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VIA U.S. FIRST CLASS MAIL & E-MAIL

Ms. Susan Murphy
U.S. Environmental Protection Agency – Region I
5 Post Office Square, Suite 100 (OEP06-1)
Boston, MA 02109-3912

RE: Supplemental Comments on Draft Permit #MA0100897
City of Taunton

Dear Ms. Murphy:

On June 18, 2013, the City of Taunton submitted comments on the draft permit. Since the submission of the original comments, the City of Taunton received updated information pertaining to the technical validity of the methods which EPA relied upon in issuing the draft permit. Based on this new information, Hall & Associates is submitting these supplemental comments on behalf of this City. This supplemental information (*e.g.,* Great Bay Estuary Joint Report of Peer Review Panel, supplemental peer review responses, and the decision in *Ohio Valley Environmental Coalition, et al. v. Elk Run Coal Company, Inc., et al, Civil Action 3;12-0785, Federal District Court for Southern District of West Virginia*) was not available at the time the public comment period closed. Moreover, as the Agency has not issued a final permit, these supplemental comments should be considered timely filed.

The following new information provides independent confirmation that the proposed nutrient reduction requirements are not based on scientifically defensible or reliable methods and fail to properly implement state narrative criteria. Thus, EPA's continued reliance upon the regulatory approaches used to develop the proposed permit would be arbitrary and capricious. A brief summary of the critical new information follows:

- A recently released Peer Review Report of the New Hampshire Department of Environmental Services' 2009 document entitled "Numeric Nutrient Criteria for the Great Bay Estuary" ("2009 Criteria document") assessed the scientific validity of using

simplified methods for predicting dissolved oxygen ("DO") changes caused by nutrients in estuarine environments. Specifically, the Peer Review Report concluded that the data and analyses contained in the 2009 Criteria document, which were far more extensive than the approach used by EPA in the Taunton permit limits analyses, were not scientifically defensible. In particular, the peer review concluded that a proper evaluation of nutrient-related DO effects requires direct consideration of the numerous physical, chemical and biological processes affecting the DO regime and that a direct relationship between nutrient concentrations and ambient DO levels (as assumed by EPA in the Taunton analyses) simply does not exist. As with the Great Bay analyses, EPA's Taunton limits derivation lacked the necessary confounding factors analyses to reasonably conclude that nitrogen is causing low DO in an estuary setting. Finally, the peer review also concluded that one cannot simply take a system response from a different estuarine setting and presume that a different, physically distinct setting in the estuary will have the same response. Such an approach was determined to be "irresponsible" by the peer review team. In the Taunton permit analysis, EPA utilized the same unsupportable assumption in deriving the required TN reduction. (See, Attachment 1 which identified the relevant peer review findings applicable to DO impact assessment).

- In a recent U.S. District Court case, *Ohio Valley Environmental Coalition, et al. v. Elk Run Coal Company, Inc., et al*, the Court confirmed the need to specifically demonstrate, not presume, a cause-and-effect relationship when asserting a narrative criteria violation exists due to a particular pollutant. The court also repeatedly underscored the need to consider and address confounding factors when asserting that a particular pollutant causes or contributes to a narrative criteria violation. As noted above and in the City's earlier comments, no such confounding factors analyses or specific causation demonstration were undertaken by the Region. The Region's assessment simply assumed that lower DO conditions periodically occurring in the Taunton Estuary were caused (in whole or in part) by nutrients, and that the only corrective measure to address the situation was nutrient reduction. Consequently, this assessment did not provide a legally sufficient basis for concluding a numeric or narrative criteria violation was being caused by the City's nitrogen discharge.

Based on the new information contained in these supplemental comments and the earlier comments submitted by the City of Taunton, EPA's proposed permit action is technically and legally flawed. Therefore, the portions of the permit imposing nutrient reductions on the City of Taunton due to alleged nutrient impairments and narrative criteria violations should be withdrawn.

Thank you for your consideration of these comments. We look forward to the Region's response.

Sincerely,

John C. Hall

Attachments

cc: Mayor Thomas C. Hoye, Jr.
Joseph Federico, BETA
Dan Arsenault, EPA

Attachment 1

Supplemental Comments on Taunton Draft Permit – Inappropriate Numeric Nutrient Criteria Development in Taunton River as Confirmed by Great Bay Estuary Peer Review

As discussed in the previously submitted permit comments, EPA utilized very simplified methods for determining that nutrients were causing narrative and dissolved oxygen (DO) criteria violations in the Taunton Estuary. EPA also used simplified methods to select a required ambient level of TN that would ensure DO criteria violations would no longer occur. This TN criterion was selected by finding another place in the Narragansett Bay Estuary that met DO standards and assumed that the TN level at that location was required to achieve DO criteria in the upper reaches of the Taunton Estuary. No consideration of the different physical, chemical or biological factors between the two sites, or how such factors would affect the DO regime or nutrient impacts, was undertaken by EPA. Previously, the City commented, *inter alia*, that such simplified methods and assumptions were unreliable and inappropriate for finding that nitrogen was causing or contributing to the violation of standards or setting nutrient limitations. For the Great Bay Estuary, a team of four nationally recognized experts on nutrient impact evaluation determined that the application of such simplified methods to derive criteria and establish nutrient reduction requirements was not reasonable or scientifically defensible. The City asserts that the technical conclusions of that review apply with equal force and validity to the Taunton Estuary, given the simplified methods EPA has employed in this case also.

This attachment discusses similarities in the analyses used to derive numeric nutrient criteria and nutrient limitations in the Taunton River and Great Bay Estuary systems. New evidence confirming that EPA's Taunton Estuary nutrient:DO impacts assessment is equally flawed, if not more so, is provided by the four expert authors of the February 13, 2014 *Joint Report of Peer Review Panel for Numeric Nutrient Criteria for the Great Bay Estuary* (Peer Review Report - enclosed). The relevant quoted responses are provided verbatim (critical text are highlighted in *italics),* below. Given the Peer Review Report findings, the State of New Hampshire has abandoned its support of such methods and the technical conclusions based on those analyses. (See, attached, settlement agreement). Following the release of the Peer Review Report, the reviewers provided responses (Supplementary Responses) to clarify and expand on their previous answers, further confirming that the use of simplified methods for DO impact assessment in estuaries is not scientifically defensible.

In deriving the Taunton River Estuary TN criterion, EPA used a "sentinel site" approach, similar to a reference station approach. EPA assumed that because Station MHB16 (in Mount Hope Bay) met the 5.0 mg/L water quality standard (WQS) for DO, the same TN concentrations at

Station MHB19 would be necessary to likewise achieve the DO WQS in the upper reaches of the Taunton Estuary. This presumes, without demonstration of cause-and-effect, that TN primarily controls DO in both locations to the same degree, and that the differences in physical setting, chemical conditions and biology have no meaningful effect on nutrient dynamics or related DO responses at the two locations. The EPA analysis also failed to account for any confounding factors which influence DO concentrations in the estuary. As noted below, the Great Bay peer review expressly rejected such assumptions and analyses as unreasonable and unsupportable.

Critical Differences in Site-Specific Physical, Chemical, and Biological Factors Must Be Considered

The peer reviewers affirmed that the uses of reference or sentinel approaches without consideration of the effect of differences in the physical, chemical, and biological factors at each location is not scientifically defensible. The Peer Review Report discounted similar assumptions as scientifically invalid where system responses at the mouth of the harbor and from other estuaries were used to predict nutrient impacts in upstream waters (in the bay and its upper tidal rivers) of the Great Bay Estuary. This is essentially the same approach used by EPA in applying its "sentinel station" found in the open waters of Mount Hope Bay to the upper reaches of the Taunton Estuary near the City. The germane Peer Review Report conclusions follow:

> Also, important differences in some of the physical characteristics of Great Bay and the embayments of Massachusetts were not acknowledged, implying that DES did not consider the relevance of the differences and how they could affect interpretation of water quality monitoring data. *Furthermore, by making a simple comparison to the MEP program without a comprehensive evaluation of the status of that program, DES was irresponsible in making the comparison and implying that it supports total nitrogen criteria proposed for the Great Bay*. (Peer Review Report, Dr. W. Judson Kenworthy at 50).
>
> The principle 'no one suit fits all' was applied appropriately in MA. This resulted in some embayments having different nitrogen criteria in MA, and recognition that no one concentration value will fit for all of the different systems. *Although DES explicitly recognizes different segments of the Great Bay estuary, in order to discover nitrogen criteria the method DES used failed to consider potentially important differences that could affect nitrogen, symptoms of nitrogen loading, and the eelgrass response. For example, the lower salinity tributaries of Great Bay have distinctly different biophysical characteristics and much tighter coupling to the watersheds than further downstream which is more coupled to oceanic influences*. (Peer Review Report, Kenworthy at 51).

In the Supplementary Responses, Dr. Kenworthy continued:

> One important initial step in this process of factor consideration has already been partially completed by DES and its Great Bay collaborators. DES has already zoned the Bay into distinct geographically defined segments. *This geospatial approach implicitly*

recognizes that there may be different (or similar) biological (e.g., eelgrass and macroalgae distribution), hydrological (e.g., currents, wave exposure, water residence time, salinity, optical properties) and geological characteristics (e.g., bathymetry, sediment type) in each segment, as well as different watershed features influencing the Bay's water quality (e.g. land use, nonpoint and point source nutrient discharges). Simply stated, this acknowledges that not all segments are alike and the list of priority and confounding factors in each segment that influence the growth and survival of eelgrass can be different (or similar) and significantly less than 20. […] While zonation provides the spatial context for prioritizing and evaluating the most important factors, it reduces the scale of the problem and provides an opportunity to: 1) organize and simplify the structure of the models used to evaluate nitrogen cycling and loading processes and their effects on eelgrass in each segment, 2) more readily identify and model the bio-physical connectivity between segments (hydraulic flushing and residence times) as opposed to modeling the entire Bay, and 3) more easily and quantitatively link the water column and the substrate of the Bay to the specific watershed characteristics influencing nitrogen loading and the priority factors in each segment. Lastly, *the process of designating specific zones allows for scientists to identify which segments are most immediately threatened by nitrogen loading and enables managers to prioritize actions in a framework of adaptive management. This will better enable state and municipal managers to determine how and when to allocate financial and infrastructural resources to remediate the impacts in particular segments as opposed to the entire Bay, which likely has segments which are not as seriously threatened as others.* (Supplementary Responses, Kenworthy Question 1)

In practice, application of the DES conceptual model to the Great Bay Estuary *failed to address several influencing factors identified by the NEEA [National Estuarine Eutrophication Assessment] protocol* and needed to fully evaluate the effects of nitrogen on eelgrass. *Many of the factors explicitly indicated by the NEEA, for example, hydraulic flushing and water residence time (Bricker 1999), were not considered in the DES model. These two physical factors (among several others) are especially important in controlling nitrogen loading, processes of nitrogen cycling, and nitrogen concentrations in New England Estuaries (Latimer and Rego 2010).* (Peer Review Report, Kenneth H. Reckhow at 11-12).

The data and arguments provided in the DES 2009 Report to support the weight of evidence for a relationship between nitrogen concentration, macroalgal abundance and eelgrass loss are neither compelling nor scientifically defensible. […] *On page 38 in their report DES correctly acknowledged it is not clear whether the same threshold would apply to other sections of the estuary where environmental conditions (e.g., substrate type, sediment stability, water depth, wave energy) may affect the growth and abundance of macroalgae and the interactions between macroalgae and eelgrass*. (Peer Review Report, Kenworthy at 27-28).

As with the analyses reviewed for Great Bay Estuary, it is clear that DO at MHB16 and MHB19 are affected by distinctly different physical, chemical, biological and hydrodynamic

characteristics. Figure 1 below illustrates the locations of Stations MHB16 and MHB19, situated approximately ten miles apart. Station MHB19 is located in the Taunton River Estuary, while Station MHB16 is at the southern end of Mount Hope Bay near the Sakonnet River tidal strait. These two waters clearly are not subject to the same oxygen demanding loads from various terrestrial and man-made sources. Tidal dilution and the quality of waters affecting MHB16 are obviously quite different from those affecting MHB19. Additionally, a 2007 SMAST report listed Station MHB16 under the Mt. Hope Bay sub-embayment and Station MHB19 as the Taunton River Estuary sub-embayment.[1] This further indicates that MHB16 should not be considered a sentinel station for MHB19.

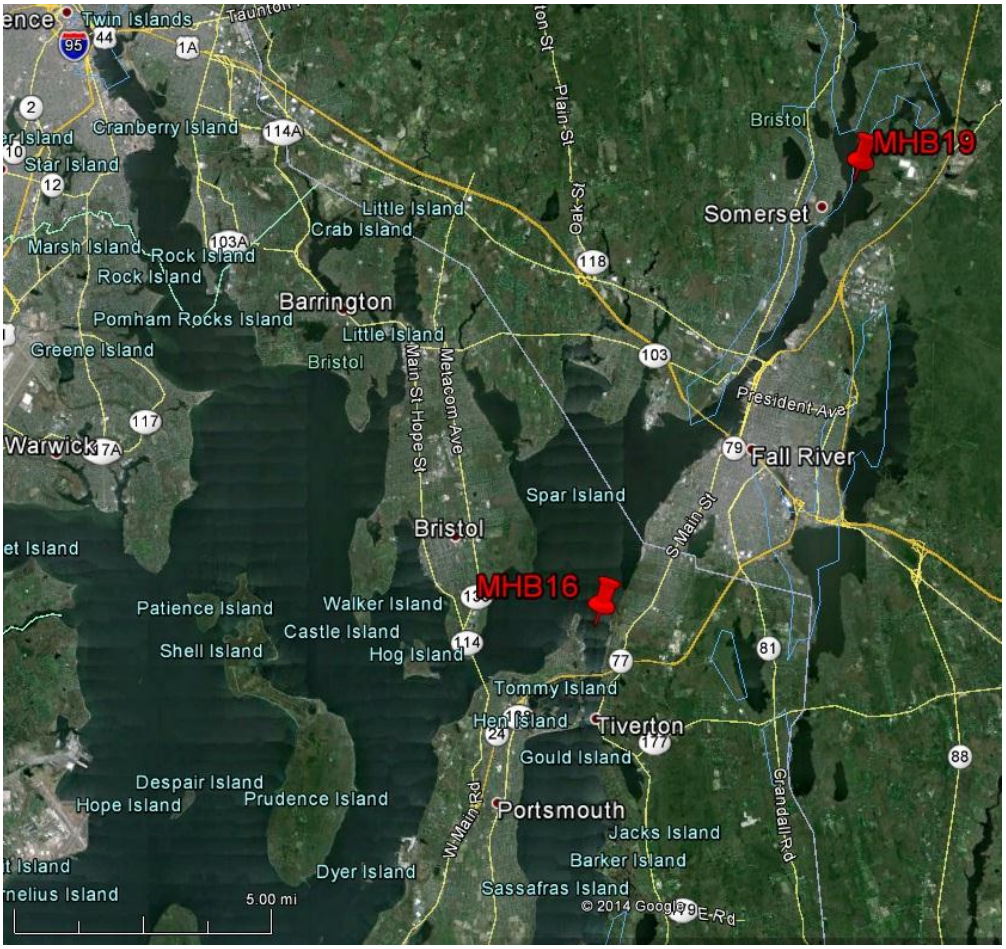

Figure 1: Locations of Stations MHB16 and MHB19

[1] UMass at Dartmouth School for Marine Science and Technology (SMAST). (16 August 2007). *Summary of Water Quality Monitoring Program for the Mount Hope Bay Embayment System (2004 – 2006)*. Table 1 at 13.

Simplified DO Predictions Based Solely on Nutrient Concentration Are Not Scientifically Defensible

The Taunton permit used the most simplified analysis possible – it claims that meeting a specific TN value at two distinctly different locations will result in identical minimum DO concentrations. This analysis did not even attempt to show that the DO level occurring at MHB16 was a function of the degree of algal growth present, as was claimed in the New Hampshire 2009 Numeric Nutrient Criteria document. Thus, the methods used for the Taunton permit were even less "robust" than those ejected in the Great Bay peer review. Because of the lack of any explicitly demonstrated cause-and-effect relationship or consideration of confounding factors in the DO analyses, all four peer reviewers confirmed that such simplified analyses have no scientifically defensible basis:

> The DES 2009 Report did not adequately demonstrate that nitrogen is the primary factor in the Great Bay Estuary *because it did not explicitly consider any of the other important, confounding factors in developing relationships between nitrogen and the presence/health of eelgrass*. (Peer Review Report, Dr. Victor J. Bierman, Jr. at 18).
>
> With the exception of the nitrification process, *nitrogen concentrations are not directly linked to DO, but are only indirectly linked through primary production and the subsequent sequence of physiological processes that utilize the produced organic matter. These include respiration, oxidation of DOC exudates, oxidation of POC, and sediment oxygen demand (SOD). Another necessary and confounding factor, with regard to lower DO, is physical stratification/vertical stability of the water column.*
>
> For the above reasons, development of scientifically credible statistical relationships between nutrient concentrations as a causal variable and DO as a response variable is difficult under any circumstances. *In fact, even EPA itself was unwilling to demonstrate such a relationship in its own guidance. A notable omission, not generally recognized, is that the EPA Technical Guidance Document for Stressor-Response Relationships (EPA 2010b) does not contain a single example for dissolved oxygen as a response variable*.
>
> My opinion is that the results in Figures 28-29 of the DES 2009 Report for *statistical relationships between DO and nitrogen concentrations, and the conclusions drawn from these results, are weak and unreliable because univariate linear regression approaches do not adequately represent the underlying direct/indirect cause-effect mechanisms*. Conditions in Great Bay are driven by a set of physical, chemical and biological dynamics for which process-based mass balance models would be more appropriate tools for assessing water quality and resulting eutrophication. See my response to Question 4a for a more complete discussion. (Peer Review Report, Bierman at 31).
>
> The DES 2009 Report properly interprets the complexity of the relationship between co-varying factors, B-IBI, and nitrogen, but it fails to follow through with a similar evaluation relative to B-IBI and DO. This leads the DES 2009 Report to set a total nitrogen concentration for keeping DO above the standards of 5 mg O_2/L at all times and

> daily average saturation at least 75% that is not supported by either a stressor-response or weight of evidence approach.
>
> Relative to weight of evidence, the data presented are likely sound but are not properly applied to linking benthic conditions with low DO and subsequently to linking low DO with total nitrogen concentrations. *Much of the problem is with the analysis approach being limited to simple linear regressions, which do not properly evaluate the influence of co-varying factors that confound conclusions regarding total nitrogen concentration as being the causal factor for DO and benthic conditions*. (Peer Review Report, Diaz at 46).

Dr. Bierman's supplemental comments reiterated that EPA's Stressor-Response Guidance never discusses using DO as a response variable for developing nutrient criteria using these simplified methods. He also strongly recommended a model be developed to accurately determine site-specific relationships between nutrients and DO.

> [D]evelopment of scientifically credible statistical relationships between nutrient concentrations as a causal variable and dissolved oxygen as a response variable is difficult under any circumstances. *The reason is that dissolved oxygen dynamics in aquatic systems are complex and highly site-specific. It is significant to note that the EPA Technical Guidance Document for Stressor-Response Relationships (cited on Page 31 as EPA 2010b) does not contain a single example for dissolved oxygen as a response variable. My opinion is that process-based load-response models are a more appropriate approach for dissolved oxygen than the reference condition approach or empirical (statistical) stressor-response analyses.* Such models could be used to link watershed loads directly to ambient dissolved oxygen concentrations, and then to develop TMDLs and/or NPDES permit limits. They could also be used to back-calculate numeric nutrient concentration criteria corresponding to ambient dissolved oxygen concentration criteria. (Supplementary Responses, Bierman).

In the Taunton permit analyses, EPA also erroneously assumed a direct cause-and-effect relationship between TN and excessively low DO at MHB19, though as noted by the peer review, no such relationship exists. Implicit in this assumption is that TN instigated excessive algal growth, resulting in unacceptably low DO conditions. However, no analysis of TN effects on algal growth at MHB19 or MHB16 was ever conducted by EPA. As with the Great Bay analyses, the influences of relevant confounding factors at each location were ignored for the Taunton Estuary DO assessment. These include bathymetry, residence time, tidal exchange, stratification, carbon and ammonia oxygen demand, SOD and light transmission, among a host of others. EPA's Taunton River Estuary analysis thus shares key inadequacies with DES' Great Bay analysis which were identified and criticized by renowned experts in the field. Thus, by the same token, EPA's Taunton River Estuary analysis of low DO is likewise scientifically invalid. A site-specific water quality model considering the various factors influencing the occurrence of DO less than 5 mg/L must be developed for the Taunton River Estuary for scientifically defensible limitations to be established.