading to the system as a whole. First, it must be understood that the measurement of benthic flux is derived from the particulate organic material, derived from dead organisms, that settles and helps form the bottom sediments in the estuarine or embayment systems. The organic material that makes up the sediment has assimilated nitrogen from all the sources entering the system, and the nitrogen within the sediments can go through several cycles of release and redeposition before exiting the system; therefore, there is no simple mathematical relationship of a specific source, such as septic nitrogen, to the benthic nitrogen values. Furthermore, it should be recognized that benthic flux is exerted predominantly in the summer months for a maximum period of approximately 60 to 90 days per year which diminishes its

⁸ Wright-Pierce, April 2009, DRAFT Town of Orleans Comprehensive wastewater Management Plan.

influence on the system in comparison to other sources which contribute 365 days per year. Thus, the high ratios of benthic flux to septic nitrogen stated in your letter are not accurate because they are based on a 365 day per year contribution of benthic nitrogen. Additionally, such comparisons, while interesting, are not germane to nitrogen reduction requirements because the linked model factors in all nitrogen components in evaluating nitrogen reduction scenarios.

The values for benthic flux represent a net flux which integrates both release of nitrogen to the water column and removal (i.e. denitrification) from the water column. Positive flux values represent nitrogen sources and negative flux values (such as found at Pochet Neck) represent nitrogen sinks. Therefore, while specific rates of denitrification are not determined, denitrification is accounted for in the analysis.

With respect to sampling protocol, cores were taken on the same day in any given pond. Cores over the entire system were completed over a period of successive days within the shortest time frame feasible. However, given that flux rates would not change rapidly over the sampling period in the summer, a multi-day sampling period is within accepted practice.

References to studies by Valiela et al.⁹ have suggested that the assessment of the West Falmouth Harbor plume show significant levels of nitrogen reduction during groundwater transport to the harbor. In reviewing that paper vis-à-vis the MEP Technical report for West Falmouth Harbor¹⁰ it appears that claims of 82% nitrogen reduction in Valiela's paper result from other mechanisms than loss during aquifer transport. The Valiela study analyzes the plume from the West Falmouth treatment plant and reports 100% discharge to the Snug Harbor sub-watershed. As USGS groundwater modeling and field validation studies have shown, the plume from the West Falmouth Treatment Plant discharges to Mashapaquit Creek and Inner Harbor basins in addition to Snug Harbor. Valiela estimated that the annual load from the treatment facility was 15,402 kg/yr and determined that the nitrogen plume to Snug Harbor was 2705 kg/yr and calculated that 82% of the nitrogen is attenuated during transport. However, the MEP report, based on watershed delineations completed by USGS, shows that the plume from the treatment plant discharge is distributed over three sub-watersheds: Snug Harbor, Mashapaquit Creek and Inner Harbor. Of the 13,300 kg/yr treatment plant annual load determined by MEP, 8120 kg/yr (61%) discharges to Mashapaquit Creek, 2598 kg/yr (20%) discharges to Inner Harbor and 2582 kg/yr (19%) discharges to Snug Harbor. Furthermore the MEP analysis had validation of discharge to Mashapaquit Creek. Under this analysis, the percentage of nitrogen reaching Snug Harbor matches very closely to Valiela's estimates of what the plume load should be without any attenuation. Simply put, when the hydrogeology is accounted for and an accurate watershed delineation employed, the data of Valiela et al. provide additional documentation that nitrate is not removed during transport through aerobic aquifer soils. MassDEP and SMAST view this as an independent validation of the MEP approach. It should be noted that the contention that nitrate is not removed during transport through aerobic aquifers on Cape Cod is supported by

⁹ Kroeger, K.D., M.L. Cole, J.K. York and I. Valiela, 2006, "Nitrogen Loads to Estuaries from WasteWater Plumes: Modeling and Isotopic Approaches", *Groundwater*, Vol. 44, No. 2, pp. 188-200.

¹⁰ Howes, B., S.W. Kelley, J.S. Ramsey, R. Samimy, D. Schlezinger, E. Eichner, 2005, Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for West Falmouth Harbor, Falmouth, Massachusetts, Massachusetts Estuaries Project, Massachusetts Department of Environmental Protection, Boston, MA.

numerous site specific studies by many different researchers over several decades. No quantitative study has been able to document nitrate removal under these conditions, although many looked for it, including the very detailed studies by the USGS related to the Tri-Town effluent plume within the Town of Orleans.

It is important to note that while the MEP does not consider attenuation of septic nitrogen directly in groundwater transport, the linked modeling approach does account for significant attenuation of groundwater nitrogen through freshwater ponds and streams. Absent site specific attenuation numbers, ponds generally enjoy a presumption of 50% attenuation and streams 30%. These values are based on a number of site-specific studies that have measured attenuation in various water bodies and represents averages derived from those studies.

Chapter IV of all the MEP technical reports, including the Pleasant Bay report, provide the loading values of other nitrogen sources such as natural background, fertilizer, roof runoff, road runoff and direct precipitation. All these values are derived from various studies and many are common to other nitrogen modeling efforts by the Cape Cod Commission and CZM's Buzzards Bay Project, as well as other USGS efforts. With respect to natural background, the values inherently account for uptake through biologically active soil horizons. In the case of fertilizer loading, the MEP accounts for uptake by applying a 20% leaching factor, i.e. the nitrogen reaching the groundwater is 20% of that actually applied (80% is retained or denitrified before reaching groundwater). This is a value that was developed from approximately 300 interviews and over 2000 site surveys in the towns of Barnstable, Falmouth, and Mashpee. Recently, a report prepared by Martin Petrovic¹¹ for the Pleasant Bay Alliance suggested that a 10% leaching rate may be appropriate; however, the Horsley Witten Group¹² evaluated both the MEP methodology and Dr. Petrovic's report and concluded that the 20% leaching rate is valid.

Your letter contends that the sentinel station, PBA-12, has met the threshold concentration of 0.16 mg/l bioactive nitrogen since 2004. In reviewing the data, the following values were obtained:

2004 – 0.17 mg/L
2005 – 0.14 mg/L
2006 – 0.13 mg/L
2007 – 0.17 mg/L.

The 2008 data still is undergoing quality assurance review.

The data summary above indicates that the sentinel station has not consistently met the threshold. Additionally, monitoring in the terminal ponds continues to show that hypoxic conditions exist. Nonetheless, through adaptive management, MassDEP will continue to evaluate monitoring results to determine if changing conditions meet the threshold targets. However, a major concern in any trend analysis of the Pleasant Bay system is the permanency of the 2007 breach and its

¹¹ Petrovic, M. 2008. "Report to the Pleasant Bay Alliance on the Turfgrass Fertilizer Nitrogen Leaching Rate".

¹² Horsley Witten Group. 2009. "Evaluation of Turfgrass Nitrogen Fertilizer Leaching Rates in Soils on Cape Cod, Massachusetts

impact on water quality. Overreliance on dynamic changes and conditions are not acceptable substitutes for nitrogen reduction.

Your letter also raised some questions regarding modeling assumptions and how those assumptions may affect final results. There is a suggestion that Arey's Pond is stratified; however, SMAST evaluated Arey's Pond and determined that while it may experience short periods of stratification on a daily basis, it is not a permanent seasonal condition and therefore would not warrant special modeling consideration.

With respect to calibration and validation of the model, the process is fully described in the Pleasant Bay technical report. Briefly, the model was calibrated to bioactive nitrogen measurements and validated to salinity measurements collected during the summers of 2000 to 2005. Dispersion coefficients were developed based on field data.

MassDEP appreciates the time and effort that the WMV&DC has put into reviewing and critiquing the MEP approach; however, MassDEP believes that this response answers the many questions asked and the concerns expressed by the WMV&DC. Furthermore, MassDEP maintains confidence in the science of the MEP and supports the findings of the MEP and considers the MEP findings appropriate for the Town of Orleans to continue to move ahead, without delay, in implementing its comprehensive wastewater management plan. In fact, the WMV&DC's consultant, the Woods Hole Group (WHG) stated in their draft report:

- “• MEP is a high quality and necessary endeavor, and is conducted by highly qualified and experienced scientists, engineers, and planners. There are serious issues facing the Orleans portion of Pleasant Bay that threaten the environment, property values, fishing livelihoods, and general enjoyment of this valuable natural resources. There is a need for action, both to address local concerns and to comply with Federal and State TMDL mandates.
- The MEP reports for the Orleans portions Pleasant Bay represent a strong foundation for developing a course of action to develop and comply with site specific TMDL requirements.”¹³

Curiously, these comments were not included in the WMV&DC's final report.

While the WHG obviously found some areas where refinements could be made in the MEP report on Pleasant Bay, those points were generally with regard to the use of a consistent methodology applied to a multitude of embayments across southeastern Massachusetts. The critical point is that the WHG report did not find any errors or significant omissions in the MEP approach or in the Pleasant Bay Report. After reviewing the report, both MassDEP and SMAST are satisfied that uncertainty remains within established parameters set forth in MEP protocol.

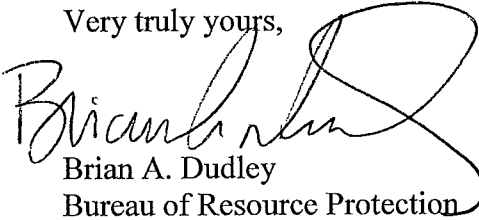
Pleasant Bay is scheduled for sewerage in the later phases of the Orleans plan. It is clear that this phased approach proposed by Orleans' CWMP will allow simultaneous tracking of estuarine response as watershed nitrogen source reductions take place, providing the opportunity for some

¹³ Woods Hole Group, 2009, Peer Review (Independent Technical Review) of the Massachusetts Estuaries Project Report on the Pleasant Bay System DRAFT REPORT

adaptive management. However, the CWMP proposes implementation strategies to restore currently impaired water bodies, and MassDEP emphasizes that the town must implement its recommended alternative to start addressing those impairments.

If you have any questions or require further information, please do not hesitate to contact me at (508)771-6047.

Very truly yours,



Brian A. Dudley
Bureau of Resource Protection

ecc: Cape Cod Water Protection Collaborative
Attn: Mr. Andrew Gottlieb

UMD-SMAST
Attn: Dr. Brian Howes

DEP/Boston
Attn: Mr. David DeLorenzo