RESPONSE TO COMMENTS ON DRAFT NPDES PERMIT NO. NH0100196
TOWN OF NEWMARKET WASTEWATER TREATMENT PLANT
NEWMARKET, NEW HAMPSHIRE
NOVEMBER 15, 2012

On October 5, 2011, the U.S. Environmental Protection Agency, Region 1 ("EPA") and the New Hampshire Department of Environmental Services, Water Division ("NHDES") published draft National Pollutant Discharge Elimination System ("NPDES") permit number NH0100196 for public notice and comment. The draft permit proposed to reauthorize discharges of treated wastewater effluent from the Town of Newmarket, New Hampshire's Wastewater Treatment Plant ("Facility") to the Lamprey River. Comments were accepted until December 16, 2011.

EPA and NHDES received written comments from:

- Town of Newmarket ("Newmarket" or "Permittee")
- Great Bay Municipal Coalition ("Coalition")
- Conservation Law Foundation ("CLF")
- William H. McDowell and Michelle L. Daley
- Frederick T. Short, Ph.D
- Joint comments from CLF, Conservation New Hampshire, Environment New Hampshire, Great Bay Trout Unlimited, N.H. Audubon, and New Hampshire Coastal Protection Partnership
- The Nature Conservancy
- The Town of Newington
- Lamprey River Watershed Association

EPA determined to hold a public hearing on the draft permit based on substantial public interest in the permit. The hearing took place on November 30, 2011 at the Newmarket Town Hall. At the public hearing, the following individuals made oral comments:

- Sean Grieg
- Dave Mercier
- Dean Peschel
- John Hall
- Adam Schroadter
- John Bentley
- Dawn Genes
- Phil Nazzaro
- Fred Short
- Tom Irwin
- Peter Whelan
- Ray Konisky
- Tom Morgan
- Pete Richardson

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This is EPA's response to all timely comments received on the draft permit, as revised, and its explanation of any changes made to the permit as a result of those comments.[1, 2] EPA has carefully assessed the numerous comments received on the draft permit and, as a result of those comments, made the following changes:

1) The monthly total nitrogen limit has been changed to a rolling seasonal average (Part 1.A, Footnote 8).

2) A permit reopener pertaining to nitrogen limit has been added (Part 1.F.4 Nonpoint Source Nitrogen Reductions).

3) The following language has been removed:

   "Existing discharges containing either phosphorus or nitrogen which encourage cultural eutrophication shall be treated to remove phosphorus or nitrogen to assure attainment and maintenance of water quality."

4) The Marine Acute Toxicity Test Procedure and Protocol has been updated to the most recent version, dated July, 2012.

EPA otherwise reaffirms its original determinations, including its judgment that, in light of all the information in the record, a nitrogen limit of 3.0 mg/l is as stringent as necessary to ensure compliance with applicable water quality standards, including New Hampshire's narrative nutrient criterion.

A copy of the final permit may be obtained by contacting, Dan Arsenault, U.S. Environmental Protection Agency, 5 Post Office Square, Mail Code: OEP06-1, Boston, MA 02109, Phone: (617) 918-1562, E-Mail: Arsenault.Dan@epa.gov. Copies may also be obtained from EPA's web site at http://www.epa.gov/region1/npdes/index.html.

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[1] The Coalition submitted voluminous comments outside the public comment period. On December 19, 2011, August 15, August 30, September 7, September 12, September 24, October 18, November 5, and November 8, 2012, the Coalition submitted "additional/supplemental comments …based on information not available at the time the permit comment periods closed and therefore constitute timely comments pursuant to applicable NPDES rules and norms of administrative law." Even if the comments are based on information unavailable during the public comment period, this does not render them timely. Under applicable federal regulations, EPA is only required to respond to materials submitted *during* the public comment period. *See* 40 C.F.R. § 124.17(a)(2). "That is, within the interval of time between the beginning and end of the public comment period, not before, not after." *In re Avon Custom Mixing Servs.*, Inc., 10 E.A.D. 700, 706 (EAB 2002); *see also*, *In re City of Phoenix, Arizona Squaw Peak and Deer Valley Water Treatment Plants*, 9 E.A.D. 515, 524-31 (EAB 2000); *In re Steel Dynamics, Inc.*, 9 E.A.D. 165, 194 n.32 (EAB 2000) ("Permitting authorities are under no obligation to consider comments received after the close of the public comment period."). Given the opportunity for the Coalition to comment on the revised draft permit both in writing at the public hearing during an unusually protracted comment period that extended far beyond the ordinary 30-day period required by regulation; the lengthy and voluminous comments already submitted on the permit by Coalition, which relate generally to the subject matter of the supplemental comments; and the failure of the Coalition to provide any specific or compelling justification for their tardy submittal, EPA rejects the supplemental comments as untimely and accordingly does not respond to them in this Response to Comments.

[2] This Response to Comments also substantively encompasses any significant comments on the draft permits raised during the public hearing.

Background

Cultural eutrophication is an ecosystem response to increases in nutrient (primarily nitrogen and phosphorus) inputs from human sources.[3] Estuaries, bays and nearshore coastal waters in the Gulf of Maine receive nutrient inputs from land-based sources via rivers and streams; directly from human activities adjacent to and within marine environments; oceanic upwelling and circulation; and atmospheric deposition. These inputs result in predictable consequences once they enter the water body (Cloern, 2001; Bricker et al., 2007, Figure 1). First, nutrient concentrations in the water column increase, which then stimulates growth and production of both phytoplankton and larger algal species such as floating mats of macroalgae, including *Ulva* or sea lettuce. Although a certain amount of phytoplankton and macroalgae are needed to support upper trophic levels (i.e., fish), excessive algal growth can lead to other more serious water quality impact. For example, high concentrations of phytoplankton may cloud the water and cause die off of seagrasses and other submerged aquatic vegetation. Seagrasses, such as eelgrass (*Zostera marina*), are essential to estuarine ecology because they filter nutrients and suspended particles from the water column; stabilize sediments; provide food for wintering waterfowl; provide habitat for juvenile fish and shellfish; and are the basis of an important estuarine food web. *See* Piscataqua Region Estuaries Partnership ("PREP") 2009 State of the Estuaries Report (PREP 2009a) at 16. Macroalgae growth can smother and kill seagrasses and bottom-dwelling organisms such as clams. In addition, episodes of low bottom water dissolved oxygen (i.e., hypoxia or anoxia) may occur if algae sink to the bottom and deplete oxygen levels during decomposition. The phytoplankton community may shift to favor more toxic and nuisance species, or harmful algal blooms (red tides) that may also result in public health concerns.

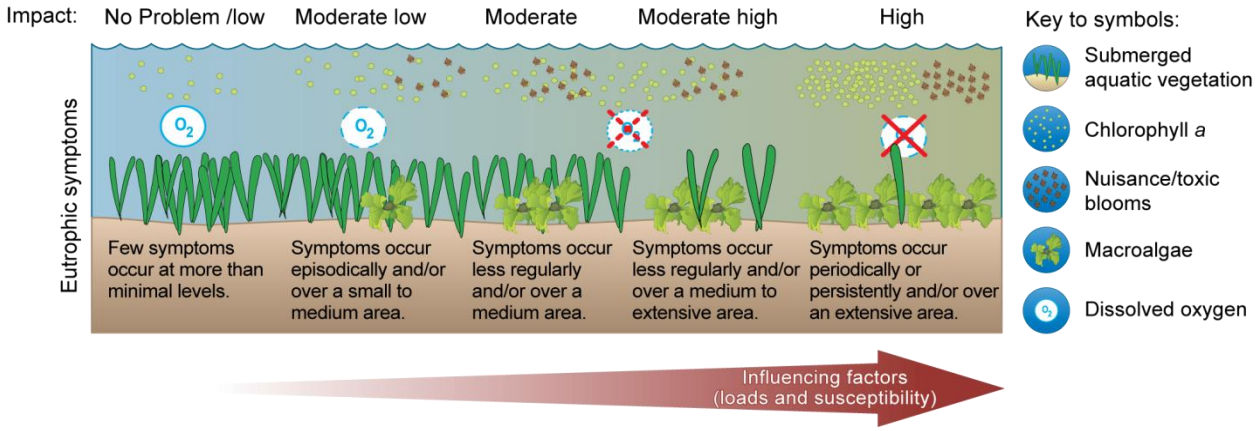

Figure 1: Conceptual diagram of the predictable consequences of increased nutrient discharges (low on left to higher on right) into coastal waterbodies. The response to nutrient loads within the waterbody is conditioned/modulated by the physical characteristics of the estuary such as the tidal exchange and the residence time (from Bricker et al., 2007).

[3] *See* Env-Wq 1702.15 (defining cultural eutrophication as "the human-induced addition of wastes containing nutrients to surface waters which results in excessive plant growth and/or a decrease in dissolved oxygen.").

Currently, nearly 20 million gallons of wastewater that receives little or no treatment for nitrogen removal flow from wastewater treatment facilities ("WWTFs") to the Great Bay Estuary[4] every day; existing NPDES permits allow for an additional 10 million gallons per day to be added to this in future years. In the Great Bay Estuary, New Hampshire has listed 11 of the 18 sub-estuaries, including the Lamprey River, as impaired due to excessive nitrogen. High nitrogen concentrations in the estuary have led to low oxygen conditions, particularly in the upper portions of the estuary, and a significant decrease in eelgrass, which is a critical estuarine aquatic habitat. While nonpoint sources also contribute significant nitrogen loads to the Great Bay Estuary and need to be reduced over time, these loads are less bioavailable and less controllable. Establishing reasonable and protective permit limits for WWTFs in the watershed is an essential step to restore and maintain water quality and eelgrass habitat in the estuary.

The Great Bay Estuary exhibits all of the primary and secondary indicators of eutrophication. *The 2009 State of the Estuaries Report*[5] evaluates twelve environmental indicators, of which three are directly related to eutrophication, specifically nitrogen, eelgrass and dissolved oxygen. The Report indicates that estimated total nitrogen load to Great Bay from 2006-2008 has increased by 42% compared to 2002-2004 levels. In addition, dissolved inorganic nitrogen concentrations at Adams Point (in Great Bay) have increased by 44% in the past 28 years (1974-1981 to 2001-2008). From 2003 to 2008 total nitrogen concentrations have increased by 24% at Adams Point and by 47% at the Coastal Marine Laboratory in Portsmouth Harbor. As to dissolved oxygen, the report states that while violations of the water quality criterion (5 mg/l daily minimum) are rare in the bays and harbors, they often occur in the tidal rivers. Regarding eelgrass, the Report concludes that eelgrass cover in Great Bay proper declined by 37 % between 1990 and 2008, and has completely disappeared from the tidal rivers, Little Bay, the Upper Piscataqua River and the Lower Piscataqua River-North.[6] (PREP, 2009a). There have been

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[4] The Great Bay Estuary consists of the Piscataqua River and its direct tidal rivers, the Salmon Falls, Cocheco and Great Works; Little Bay and its direct tidal rivers, the Bellamy and Oyster; and Great Bay and its direct tidal rivers, the Lamprey, Squamscott and Winnicut. The entire Great Bay Estuary covers approximately 21 square miles and consists of waters of varying depths, current and salinities. Great Bay proper covers approximately 9 square miles, about 40 percent of the entire estuary. EPA uses the term "Great Bay Estuary" when identifying the estuary as a whole, and "Great Bay proper" when referring to that more limited geographic segment.

[5] The Piscataqua Region Estuaries Partnership (PREP) was formed in 1985 after the Great Bay Estuary and the Hampton-Seabrook Estuary were designated by EPA as "estuaries of national significance" and included in the National Estuary Program. Every three years, PREP prepares a State of the Estuaries Report that communicates the status and trends of certain environmental indicators for the coastal watershed and estuaries. Data presented in the NHDES *Numeric Nutrient Criteria for the Great Bay Estuary* (NHDES 2009a) are from PREP's *2009 Environmental Indicators Report*, which is a peer-reviewed technical document on the status and trends of all 42 indicators tracked by PREP. The interpretations of the indicators in the State of the Estuaries Report were reviewed by PREP's Technical Advisory Committee and other experts in relevant fields, including university professors, researchers, and federal environmental managers. PREP has recently produced a draft *2012 Environmental Data Report*.

[6] Eelgrass cover data from a draft 2012 PREP report are generally consistent with the NHDES *Great Bay Nutrient Report*, with additional losses of eelgrass cover in Great Bay proper but appearance of an area of eelgrass in Little Bay (PREP, 2012, HAB2-1).

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even more dramatic decreases in eelgrass biomass (64% in Great Bay proper from 1990 to 2008 (PREP, 2009b)), which often occurs before the loss of acreage or areal cover.[7]

As described in the *State of the Estuaries Report*, wastewater treatment plants contribute 31% of the total nitrogen load to the Great Bay Estuary, while nonpoint sources, including nitrogen from lawn fertilizers, septic systems, animal waste, and atmospheric deposition to land, account for 69%. Major sources of nitrogen are all related to population growth and associated land developmental patterns. One of the indicators tracked for the Report is impervious cover, which has increased by about 75% from 1990 to 2005. (PREP, 2009a). Increased impervious cover cause increases in the direct discharge of stormwater and associated pollutants, including nitrogen.

While nitrogen pollution generally afflicts the entire Great Bay Estuary, not all portions of the estuary exhibit the same impacts. Data collected by NHDES from 2000 through 2008 clearly show that total nitrogen concentrations are highest in the tidal rivers and lower in the bays and harbors.

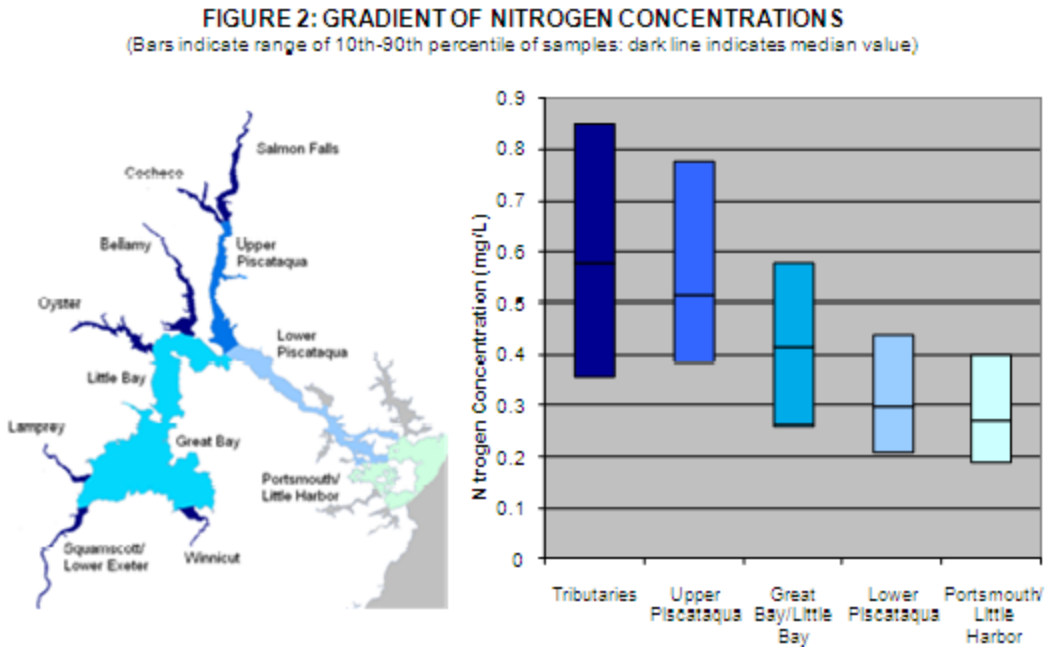

Figure 2. Gradient of Nitrogen Concentrations.

[7] PREP considers eelgrass biomass data to be "supplemental information when evaluating the HAB-2 (eelgrass cover) indicator" (PREP, 2012). The decreasing trend in eelgrass biomass has continued based on the draft 2012 PREP report; based on that regression line, biomass has been reduced by about 70 percent from 1990 to the present and by about 40% from 2004 to the present.

Treatment plants and nonpoint sources discharging to the tributaries of the tidal rivers, and directly to the tidal rivers, represent the greatest loads to the watershed. These loads, coupled with the limited dilution in these waters as compared to the more seaward parts of the estuary, result in the highest total nitrogen concentrations, causing the greatest impacts. These concentrations are reduced as water flows seaward down the estuary and is diluted by greater amounts of ocean water brought in from the tide, resulting in reduced impacts. The lowest instream concentrations and the fewest impacts are seen at the mouth of the estuary, where the Piscataqua River discharges to the Atlantic Ocean. Consequently, Great Bay proper does not typically experience dissolved oxygen violations and eelgrass still persists, although it has been significantly reduced. The tidal rivers, on the other hand, exhibit the greatest impacts from eutrophication, including low dissolved oxygen and total loss of eelgrass. The Upper Piscataqua River, the Lower Piscataqua River-North and the Winnicut River have experienced 100% eelgrass loss, while the Lower Piscataqua River-South, Sagamore Creek, Little Harbor, and Portsmouth Harbor have also experienced significant losses in biomass.

The immediate receiving water for the Facility's discharge, the Lamprey River, is a tidal river exhibiting multiple symptoms of nutrient overenrichment. Data show that the trend monitoring station closest to the Newmarket discharge (GRBLR) has a mean total nitrogen concentration of 0.455 mg/l and a maximum of 0.785 mg/l (see Table 2B, page 21); a median chlorophyll-a concentration of 7.50 ug/l and a maximum of 145.45 ug/l (Table 6B, page 33); a minimum dissolved oxygen concentration of 5.1 mg/l (Table 7B, page 47); and an absence of eelgrass.

New Hampshire's surface waters are divided into water classifications: Class A and B. *See* RSA 485-A: 8; Env-Wq 1702.11. Class B surface waters (which include the Great Bay Estuary) must be acceptable for fishing and swimming and must not receive sewage discharges that are "inimical to aquatic life or to the maintenance of aquatic life." RSA 485-A:8, II. In addition, DES has promulgated additional standards applicable to Class B waters at Env-Wq 1703.14 ("Nutrients"):

1. Class B waters shall contain no phosphorus or nitrogen in such concentrations that would impair any existing or designated uses, unless naturally occurring. *See* Env-Wq 1703.14(b).
2. Existing discharges containing either phosphorus or nitrogen which encourage cultural eutrophication shall be treated to remove phosphorus or nitrogen to ensure attainment and maintenance of water quality standards. *See* Env-Wq 1703.14(c)

And Env-Wq 1703.19 ("Biological and Aquatic Community Integrity"):

1. [All] surface waters shall support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region. Env-Wq 1703.19(a).

These narrative criteria are designed to protect existing and designated uses of the water body. New Hampshire does not have a numeric water quality criterion for nitrogen.

In the face of clear symptoms of eutrophication, and resultant impairments, NHDES conducted a

site-specific water quality analysis for Great Bay as part of the initial stages of its numeric nutrient criteria development process and published it in 2009 as the "*Numeric Nutrient Criteria for the Great Bay Estuary*" ("NHDES Great Bay Nutrient Report"). (NHDES 2009a). Through this analysis, NHDES generated numeric instream nitrogen, chlorophyll-a and light attenuation thresholds ("proposed numeric thresholds") for the various water bodies comprising the Great Bay Estuary, which in NHDES's technical judgment represented ambient concentrations that would, given the site-specific characteristics of particular receiving waters, achieve applicable narrative water quality criteria and would be protective of designated uses applicable to such waters. Although sometimes termed "criteria," it is important to note that New Hampshire has never adopted the numeric thresholds as new or revised water quality standards for nutrients within the meaning of Section 303 of the Act. Neither NHDES nor EPA are obligated to apply these values for permitting purposes, or otherwise. These thresholds are both non-binding and non-exclusive, reflecting NHDES's technical assessment of *a* proposed set (and not the only set) of protective proposed numeric thresholds that will implement the applicable narrative criteria for a given water body. NHDES is at the moment using these thresholds to inform Section 303(d) assessment and listing decisions.[8] (NHDES, 2009(a) at 68 ("These values will first be used as interpretations of the water quality standards narrative criteria for DES Consolidated Assessment and Listing Methodology for 305(b) assessments.").

That NHDES was required to translate its narrative nutrient criterion prior to implementing it on a site-specific basis is unremarkable given the structure of the Clean Water Act. Narrative standards have the same force and effect as other state water quality standards; unlike numeric criteria, however, narrative water quality standards are necessarily subject to translation prior to their application. *See American Paper Inst. v. United States EPA*, 996 F.2d 346, 351 (D.C. Cir. 1993). The instream thresholds yielded by NHDES in the *Great Bay Nutrient Report* represents *one such* translation by the State of their narrative nutrient standard.

EPA in issuing an NPDES permit must, by necessity, also translate existing narrative criteria into instream numeric threshold concentrations over the course of developing water quality-based numeric effluent limitations. As explained by the D.C. Circuit:

> "As long as narrative criteria are permissible…and must be enforced through limitations in particular permits, a permit writer will inevitably have some discretion in applying the criteria to a particular case. The general language of narrative criteria can only take the permit writer so far in her task. Of course, that does not mean

[8] The *2009 Numeric Nutrient Criteria for the Great Bay Estuary* is being challenged in *City of Dover, et al. v. New Hampshire Department of Environmental Services* (Docket No. 217-2012-CV-00212), a civil action in Merrimack County, New Hampshire, Superior Court. Plaintiffs, comprised of Coalition member communities, allege that the 2009 analysis amounts to a rule under New Hampshire administrative statutes and that NHDES failed to follow necessary rulemaking procedures. The Coalition sought to enjoin NHDES from utilizing the *2009 Numeric Nutrient Criteria for the Great Bay Estuary* pending completion of the rulemaking process. EPA concluded that it was reasonable to consider and ultimately utilize the thresholds set out in that document in this permit proceeding not because they constitute binding rules or interpretations, but because in EPA's independent judgment they represent protective instream thresholds that are well supported by a substantial body of technical and scientific evidence and are relevant information within the meaning of federal regulations governing the NPDES permitting process. The disposition of this state court case, accordingly, does not bear on federal NPDES proceedings. With that said, on November 8, 2012, the Court granted NHDES's Motion to Dismiss in the case.

> that the language of a narrative criterion does not cabin the permit writer's authority at all; rather, it is an acknowledgement that the writer will have to engage in some kind of interpretation to determine what chemical-specific numeric criteria--and thus what effluent limitations--are most consistent with the state's intent as evinced in its generic standard."

See American Paper Inst., 996 F.2d at 351 (citations omitted). This process of translating a narrative criterion is governed under EPA regulations by 40 C.F.R. § 122.44(d)(1)(vi), which implements Sections 301 and 402 of the Act. Subsection (A) of that provision mandates at the outset a calculation of a protective ambient threshold concentration for the pollutant:

> "Where a State has not established a water quality criterion for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or contributes to an excursion above a narrative criterion within an applicable State water quality standard, the permitting authority must establish effluent limits using one or more of the following options:
>
> (A) Establish effluent limits *using a calculated numeric water quality criterion* [emphasis added] for the pollutant which the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and will fully protect the designated use."

See also Upper Blackstone Water Pollution Abatement Dist. v. United States EPA, 690 F.3d 9, 23 (1st Cir. 2012) ("Because both Massachusetts and Rhode Island employ narrative water quality criteria for the relevant pollutants, the EPA translated these into numeric limits under its procedures set out in 40 C.F.R. § 122.44(d)(1)(vi)."). Once a numeric effluent limitation is calculated and proposed in a draft permit, it is subject to public notice and comment prior to being finalized.

To be clear, this process of translating a narrative water quality criterion into an effluent limitation on a discharge is different than promulgation of a state water quality standard. In upholding 40 C.F.R. § 122.44(d)(1)(vi), the D.C. Circuit held that the regulation did not violate the provisions governing promulgation of state water quality standards:

> "[T]he regulation does not supplant – either formally or functionally – the CWA's basic statutory framework for the creation of water quality standards; rather, it provides alternative mechanisms through which previously adopted water quality standards containing narrative criteria may be applied to create effective limitations on effluent emissions. [] The regulation thus seems to provide an eminently reasonable means of effectuating the intent of the previously adopted narrative criteria as well as Congress' own intent, made explicit in section 301 of the CWA, that all state water quality standards be enforced through meaningful limitations in individual NPDES permits."

See American Paper Inst., 996 F.2d at 351. In this case, NHDES conducted a site-specific analysis of the receiving waters impacted by Newmarket's discharge as part of its numeric nutrient criteria development process, and proposed a series of instream thresholds designed to be protective of uses. While EPA was not required to apply these values, and there was nothing

to foreclose the use by NHDES, EPA or any other party of different thresholds if they existed, or the development of new ones, for a particular water so long as those values could be shown to achieve applicable water quality criteria and protect uses, EPA determined it was reasonable to employ these values after independently assessing the validity of the State's technical analysis. EPA concluded that that the thresholds represented a set of protective values, and utilized them for purposes of deriving the nitrogen effluent limitation in the draft permit, and subjected all these decisions (i.e., calculated numeric thresholds and permit limits) to public notice and comment.

NHDES's approach to deriving protective ambient water quality thresholds in the *Great Bay Nitrogen Report* is consistent with methodologies described in EPA technical guidance for establishing in-stream thresholds to address nutrient pollution. EPA generally recommends three types of scientifically defensible empirical approaches for setting numeric criteria to address nitrogen/phosphorus pollution (EPA, 2000a and 2000b). They are, reference condition approaches, mechanistic modeling, and stressor-response analysis.

The reference condition approach derives candidate criteria from observations collected in reference waterbodies. Reference waterbodies represent least disturbed and/or minimally disturbed conditions within a region (Stoddard et al., 2006) that support designated uses (EPA, 2000a). Therefore, the range of conditions observed within reference waterbodies provides appropriate values upon which criteria can be based. The reference condition approach requires the ability to define and identify reference waterbodies, and relies on the availability of sufficient data from these reference waterbodies to characterize the distributions of different nutrient variables. As documented in the NHDES Great Bay Nutrient Report, there is no portion of the Great Bay Estuary that is not disturbed, so a pure reference condition approach using sites in the Great Bay Estuary could not be used.[9] NHDES did use Portsmouth Harbor as a reference site for estimating a nitrogen threshold protective of eelgrass but acknowledged that the site was not pristine and the associated threshold (0.34 mg/l) was probably too high. NHDES also reviewed reference conditions criteria developed by MassDEP for several of its estuaries and showed that the NHDES proposed numeric thresholds were similar to thresholds developed for those waters.

The mechanistic modeling approach represents ecological systems using equations that represent ecological processes and parameters for these equations that can be calibrated empirically from site-specific data. These models can then be used to predict changes in the system, given changes in nitrogen and phosphorus concentrations. The mechanistic modeling approach requires sufficient data to identify the appropriate equations for characterizing a waterbody or group of waterbodies and sufficient data to calibrate parameters in these equations. A danger in complex mathematical models is that error propagation is difficult to explicitly measure, and there is a tendency to use a more complex model than required, which drives costs up substantially and unnecessarily. Another consideration that is gaining acceptance is that mathematical models need to be appropriately scaled to spatial and temporal processes, or they

[9] As NHDES described in the "Methods" section of the *NHDES Great Bay Nutrient Report*:

> "States with many different estuaries are able to compare median nutrient concentrations and response variables across estuaries. New Hampshire could not follow this approach because there is only one large estuary in the state, the Great Bay Estuary." (NHDES, 2009a at 3).

may suffer problems similar to empirical models when one extrapolates the results of scaled experiments to full-sized systems. Also, empirical coefficients introduced into equations often hide the degree of uncertainty concerning the fundamental nature of processes being represented (EPA, 2001). For example, eelgrass loss is primarily a secondary impact, influenced not only by nitrogen concentration, but indirectly by light attenuation (which is in turn driven by phytoplankton and other plant growth), replacement by macroalgae and other environmental factors. To our knowledge such an eelgrass model does not exist for any estuary; it certainly does not exist for Great Bay.

The empirical stressor-response approach is used when data are available to accurately estimate a relationship between N and P concentrations and a response measure that is directly or indirectly related to a designated use of the waterbody (e.g., a biological index or recreational use measure). Then, N and P concentrations that are protective of designated uses can be derived from the estimated relationship (EPA, 2000a, 2000b, and 2008). The empirical approach, using stressor-stressor response relationships to derive criteria is a legitimate, scientifically-based method for developing nutrient criteria. NHDES performed extensive stressor-response analyses in developing its proposed numeric thresholds.

Regardless of the methodology employed, it is often useful to utilize multiple lines of evidence, and the weight of such evidence, when evaluating environmental data. Environmental data and analyses often rely on tests of associations, rather than causal relationships, because experimental conditions cannot be created to test causal relationships without controlling for confounding factors. To address this issue, a weight-of-evidence approach is utilized, evaluating whether relationships observed are predicted by or consistent with a conceptual model.[10] Use of multiple lines of evidence reduces uncertainty. In deriving ambient water quality thresholds for the Great Bay Estuary that would protect designated uses, NHDES utilized a weight-of-evidence methodology. (Table 1 below presents the various lines of evidence used by NHDES to support its proposed water quality thresholds.)

EPA discerned ample reason to treat the *NHDES Great Bay Nutrient Report* as relevant and useful technical information for NPDES permitting purposes and for identifying protective in-stream thresholds for nitrogen, which must be calculated in order to implement New Hampshire's narrative nutrient criterion. In EPA's and other experts' estimation, NHDES performed a disciplined and reasonable investigation of correlations of water quality indicators that would be expected under its conceptual eutrophication model, and ultimately arrived at numerical thresholds that would achieve the narrative nutrient criterion, and would protect primary contact recreation and aquatic life uses (through dissolved oxygen and eelgrass protection).[11] The proposed water quality thresholds were developed with input from a technical

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[10] The Coalition, and Newmarket, generally endorse the weight of the evidence approach, stating in the Memorandum of Understanding among NHDES and various communities in the Great Bay watershed, that:

> "WHEREAS, DES and the Coalition agree that a weight of evidence approach such as presented in the nutrient criteria is appropriate as it relates to impairments related to eelgrass loss, there is uncertainty in the line of evidence for eutrophication as a causative factor, and additional analyses are required for macroalgae proliferation and epiphyte growth as causative factors…" (Coalition Exhibit 1 at 1).

[11] Liebman, in a 2010 technical memo, states:

advisory committee. NHDES accepted and responded to comments on the draft thresholds. The thresholds were, moreover, peer reviewed through EPA's Nutrient Scientific Technical Exchange Partnership and Support (N-Steps) program, receiving positive reviews from two nationally recognized nutrient experts. (Boynton, 2010; Howarth, 2010). The peer reviewers specifically cited to the comprehensiveness and clarity of the weight-of-evidence approach used to develop the proposed numeric thresholds as well as the vast quantity of site-specific data available and utilized in the analyses, as summarized in Table 1. Additional comments by experts in the field were submitted on the draft permit and were generally supportive of the NHDES thresholds. (Valiela and Kinney, 2011). Finally, EPA independently reviewed the data and analyses as sources for interpretation of the State's narrative water quality standards, consistent with our obligation under 40 C.F.R. § 122.44(d)(1)(vi).[12] EPA's final assessment of the various lines of evidence, as well as the critiques of NHDES's conclusions, are also summarized in Table 1 below.

> "…because of the strong relationships exhibited in the data, and because many components of the conceptual model seem to be corroborated, it is very likely that nitrogen strongly contributes to turbidity in the water column, resulting in impacts to eelgrass."

Additionally the memo included the following language relative to the weight of evidence approach:

> "I like the overall weight of evidence approach, and that they are applying a conceptual model that tests whether there is a dose response relationship in the data. And, most importantly, they find secondary, or independent, impacts from increasing concentrations of nutrients. These secondary impacts are independently related to use impairments. Thus, they are following a sound scientific approach to determine nutrient and chlorophyll thresholds above which impairments are likely to occur."

[12] EPA did not rely solely on NHDES's proposed nitrogen thresholds in interpreting the narrative nutrient criteria for purposes of permit issuance. For example, as indicated in the Fact Sheets for Great Bay permits, EPA cited to the *Nutrient Criteria Technical Guidance Manual* (EPA, 2001) as well as protective values established for other estuarine systems in determining protective levels for Great Bay. The Massachusetts Department of Environmental Protection has identified total nitrogen levels believed to be protective of eelgrass habitats as less than 0.39 mg/l and ideally less than 0.3 mg/l and chlorophyll *a* levels as 3 -5 ug/l and ideally less than 3 ug/l. The proposed NHDES thresholds are consistent with these values.

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Table 1. Lines of Evidence

Evidence Line	NHDES (2009a) Assessment	N-STEPS Peer Review (Boyton, 2010: Howarth, 2010)	Valiela & Kinney (2011) Assessment	Final EPA Assessment
Phytoplankton Blooms	> Blooms are linked to excess nutrients > Blooms contribute to DO depletion & decreased water clarity which affect aquatic life including eelgrass	> Notes existence of phytoplankton blooms		> Phytoplankton blooms impair the primary recreational designated uses >Blooms are symptomatic of excess nutrient inputs > The link b/w excess nutrients and phytoplankton blooms is well documented
Macroalgae proliferation	> Macroalgae growth is a direct indicator of eutrophication > Nitrogen thresholds are necessary to protect eelgrass/ prevent macroalgae from replacing eelgrass > Values of 0.34-0.38 mg N/L to prevent proliferation of macroalgae are necessary > 5.7% of the area formerly occupied by eelgrass has been replaced by macroalgae > In 2007 there were 137 acres of macroalgae mats	> Development of nitrogen thresholds based on macroalgae proliferation seems justified	> Great Bay is in transition from being dominated by eelgrass meadows to dominance by macroalgae	> Macroalgae proliferation is a major factor affecting eelgrass health > Shading by macroalgae and epiphytes growing on eelgrass leaves is contributing to the loss of eelgrass in Great Bay
Low dissolved oxygen	> To protect aquatic life: DO threshold for total nitrogen is 0.45 mg N/L and for chl a it is 10 µg/L	> Evidence line is sensitive & appropriate > DO standard seems robust > Use of datasondes is appropriate	> Low dissolved oxygen is caused by excessive primary production due to increased nutrient inputs > Clear pattern of diurnal DO swings demonstrates that primary production is controlling DO	> Low DO has resulted in multiple impairments for aquatic life resulting 303(d) listings > DO thresholds are essential for the protection of aquatic life
Loss of submerged aquatic vegetation	> 1996: 2,421 acres of eelgrass > 2007: 1,246 acres of eelgrass > Loss of eelgrass is linked to nitrogen concentration and water clarity	> Evidence line is sensitive & appropriate > Eelgrass loss is a disturbing trend	> Eelgrass is an indicator of eutrophication and is sensitive to nutrient inputs > Eelgrass provide many essential ecosystem services	> Loss of eelgrass due to excessive inputs of nitrogen creates a feedback loop b/w eelgrass loss and increased turbidity > Eelgrass has historically existed in Great Bay and the tidal tributaries
Nitrogen concentrations	> Thresholds developed to protect aquatic life and eelgrass > Nitrogen concentrations highest in tidal rivers	>Concentration based approach can be powerful and protective > Would also like to see load based approach > It is important to also consider phosphorus which was done in this analysis	> Would like to see a land-derived load based approach > Concentration based approach is appropriate and is strengthened by multiple lines of evidence > Linkage b/w chl a & dissolved inorganic nitrogen is supported by studies from other systems > Thresholds may not be protective enough to increase the extent of eelgrass	> Numeric nutrient thresholds are an essential tool to protect aquatic life and water quality > The nitrogen thresholds are protective and are a critical element to prevent further degradation > Thresholds are based on multiple lines of evidence and are useful in setting permit limits, > Possibility for co-limitation b/w N&P exists in some areas of the estuary.

DOVER 005644

Evidence Line	NHDES (2009a) Assessment	N-STEPS Peer Review (Boyton, 2010: Howarth, 2010)	Valiela & Kinney (2011) Assessment	Final EPA Assessment
Chlorophyll-a concentrations	> Chl a thresholds exhibited a strong relationship between nitrogen concentrations and chl a bloom conditions	> Relationship between nitrogen and chl a is very strong	> Connection b/w dissolved inorganic nitrogen and chl a is well documented in the literature and supported by studies in many systems	> Chl a concentrations in tidal rivers are unacceptable and impair designated uses
Water clarity	> Eelgrass restoration depths of 2.0, 2.5 & 3.0 meters correspond to light attenuation coefficients of 0.75, 0.60 & 0.50m^{-1} > Total nitrogen thresholds of 0.25, 0.27 & 0.30 mg N/L to maintain water clarity correspond to eelgrass restoration depths of 3.0, 2.5 & 2.0 meters	> It is correct to independently assess nitrogen thresholds to protect eelgrass based on water clarity from the thresholds to prevent the proliferation of macroalgae > This section is very well done > Correlation b/w TN & turbidity is very striking	> Macroalgal and epiphytic growth in Great Bay & tidal tributaries is higher than in estuaries on Cape Cod which have approved TMDL nitrogen thresholds > Historic populations of eelgrass existed in the Squamscott R. suggesting that neither transparency or color are responsible for limiting the growth of eelgrass in this River	> Light attenuation coefficients based upon Koch (2001) model and a light transmission value of 22% which has been used by the EPA Chesapeake Bay Program Office > Study by Steward et al. (2005) shows that eelgrass requires a minimum of 20% light transmission to survive > DES has developed thresholds based on multiple lines of evidence (hyperspectral imagery, CDOM, turbidity and light scattering by phytoplankton and water) > Nitrogen values for Cape Cod embayments used as local reference condition support these thresholds

The following table summarizes the water quality thresholds from the NHDES *Great Bay Nutrient Report* based on the lines of evidence described above. The Report includes threshold concentrations for chlorophyll-a, total nitrogen, and light attenuation.

Designate Use/ Regulatory Authority	**Parameter**	**Threshold**	**Statistic[5]**	**Comments**
Primary Contact Recreation[1,2] (Env-Wq 1703.14)	Chlorophyll –a	20 ug/l	90th percentile	This criterion has been used by DES for 305(b) assessments since 2004
Aquatic Life Use Support – to protect Dissolved Oxygen[1,3] (RSA 485-A:8 and Env-Wq 1703.07)	Total Nitrogen	0.45 mg N/L	Median	
	Chlorophyll –a	10 ug/l	90th percentile	
Aquatic Life Use Support – to protect Eelgrass[1,4] (Env-Wq 1703.14)	Total Nitrogen	0.3 mg N/L 0.27 mg N/L 0.25 mg N/L	Median	The range of values for the criteria corresponds to the range of eelgrass restoration depths: 2 m, 2.5 m, and 3 m.
	Light Attenuation Coefficient (Water Clarity)	0.75 m^{-1} 0.60 m^{-1} 0.50 m^{-1}	Median	

Table from NHDES (2009a) at 68.

Notes

1. Maine tidal waters are not covered by these criteria, nor are tidal waters in New Hampshire that are not part of the Great Bay Estuary (i.e., Hampton-Seabrook Harbor, Rye Harbor, offshore coastal waters).

2. If an assessment unit is impaired for chlorophyll-a for the primary contact recreation designated use, it will also be listed as impaired for nitrogen due to the strong causal relationship between chlorophyll-a and total nitrogen.

3. The criteria to prevent low dissolved oxygen apply in sections of the Great Bay Estuary where eelgrass has not historically existed, which are typically the upper reaches of the tidal rivers.

4. The criteria to protect eelgrass apply in sections of the Great Bay Estuary where eelgrass has historically existed, which is some or all of each of the tidal rivers, Great Bay, Little Bay, Piscataqua River, Portsmouth Harbor, Little Harbor, Back Channel, and Sagamore Creek. Additional research on the extent of historical eelgrass in the tidal rivers is needed, especially in the Upper Piscataqua, Cocheco, and Salmon Falls Rivers. The applicable criteria for each assessment zone will be the one corresponding to the restoration depth assigned to the zone. Initially, the restoration depth will be 2 meters for all areas except the Lower Piscataqua River-South, Portsmouth Harbor, and Little Harbor/Back Channel areas. In these areas, a restoration depth of 2.5 or 3 meters should be chosen. Additional research is needed to determine the appropriate restoration depth for these areas. Eelgrass cover mapped using aerial photography will be assessed separately for 305(b) reports using the protocol published in NHDES (2008b).

5. Median and 90th percentile concentrations should be calculated using data from all seasons over the most recent five year period of record.

Criticism of NHDES Great Bay Nutrient Report

In comments submitted on the draft permit, several commenters, most associated with the Coalition, have questioned the scientific validity of the State's water quality thresholds and challenged various lines of evidence employed by NHDES. (The primary focus of the challenges relate to the development of protective thresholds for eelgrass.) In EPA's judgment, these criticisms are unconvincing, due in part to repeated mischaracterizations and misapplications of data by the Coalition and its members. Many of the Coalition's criticisms of the *NHDES Great Bay Nutrient Report* are based on short-term data or on subsets of the dataset that do not exhibit the same relationships shown in the long-term data. Because the NHDES approach is based on the central tendencies of the long-term data set, it is to be expected, based on normal variability, that there would be subsets of the data that do not show the same relationships seen in the long term data.[13] Therefore, such comparisons are not persuasive in showing that long-term relationships are invalid. In its detailed response to the comments below, EPA evaluates, and upon consideration ultimately dismisses, objections to each line of evidence.[14]

In EPA's judgment, NHDES employed data in a transparent and rigorous manner over the course of developing their water quality thresholds. NHDES used data collected during 2000 to 2008 throughout the estuary and explored correlations, primarily using the median values for water quality parameters. NHDES used this approach to mute variability in datasets and

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[13] To take one example, many of the Coalition's comparisons of cause and effect are based on data from a single station, Adams Point, which has produced monitoring data from 1973 to 1981 and then from 1988 to the present. Adams Point is the only station in Great Bay proper that collected nitrogen data during the documented decline in eelgrass area beginning in 1996. However, Adams Point is near the outlet of Great Bay proper into Little Bay and does not reflect water quality conditions in the tidal rivers in general. Moreover, in many of its analyses of data from this site, the Coalition and/or its consultant, HyrdoQual, have inappropriately mixed and matched data. Some of these instances were highlighted in the NHDES Comments from the New Hampshire Department of Environmental Services On HydroQual's Technical Memorandum (2011), when it noted that Hydroqual had mixed low tide-only data from 1973-1981, with all tide data from 1998-2009 in its presentation of long term water quality parameters at Adams Point. This is not only statistically inappropriate, but as shown by NHDES, high tide samples tend to have lower chlorophyll-a concentrations, meaning that this mixing of data may result in making the more recent chlorophyll-a results appear lower in comparison to the 1973-1981 data than is actually the case when comparable data from the two periods are used. (See NHDES, 2009a at B-8). NHDES also noted that HydroQual had also used years with very limited data in its comparisons (years that NHDES had eliminated because it believed these data were not representative), and that HydroQual had apparently eliminated some data from the data sets with no explanation. (NHDES, 2011).

Other examples of improper use of data noted by NHDES in its memorandum included HydroQual's use of eelgrass biomass data from a report by Morrison et al. (2008) that estimated biomass numbers for the years 1990-2004, but that did not include four subsequent, generally available years of biomass data. Contrary to HydroQual's conclusion based on the truncated data set, when the entire dataset is considered it shows a "statistically significant, declining trend for eelgrass biomass in Great Bay." (NHDES, 2011 (citing PREP, 2009)). Still more examples of the Coalition mischaracterizing or misusing data and scientific papers may be found in the detailed responses.

[14] Even if a specific line of evidence was somehow shown to be invalid—and EPA does not believe this to be the case—that by itself would not demonstrate that a water quality threshold based on another line of evidence was invalid, or necessarily show that the weight of evidence supporting that threshold was insufficient.

improve correlation. NHDES selected this approach with the full understanding that spatial and temporal variability is lost, but concluded that on balance the advantages outweigh the disadvantages. (For example, NHDES noted that month-to-month variability is typically confounded by the complexity of phytoplankton dynamics.) (NHDES, 2009a). The same is true regarding eelgrass dynamics, specifically that nitrogen concentration changes and eelgrass responses do not occur on the same time scale given the complexity of eelgrass dynamics, so evaluations of short term data comparing the two is not meaningful. Using data collected over a long time scale, with numerous data points, compensates for the lag time between cause and effect, presenting a clearer picture of general long-term relationships and conditions.

The Coalition also cites to the existence of scientific uncertainty or complexity—two undeniable attributes of this permit proceeding—as a reasons to forego reliance on currently available data and peer-reviewed studies such as the *NHDES Great Bay Nutrient Report* in lieu of *future* studies and data collection and *further* peer-review processes, specifically, to establish a causal link between nitrogen loading from the watershed and cultural eutrophication in the receiving waters. EPA finds no merit in this objection, not only because it misapprehends the legal standard for imposing necessary pollutant controls,[15] but also because additional delay would be imprudent in light of receiving water conditions, particularly in tidal tributaries such as the Lamprey River, which are already impaired and showing clear signs of nutrient-induced water quality problems; because of the magnitude of the Facility's discharge, especially as it impacts the Lamprey River; because of the nature of nutrient pollution (i.e., the eutrophication cycle, once begun, can be difficult to address, as nutrients tend to recycle in the ecosystem); because the scientific and technical record in this case is more than sufficient to support the limits in the judgment of EPA and other impartial experts; and because additional analyses will always still leave some irreducible scientific uncertainty given the complexity of the environmental context.

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[15] The record is replete with evidence suggesting that nitrogen is the causative driver of eutrophication in this system. Still:

> "The requirement to impose a permit limit is not only premised on a finding that the pollutant discharges 'are' at a level that 'causes' violation of the applicable water quality standards, but the requirement is also triggered by a finding that the facility's pollutant discharges 'may' be at a level that 'contributes' to or has the 'reasonable potential' to cause a violation. 40 CFR § 122.44(d)(1)(i). The juxtaposed contrasts between 'are' and 'may,' and between 'cause' and both 'contribute' and 'reasonable potential,' indicate that EPA is not limited . . . to acting only where there is certainty of an existing causal link between a specific discharge and a particular violation of water quality standards. Instead, the regulation requires water quality-based effluent limits even when there is some degree of uncertainty regarding both the precise pollutant discharge levels and the potential causal effects of those discharges, so long as the record is sufficient to establish that there is a 'reasonable potential' for that discharge to cause or contribute to a violation of water quality standards. Agency guidance and the Board's decisions have also stated that the reasonable potential analysis must be based on the 'worst-case' effluent conditions. *In re Washington Aqueduct Water Supply Syst.*, 11 E.A.D. 565, 584 (EAB 2004); *accord Am. Iron & Steel Inst. V. EPA*, 115 F.3d 979, 1001 (D.C. Cir. 1997) (discussing EPA's policy that the reasonable potential analysis be based on the worst case scenario). The regulations, thus, require a precautionary approach when determining whether the permit must contain a water quality-based effluent limit for a particular pollutant." [footnotes omitted]

See In re Upper Blackstone Water Pollution Abatement Dist., NPDES Appeal Nos. 08-11 to 08-18 & 09-06, slip op. at 32 (May 28, 2010), 14 E.A.D. .

The record for this permit includes extensive site-specific analysis by NHDES, which has withstood scrutiny from independent reviewers. This analysis employed a methodology, i.e., multiple lines of evidence, that allowed EPA to assess the protectiveness of the ambient water thresholds based on a variety of informational sources and methodologies. In light of the foregoing, and the fact that the permit is expired, and the objectives of the Clean Water Act, EPA sees no reason to further delay reissuance of the permit and the imposition of necessary nutrient controls on discharges from the Facility to severely impaired New Hampshire waters.[16] In the face of unavoidable scientific uncertainty, EPA is authorized and required to exercise reasonable discretion and judgment.

Reaffirmation of the Nitrogen Effluent Limitation of 3.0 mg/l

Upon consideration of comments received on the draft permit, EPA affirms its conclusion that the nitrogen thresholds of 0.3 mg/l (to protect eelgrass) and 0.45 mg/l (dissolved oxygen) are within a zone of protective ambient water quality thresholds and will achieve the NHDES's narrative nutrient water quality criterion. EPA also sees no reason to depart from its original conclusion that a nitrogen effluent limitation of 3.0 mg/l on the Facility is as stringent as necessary to ensure compliance with applicable water quality standards.

The decision over how to frame the permit and its effluent limitations in order to achieve a protective in-stream nitrogen threshold (0.3 and 0.45 mg/l) is a difficult one given the overall environmental context. A variety of sources contribute to the nitrogen load in Great Bay and its tributaries, including publicly owned treatment works and nonpoint sources, such as septic systems and stormwater. Nonpoint sources of nitrogen are the dominant contributors to the Great Bay Estuary's nitrogen pollution problem but, at this time, are neither subject to any effective treatment or control nor accounted for through a Total Maximum Daily Load. In arriving at its determination that a limit of 3.0 mg/l would be reasonable and as stringent as necessary to comply with the requirements of the Act, EPA specifically reviewed and relied upon the *NHDES Nitrogen Loading Reduction Report* (NHDES, 2010), which analyzed various combinations of point and nonpoint source nitrogen reductions that would attain and maintain applicable water quality criteria and fully protect designated uses. One such scenario showed that a limit of 3.0 mg/l for the Newmarket facility (the accepted "Limit of Technology"), coupled with reductions from other POTWs and 30-40% reduction in nitrogen from nonpoint sources would achieve water quality standards in the Lamprey River and in Great Bay proper. (NHDES, 2010, Appendix C at 6). The analyses for the Lamprey and Great Bay clearly indicate significant nutrient-driven impairments and that the Newmarket facility represents an important component

[16] Scientific uncertainty is not a bar to administrative decisionmaking. "…EPA may issue permits with conditions designed to reduce the level of effluent discharges to acceptable levels. This may well mean opting for a gross reduction in pollutant discharge rather than the fine-tuning suggested by numerical limitations. But this ambitious statute is not hospitable to the concept that the appropriate response to a difficult pollution problem is not to try at all." *Natural Resources Defense Council, Inc. v. Costle*, 568 F.2d 1369, 1380 (D.C. Cir. 1977) (finding unlawful a rule that would have exempted certain discharges from permitting requirements based on the difficulty in setting limits); *Ethyl Corp. v. EPA*, 541 F.2d 1, 28 (D.C. Cir. 1976) (en banc) ("[R]ecognizing . . . the developing nature of [the field] . . . . [t]he [EPA] Administrator may apply his expertise to draw conclusions from suspected, but not completely substantiated, relationships between facts, from trends among facts, from theoretical projections from imperfect data, from probative preliminary data not yet certifiable as 'fact,' and the like.").

of the overall controllable load to these waters. Given this, and in the absence of any TMDL, existing or planned, or other meaningful nonpoint source controls, EPA felt it was necessary to maximize point source reductions as a pragmatic matter, while at the same time to provide a framework to address other sources of nitrogen in the watershed. EPA recognizes that controlling nitrogen through nonpoint source controls is neither inexpensive nor easy to implement at the state and local level, and while EPA supports efforts in this area, they are needed *in addition to* strong controls on point sources, not instead of them, in order to comprehensively address cultural eutrophication in the Lamprey River and the Great Bay Estuary.[17] Pausing, and potentially stopping at a technologically achievable level of nitrogen control if nonpoint sources of nitrogen are adequately accounted for, struck in EPA's opinion a reasonable balance between differing legal, policy and environmental imperatives in an effort to practically address a difficult environmental problem.

While POTWs do not represent the dominant portion of the nitrogen load, and controlling nitrogen discharges from these sources through NPDES permits will not by itself result in meeting the numeric instream water quality threshold that EPA has determined will attain and maintain applicable water quality criteria and fully protect designated uses, they *do* represent a significant portion of the currently controllable load. Eighteen POTWs in New Hampshire and Maine discharge close to 20 million gallons a day of wastewater with little or no treatment to remove nitrogen. Because of the size, location, and composition of the sewage being discharged, reducing nitrogen discharges from the POTWs in accordance with the Act is the single most important and predictable step that can be taken to reverse the decline of this estuary.[18] EPA's initial focus has been on the small number of facilities that discharge the bulk of the nitrogen load coming from sewage treatment plants. The plants in Exeter, Newmarket, Dover and Rochester account for over 80% of the nitrogen released to Great Bay from treatment plants.

In the absence of any available waste load allocation from a TMDL that appropriately accounts for all sources of nitrogen loading to the impacted waters or any other effective controls on nonpoint source loading, EPA did consider imposing an effluent limitation on Newmarket based on a straightforward dilution-based calculation. In order to meet the instream threshold of 0.3 mg/l that EPA has determined will attain and maintain applicable water quality criteria and fully protect designated uses, this would have resulted in an effluent limitation significantly lower than the limit of 3.0 mg/l given the lack of assimilative capacity (lack of dilution; high background) in the Lamprey. While this permitting approach would have been the simplest way to ensure that the discharge would meet the ambient water quality threshold, EPA was concerned about the fact that, even while the Newmarket facility represents a significant portion of the controllable load into Lamprey, nonpoint sources of pollution still represent the majority of the nitrogen loading into the receiving waters, and absent effective controls on these pollutant sources, designated

[17] EPA is playing its part in this effort. EPA has been involved since the start of the Great Bay Initiative, the effort PREP has facilitated that is focused on a comprehensive approach to what is a complex problem. EPA has been actively involved administering the Clean Water Act Section 319 grant program through NHDES to identify and control nonpoint source pollution. Since 1999, EPA has funded 155 projects in the Great Bay watershed with 319 funds totaling $4.1 million in direct EPA investment with a local match of $3.3 million.

[18] EPA has also issued draft permits containing nitrogen limits of 3 mg/l for two other POTWs in the watershed—Exeter and Dover—and expects to impose nitrogen limitations on other facilities in the near future.

DOVER 005650

uses cannot be attained. EPA also weighed the environmental policy risk that immediate default to a more stringent effluent limitation would not give sufficient opportunity, or incentive, for Newmarket and others in the watershed to pursue necessary nonpoint source controls, and indeed might frustrate ongoing efforts by NHDES to develop a framework to address nitrogen loading on a watershed basis. Accordingly, EPA determined that, as an initial matter, a less stringent limit would be justified as a limit as stringent as necessary to comply with Section 301 of the CWA *if* it could be imposed in conjunction with other efforts by the State to the address the nonpoint source component of the nitrogen pollution problem afflicting the receiving waters.[19] In an effort to effect this more comprehensive environmental objective, which is in keeping with the overall objectives of the Clean Water Act "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" by a date long since passed, EPA is setting permit limits to require "a gross reduction in pollutant discharges" because "this ambitious statute is not hospitable to the concept that the appropriate response to a difficult pollution problem is not to try at all." *NRDC v. Costle,* 568 F.2d 1369, 1380 (D.C. Cir. 1977).

In EPA's assessment, NHDES is in fact actively pursuing a comprehensive and concerted effort to erect a framework to address nonpoint source pollution on a watershed basis. NHDES is currently working to complete a systematic Great Bay Nitrogen Pollution Source Study. (Trowbridge, 2012). The study, which is based in part on input from communities, has two main objectives. First, this study will quantify nitrogen pollution from sources other than wastewater treatment plants such as fertilizer, septic systems, and air pollution. And secondly, it will evaluate where and what type of nonpoint source pollution control will have the greatest effect on nitrogen load reductions. The study will utilize the Nitrogen Loading Model developed by Valiela et al. (1997) to predict nitrogen inputs and outputs for the various watersheds of the Great Bay Estuary. Specific information from municipalities within the watershed is being compiled for septic systems, managed turf areas, residential turf, agricultural land, and impervious surfaces. Air models are being used to separate atmospheric deposition of nitrogen due to local and out-of-state sources. The Great Bay Nitrogen Pollution Source Study results will support watershed-based implementation plans to reduce nitrogen loadings to the Great Bay Estuary.

Moreover, in its Clean Water Act Section 401 certification, New Hampshire has specifically underscored its support for, and reinforced its role in, the permitting approach adopted by the EPA, stating:

> "[T]he effluent limit for nitrogen contained in the Newmarket Wastewater Treatment Facility permit is effectively at the current limits of biological nutrient removal (BNR) technologies for nitrogen removal. Stricter controls than those attributable to BNR technologies are not needed from the facility while the New Hampshire Department of Environmental Services (DES) and communities in the watershed pursue an adaptive planning and implementation framework to address nonpoint source controls during

[19] This choice was consistent with EPA policy to address the complex nutrient pollution problems confronting the Nation's waterways. See Memorandum from Nancy K. Stoner, "Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions," March 16, 2011 ("While EPA has a number of regulatory tools at its disposal, our resources can best be employed by catalyzing and supporting action by states that want to protect their waters from nitrogen and phosphorus pollution.").

the five-year permit term. DES recognizes that treatment facility improvements to meet these permit limits will be costly and that phasing may be feasible to spread costs out over time in order to make the improvements more affordable for sewer system users. In addition, resultant reductions in nitrogen from treatment plant improvements must ultimately be complemented by reductions from other Great Bay Estuary wastewater treatment plants, municipal stormwater systems and nonpoint sources that will take time to accomplish. In this context, DES supports a phased approach for upgrade of the Newmarket Wastewater Treatment Facility coincidentally with implementation of an adaptive management plan and a robust water quality monitoring plan, both under workscopes and schedules approved by the EPA and DES."

See NHDES Section 401 Certification, dated November 5, 2012, at 1-2.

EPA remains mindful of its obligation to include in the permit effluent limitations and conditions that are as stringent as necessary to *ensure* compliance with water quality standards. *See In re City of Marlborough, Mass. Easterly Wastewater Treatment Plant*, 12 E.A.D. 235, 248-52 (EAB 2005); *In re Gov't of D.C. Mun. Separate Storm Sewer Sys.*, 10 E.A.D. 323, 342 (EAB 2002). In the event EPA's expectations regarding NHDES's and Newmarket's pursuit of a framework to address nonpoint source reductions prove incorrect, EPA will reopen the permit to propose limitations on the discharge that will meet the instream threshold in the immediate receiving water through a permit modification. EPA has therefore introduced an express reopener condition in the permit linked to the State's and Permittee's efforts on nonpoint source controls. Specifically, achieving the necessary nonpoint source reductions will require collaboration between the State of New Hampshire and public, private, and commercial stakeholders within the watershed to: (1) complete nonpoint source loading analyses; (2) complete analyses of the costs for controlling sources; and (3) developing control plans that include:

a. A description of appropriate financing and regulatory mechanisms to implement the necessary reductions;
b. An implementation schedule to achieve reductions (this schedule may extend beyond the term of this permit); and
c. A monitoring plan to assess the extent to which the reductions are achieved.

Following issuance of the final permit, EPA will request progress reports and review the status of the activities described above in items (1), (2), and (3) at twelve month intervals from the date of issuance. If the EPA determines the activities described above are not being carried out, then EPA will reopen the permit and incorporate any more stringent total nitrogen limit necessary to assure compliance with applicable narrative water quality criteria.

Finally, in coming to its conclusion to retain the proposed limit, EPA took account of the fact that the Permittee itself has recognized the need for a nitrogen limit to address detrimental impacts from its discharge on the receiving waters, stating in its comments on the draft permit:

"The Great Bay is showing signs of impairment and efforts should be made to make improvements. Nitrogen needs to be reduced to some degree. Towards those efforts we have partnered with the Great Bay Coalition to move forward with a Memorandum of

> Agreement with NHDES to address these issues."

And:

> "The Town of Newmarket requests that EPA and NHDES revisit their draft permit limit of 3 mg/L total nitrogen to allow an 8 mg/L total nitrogen limit as a seasonal average. This new nitrogen limit will reduce the total nitrogen from our WWTF to 80% of current levels and 88% of the current dissolved inorganic nitrogen (DIN) levels that are the most detrimental to the health of Great Bay."

While the Permittee, the Coalition and others differ with EPA over the precise level of nitrogen control necessary to address the water quality impairments in the receiving water, EPA has not been persuaded by arguments made for imposing a less stringent limit than 3.0 mg/l. In citing to the reasonableness of a limit of 8 mg/l, the Permittee and Coalition have relied in large part on the existence of scientific uncertainty; the need for further study; the costs associated with upgrading treatment facilities to achieve lower limits; and the fact that non-WWTF sources contribute the majority of nitrogen loading to the receiving waters. EPA does not find the rationales underlying the approach advocated by the Permittee and Coalition to be compelling in light of the severe nutrient-related impacts in the receiving waters, and the Facility's significant contribution to such impacts, and because such reduced level of nitrogen control would require even greater nonpoint source controls, which are less predictable and certain to achieve. Additionally, while EPA recognizes that the majority of total nitrogen loading is coming from nonpoint sources, wastewater treatment plants like Newmarket discharge the majority of the dissolved inorganic nitrogen (DIN) load, which is the most bioreactive component of total nitrogen. As the preferential form of nitrogen for algae growth, DIN is therefore the highest priority for reductions as part of a comprehensive approach to reducing total nitrogen levels as stringent as necessary to comply with water quality standards. During the critical season for algae growth, the point source contribution is even more significant given the reduced rate of nonpoint source contributions during this period. Nitrogen removal at the treatment plants is thus also the most predictable and effective way to control the impacts of the most harmful component of total nitrogen on the receiving waters. More fundamentally, the Permittee and Coalition's proposed course does not provide a discernable pathway to achieve water quality standards, opting instead to temporize based largely on factors that have little purchase—scientific uncertainty and cost—in the context of *establishing* a water quality-based effluent limitation, especially in the context of a long-expired permit and a pressing environmental harm.

COMMENTS FROM THE TOWN OF NEWMARKET

Comment #1:

Capacity and Evaluation Needs Performed

The Town of Newmarket has demonstrated its commitment to addressing the water quality issues in the Lamprey River and the Great Bay Estuary by providing the funding to execute an update to our wastewater facilities planning efforts. An engineering evaluation was performed in order to assess the needs of our Wastewater Treatment Facility for the next 20 years. We also have assessed our capacity needs in order to determine the flow to the WWTF. Our current wastewater flows are 570,000 gallons per day and we need to provide 850,000 gallons per day of capacity for the next twenty years.

In order to meet an effluent total nitrogen of 8 mg/L, the cost to our users in order to upgrade our WWTF is estimated to be $12.5M in capital and an additional $230,000 in annual operating costs.

In order to meet an effluent total nitrogen in the draft permit of 3 mg/L, the cost to our users in order to upgrade our WWTF is estimated to be $16M in capital and an additional $265,000 in annual operating costs.

The cost to our sewer rate payers, which constitutes approximately 80% of the Town, is estimated as follows:

User Rate Impact for Varying Levels of Nitrogen

Permit Condition	User Rates	Annual Cost*	Increase
Current Permit	$6.20 per 100 cf plus $6/qtr.	$768	-
8 mg/L TN	$14.50 per 100 cf plus $6/qtr.	$1,764	2.3 X
3 mg/LTN	$16.60 per 100 cf plus $6/qtr.	$2,016	2.6X

*Based on 12,000 cf/year, NHDES

Response #1: EPA appreciates the comment, notes it for the record, and commends the Town for having moved forward with facilities planning to explore nitrogen removal options. The Town should be aware that Section 301 of the CWA and its implementing regulations obligate EPA to establish water quality-based effluent limits that are as stringent as necessary to attain and maintain applicable water quality standards, including narrative criteria, and to develop those limitations irrespective of cost or technological feasibility. While cost is not taken into account as a consideration when *establishing* water quality-based effluent limitations, it can be a factor when *implementing* limits (i.e., through reasonable schedules of compliance in administrative enforcement orders).[20] Newmarket should pursue cost and/or affordability concerns over complying with the permit limit in this context. Affordability thresholds are established in

[20] It also plays a role in other regulatory actions (i.e., use attainability analyses, variances from water quality standards, etc.) not applicable to this permit issuance proceeding.

EPA's *Interim Economic Guidance for Water Quality Standards*. When conducting cost analyses in the future, EPA recommends that the Town utilize actual as opposed to design water use values and, in addition, that it provide the basis for projected sewer rate increase calculations. The user charge estimate in the comment are based on a hypothetical yearly water use of 12,000 cubic feet per capita, which in EPA's experience is much greater than actual water use, and thus represent an inflated sewer use charge.

Comment #2:

Areas of Agreement

The Great Bay is showing signs of impairment and efforts should be made to make improvements. Nitrogen needs to be reduced to some degree. Towards those efforts, Newmarket has partnered with the Great Bay Coalition to move forward with a Memorandum of Agreement with NHDES to address these issues.

Newmarket is committed to working collaboratively with regulators and other communities to develop an adaptive management solution. The causes for the degradation of Great Bay are many and complex. The solution may take time and should require some level of demonstration of success. Adapting the implementation of solutions to the best responses is imperative to focus scarce resources into the areas showing the most success.

Response #2: EPA appreciates the comment and notes it for the record. See Responses #15 and 16 regarding issues related to the MOA and Responses #3 and 53 with respect to adaptive management.

Comment #3:

Adaptive Management Solution

The Town of Newmarket requests that EPA and NHDES revisit their draft permit limit of 3 mg/L total nitrogen to allow an 8 mg/L total nitrogen limit as a seasonal average. This new nitrogen limit will reduce the total nitrogen from our WWTF to 80% of current levels and 88% of the current dissolved inorganic nitrogen (DIN) levels that are the most detrimental to the health of Great Bay. This decrease in nitrogen, if implemented as proposed in the Adaptive Management Approach, will bring the nitrogen in the Bay back to the levels seen when the eelgrass was healthy (mid- 1990's levels). This initial tier of permit conditions will allow the Town flexibility to accept additional future non-point source pollution such as private septic systems, since antibacksliding provisions could hold the load constant and achieving a lower concentration limit below 8 mg/L would be feasible. The Town is also committed to supporting water quality and habitat monitoring, Great Bay restoration projects and non-point source nitrogen reduction programs.

Response #3: The Town's claim that point source limits of 8.0 mg/l will result in restoring DIN levels in the Bay to mid-1990's levels or that mid-1990's levels of DIN will result in attainment of water quality standards is without basis in EPA's judgment. EPA is not persuaded that the

mid-1990s represent an appropriate water quality benchmark for assessing the health of eelgrass populations in Great Bay. For one, the loss of eelgrass and proliferation of macroalgae and epiphytes often lags behind the tipping point in an estuary as measured by nitrogen concentrations (Bricker et al., 2007).[21] For another, this suggestion considers only municipal loads, and fails to account for the significant increases in nonpoint source loads that have taken place in the interim. Finally, eelgrass is not the only nutrient-related concern within the Great Bay Estuary. Algal blooms (particularly in the tidal tributaries), epiphytic growth, and direct toxic effects to eelgrass are also concerns.

EPA understands that the Coalition has developed an adaptive management plan for Great Bay and appreciates any planning efforts undertaken by the Town to address both point and nonpoint sources of nitrogen in the watershed. These facts, however, do not in EPA's assessment warrant a relaxation of the nitrogen effluent limit from 3.0 mg/l to 8 mg/l. Please see *Reaffirmation of the Nitrogen Effluent Limitation of 3.0 mg/l* above. Given the current levels of nitrogen in the Lamprey River and the Great Bay Estuary as a whole, in EPA's judgment *both* an effluent limitation of 3.0 mg/l *and* significant nonpoint source reductions will be necessary to achieve water quality standards in the Lamprey River and Great Bay. As outlined in the Fact Sheet, the average annual load to protect all designated used in the Lamprey River is 140.1 tons/yr while the current average annual load is 238.9 tons/yr (34.7 tons/yr from point sources and 204.1 tons/yr from nonpoint sources) (NHDES, 2010 at Appendix C, Table 3). A reduction in total nitrogen loading to the system of 41% is needed. The permit's nitrogen limit of 3.0 mg/l is intended to maximize point source reductions into the Lamprey; it is not by itself designed to result in attainment of the threshold that EPA has determined will attain and maintain applicable water quality criteria and fully protect designated uses, but to do so in conjunction with nonpoint source reductions. In adopting this permitting framework, EPA remains cognizant that maximizing point source reductions will decrease the magnitude of required nonpoint source reductions. As these nonpoint source reductions are more difficult and unpredictable to achieve, this in EPA's view counsels in favor of retaining the lower limit of 3.0 mg/l. Additionally, while EPA recognizes that the majority of total nitrogen loading is coming from nonpoint sources, wastewater treatment plants like Newmarket discharge the majority of the dissolved inorganic nitrogen (DIN) load, which is the most bioreactive component of total nitrogen. During the critical season for algae growth, the point source contribution is even more significant given the reduced rate of nonpoint source contributions during this period. Nitrogen removal at the treatment plants is thus also the most predictable and effective way to control the impacts of the most harmful component of total nitrogen on the receiving waters.

If the Town's actions to effectively address nonpoint sources of nitrogen require it to expand current sewer service (i.e., tying in septic systems), EPA understands that the permit may need to be modified, in accordance with applicable requirements, including backsliding and

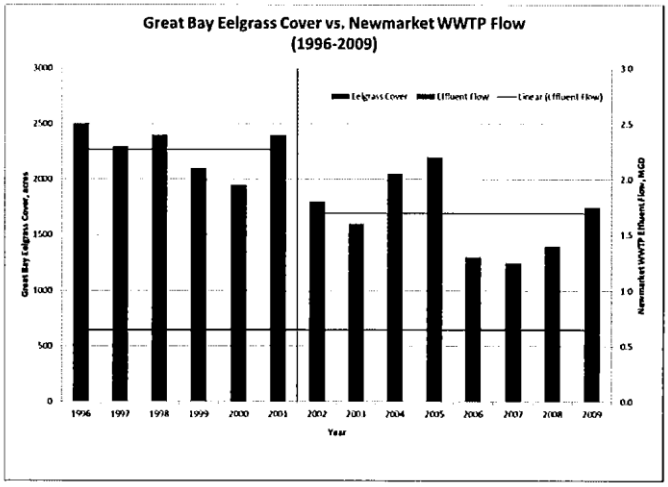
[21] Although the comment makes reference to DIN levels, regulating total nitrogen is consistent with recommendations in EPA's *Nutrient Criteria Guidance Manual* (EPA, 2001), which recommends limiting total concentrations (i.e. total nitrogen) as opposed to fractions of the total due to the recycling of nutrients in the environment. This approach is also in accord with the *NHDES Great Bay Nutrient Report*, which states, "Nitrogen cycling results in constant shifts between the different forms of nitrogen. Setting criteria for dissolved inorganic nitrogen is problematic because the concentrations of this species is drawn down or fully depleted during periods of high productivity. Therefore, DES feels that total nitrogen is a more stable indicator to use for the water quality criteria." (NHDES, 2009a).

antidegradation, to authorize increased loading from the treatment facility. In EPA's view, an increase in nitrogen loading from the facility would be consistent with the goal of achieving water quality standards to the extent that it represents a net reduction in nitrogen to the receiving water.

Comment #4:

Point Source versus Non-point Source Problem and Solutions

NHDES studies quantify the source of total nitrogen pollution into Great Bay as being 27% point source and 73% non-point source pollution in order to estimate the Total Maximum Daily Load allowed. Our WWTF has been discharging at a similar level from 1996 to 2011. This is the same time period where eelgrass was healthy initially and then declined in Great Bay. This is demonstrated in the following graph showing eelgrass cover in Great Bay versus the Newmarket WWTF flow.

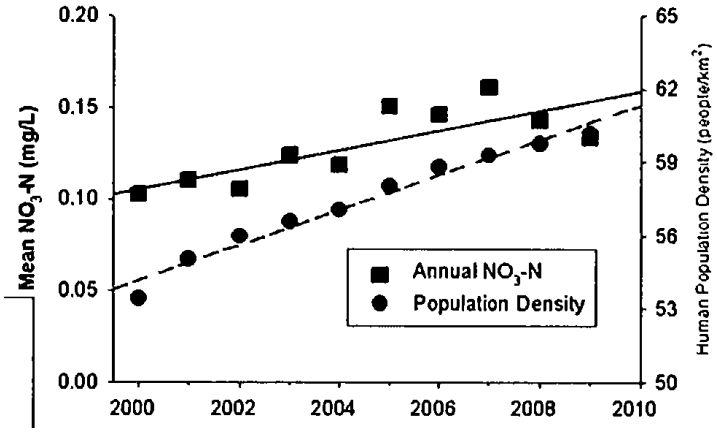


The factors that can be demonstrated to have changed over this time frame and which are only related to non-point sources are listed as follows:

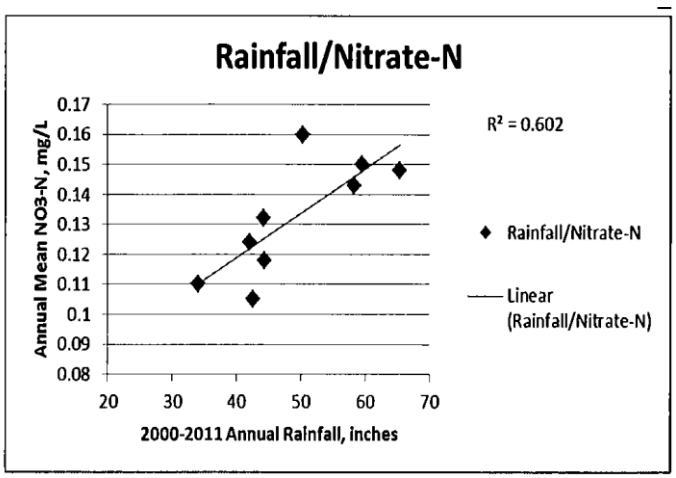
- Watershed wide increase in population (17% from 1990 to 2010)
- Increase in septic tank discharges to groundwater
- Increase in rainfall (25% over the last decade in New Hampshire)
- Increase in impervious surfaces
- Increase in the use of fertilizers for ball fields and lawns
- Increase in stream encroachment
- Increase in invasive species growth

To support our comment that non-point sources pollution can be the major source of impairments to the Great Bay, we offer three general information graphs taken from publically available information.

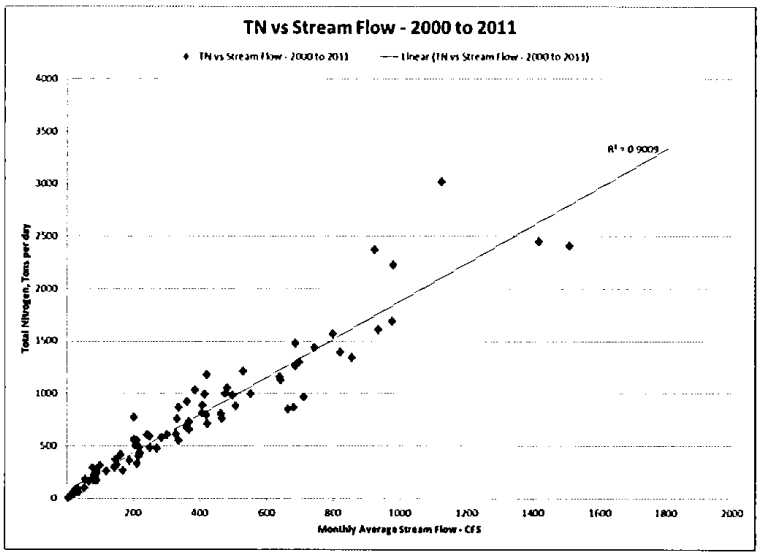
The first graph is the populations density in the Lamprey River Watershed and nitrate-nitrogen concentrations in the Lamprey river near Packers Falls from the May 10, 2011 SWA Science Symposium. This graph demonstrates the linear relationship between population increases and increases in nitrogen levels in the Lamprey River.



The second graph plots the rainfall in Durham, NH versus the nitrate-nitrogen levels in the Lamprey River near Packers Falls. This graph demonstrates the linear relationship between nitrogen levels and rainfall.



The third graph is information taken from the UNH sampling station LMP-73 for total nitrogen (particulate and total dissolved nitrogen) plotted as the monthly mean total nitrogen in tons per day versus river flow.



This location is at Packers Falls in Newmarket, upstream of the head of tide dam on Route 108 approximately 2 to 3 miles, in the fresh water section of the Lamprey River. This graph demonstrates that the total nitrogen in the river is directly related to the river flow and runoff rather than the point sources discharges.

Finally, our Town Council members provided statements at the public hearing indicating they have first-hand knowledge of animal waste pollution in the river from upstream communities. This clearly shows that upstream users impact the health of Great Bay and need to be part of the solution if real progress is to be made in reducing nitrogen. The Town's presentation at the public hearing on November 30th is included as Exhibit 1.

Response #4: EPA does not dispute that the majority of the total nitrogen load into the Great Bay Estuary is from nonpoint sources, and it is for this reason (i.e., to provide NHDES and the Town with the framework and opportunity to pursue nonpoint source reductions) that EPA has opted for a nitrogen effluent limit of 3.0 mg/l rather than a more stringent limit equal to the numeric instream threshold that EPA has determined will attain and maintain applicable water quality criteria and fully protect designated uses. Please see *Reaffirmation of the Nitrogen Effluent Limitation of 3.0 mg/l* above.

EPA expects NHDES and the Town to pursue a comprehensive watershed-based nonpoint source reduction effort over the 5-year permit term. This effort will necessarily need to address potential increases in nitrogen loading to the receiving waters from the watershed that could result from future development. While EPA recognizes that municipalities may on their own be unable to effectively address nonpoint sources of nitrogen outside their jurisdictional boundaries, EPA also observes that a significant portion of nonpoint source loadings originate from the same communities that have point source discharges.

While developing and implementing strategies to control nonpoint sources is critically important, it does not obviate the need to address point sources nitrogen pollution into the Great Bay Estuary, including the Lamprey River. Nitrogen removal at the treatment plants is likely the most predictable, cost effective and ecologically beneficial path to reduce nitrogen loads to the Great Bay Estuary and to mitigate the water quality impacts of those loads. Some nonpoint sources of nitrogen represent natural background loadings that are not controllable. Of the controllable loadings in the watershed resulting from development, achieving meaningful controls will be challenging and will likely cost more per pound of nitrogen removed than point source controls (see NHDES, 2010 at 1). And, as noted above, the majority of DIN comes from POTWs discharging into the system, and this component of nitrogen is more susceptible to being taken up by aquatic plant growth, fueling harmful productivity.

The point source analysis presented only indicates that there has not been a significant increase in discharge *flows*. There are little data available to indicate whether there has been an increase in nitrogen discharge *loadings*. Rochester is an example of where nitrogen discharge concentration levels have increased over time, resulting in an increase in nitrogen discharge loadings independent of any flow increase. Quarterly monitoring provided by Rochester indicates that for 2001 – 2006 total nitrogen discharge levels ranged from 13 -18 mg/l and for 2007 – 2011 total nitrogen discharge levels ranged from 20 – 35 mg/l. Even if the recent increase in loads were primarily attributable to nonpoint sources, the fact remains that total loadings exceed acceptable loadings and point sources contribute significantly to these exceedances, and accordingly need to be controlled. Since permitted flows exceed actual flows, there is also potential for increased point source discharge loadings in the future.

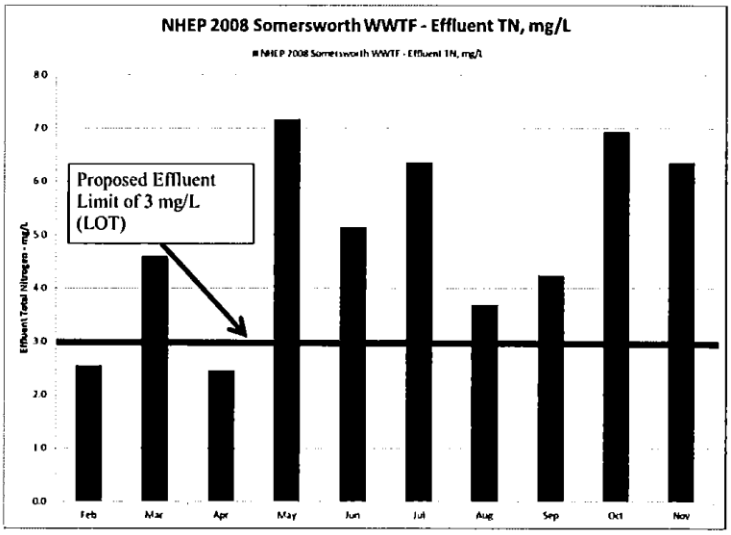
Comment #5:

<u>Permit Limit of 3 mg/L TN is Prohibiting Adaptive Management</u>

A permit limit of 3 mg/l is stated by EPA reported to be the Limit of Technology (LOT). This limit will eliminate the Town's ability to address non-point source pollution from

septic systems due to anti-backsliding provisions requiring lower concentrations if increased flows are received at the WWTF.

We question the capability of LOT treatment processes to meet the low monthly average total nitrogen value effectively because of the seasonal variation in the wastewater temperature. In the adjacent graph, we present a local WWTF near our Town that has a process capable of achieving limits of technology. This data is taken from the NHEP 2008 study of effluent nitrogen discharged from Great Bay wastewater treatment facilities.



The Somersworth, NH WWTF achieved a monthly average TN of 5 mg/l in 2008, suggesting LOT in our area of the country maybe higher than 3 mg/l.

Response #5: EPA disagrees that the imposition of an effluent limitation of 3 mg/l will eliminate the Town's ability to address nonpoint source pollution from septic systems or otherwise impede an adaptive management approach. Clean Water Act anti-backsliding prohibitions do not erect an absolute bar to subsequent relaxation of a permit's effluent limitations and, in this case, would not preclude the possibility of a permit modification to accommodate accepting additional flow from septic systems or other nonpoint sources of pollution. (The Permittee should be aware that an increase in plant flow may result in the increase in other pollutants and would need to comply with State of New Hampshire's antidegradation regulations at Env-Wq 1708.)

EPA does not agree with the Town's proposition that the LOT for New Hampshire is higher than 3 mg/l. The claim is based on the performance of one plant in a single year. The Somersworth WWTF employs a modified University of Cape Town process. This process was employed for biological removal of total phosphorus to meet the permit limit of 0.75 mg/l. This process is also able to remove nitrogen. According to Somersworth's engineering design firm, the plant is currently being optimized for phosphorus removal, not nitrogen removal. Steps could be taken at this facility to optimize the removal of nitrogen (Personal communication – Dan Arsenault, EPA with Steve Clifton of Underwood Engineers, 8/10/12)

Two Massachusetts facilities, Wareham (NPDES Permit No. MA0101893) and Scituate (NPDES Permit No. MA0102695), have permit TN effluent limitations of 4.0 mg/l. These limits were raised from 3.0 mg/l TN to 4.0 mg/l TN based on issues relative to potentially high levels of dissolved organic nitrogen (DON) in the discharges that might prevent attainment of the 3.0 mg/l limits and claims that the DON is not as bioavailable as inorganic forms of nitrogen. The concern that high DON might prevent attainment of a 3.0 mg/l TN limit has since proven to be unfounded. The April – October effluent TN for Scituate averaged 2.7 mg/l TN in 2010 and 3.3 mg/l in 2011. The April – October TN for Wareham averaged 2.8 mg/l TN in 2010 and 2.3 mg/l TN in 2011. Both of these facilities averaged 3.0 mg/l TN or close to this value. With respect to the April – October effluent TN average of 3.3 mg/l, two months had TN effluent averages of 5.3 mg/l. The April average low temperature in New Hampshire is only a few degrees lower than the April average low temperatures in Massachusetts, so EPA believes the comparison is apt.[22]

Comment #6:

Ongoing Studies and Review of Eelgrass Draft Nutrient Criteria

Ongoing studies are underway regarding the draft numeric criteria. These studies relate to the scientific nature of EPA's assertion that transparency-based 0.3 mg/L TN criteria must be achieved in the Lamprey River, to allow recovery of eelgrass. The conclusions drawn (Exhibit 2) are that the loss of eelgrass in the portions of Great Bay where the nitrogen levels are elevated do not appear to be a result of either insufficient transparency or excessive epiphyte growth; eelgrass receive sufficient light over the tidal cycle.

Based on this information, the 2009 proposed draft TN criteria should be significantly amended, as well as the 2009 amendment to the 2008 Section 303(d) lists in which NHDES put forward that decreases in the eelgrass resource was caused by elevated nitrogen levels and reductions in transparency. We ask that Exhibit 2 be included as part of the Town's comments for the record.

Incorporation by Reference of the Comments, Filed by the Great Bay Municipal Coalition

The Town of Newmarket is a member of the Great Bay Municipal Coalition ("Coalition"), an entity dedicated to the establishment of appropriate and cost-effective restoration measures to protect Great Bay. The Coalition filed comments on the Newmarket draft permit on December 14, 2011. Those comments were filed on behalf of the Coalition and each of its member communities, and the Town of Newmarket specifically incorporates those comments by reference herein. For ease of reference, we also include a copy of the Coalitions comments and their presentation at the public meeting (Exhibit 3) held on November 30th at the Town Hall.

[22] See http://www.usclimatedata.com for Epping, NH (April average low of 33° F) and East Wareham, MA (April average low of 38° F).

Response #6: EPA addresses the Coalition's written comments, dated December 15, 2011, and oral comments made at the November 30, 2011, public hearing elsewhere in this Response to Comments (Coalition comments begin at Comment #12).

Exhibit 2 consists of "Supplemental Comments" on the "Proposed Exeter Permit" and is almost entirely specific to the draft Exeter permit. Based on the context in which Exhibit 2 is referenced, it appears that the Town is citing to this document primarily to support its statement that "the loss of eelgrass in the portions of Great Bay where the nitrogen levels are elevated do not appear to be a result of either insufficient transparency or excessive epiphyte growth; eelgrass receive sufficient light over the tidal cycle." (Exhibit 2, heading 1 at bullet 1). This portion of Exhibit 2 is incorporated in its entirety in the Coalition's December 15, 2011, comments and is addressed at Response to Comment #14. Otherwise, responses to the issues raised in Exhibit 2 are set forth below in Comments and Responses 6A, 6B, 6C, and 6D.

Comment #6A:

Exhibit 2 - Water Quality Studies and Peer Review of Eelgrass Draft Numeric Criteria

Pursuant to the Memorandum of Agreement, Coalition Provision V., the Coalition undertook a series of meetings involving various technical experts to review the various factors influencing eelgrass-related impairments that are occurring in the Bay and tidal rivers. This analysis was undertaken to determine if the previously identified impairments, causes, and corrective measures contained in various DES and PREP reports needed to be amended based on an updated assessment of the available scientific information. Based on our understanding of the factors impacting eelgrass health in the Bay, four key documents should be updated: Amendments to the New Hampshire 2008 Section 303(d) List Related to Nitrogen and Eelgrass in the Great Bay Estuary (August 13, 2009) and the related Amendments to the New Hampshire 2010 Section 303 (d) List (August 2010); PREP: 2009 Environmental Indicators Report; Numeric Nutrient Criteria for the Great Bay Estuary (June 2009); and DES Draft "Great Bay Nitrogen Loading Analysis" (November 2010), including "Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed" (Appendix C). Because EPA's permitting decisions continue to rely extensively upon these prior documents and DES' determinations therein, it is essential that they be updated to reflect the latest scientific understanding of nutrient factors impacting the Great Bay Estuary so that an appropriate nutrient reduction and bay restoration plan can be implemented.

The following briefly summarizes the results of the MOA Review Committee and the updated information from various water quality assessments (e.g., Squamscott River sampling program):

MOA REVIEW COMMITTEE

Two meetings were held with a group of UNH researchers, DES, Coalition members, and Coalition members' consultants. An EPA representative was only present at the first meeting but was copied on all subsequent correspondence. The UNH participants were selected

because of their specific expertise on key ecological issues of concern. Many of these participants are also members of the PREP review committee. The meeting minutes from those discussions are attached. *(See* Attachments 1 and 2.) Based upon those discussions, the following technical conclusions have been drawn:

1. Eelgrass losses in the portions of Great Bay where nitrogen levels are elevated do not appear to be a result of either insufficient transparency or excessive epiphyte growth; eelgrass receive sufficient light over the tidal cycle (confirmed by Fred Short);

2. Macroalgae growth has significantly increased in the Great Bay over the past two decades and, this condition is adversely impacting habitat and eelgrass populations (confirmed by Art Mathieson);

3. Macroalgae die back every winter, and their regrowth occurs primarily during warmer weather, peak light months (May to September) (confirmed by Art Mathieson);

4. The excessive macroalgae are most likely caused by increased dissolved inorganic nitrogen (DIN) loads to the Great Bay though certain invasive species may also tolerate low DIN levels (confirmed by Art Mathieson, DES); and

5. The level of DIN control required to control macroalgae is not known with any certainty but these invasive species should be controllable through reduction of inorganic nitrogen loading levels to mid-1990 conditions when the eelgrass resource experienced a period of abundance (confirmed by group discussion).

Based upon this information, the 2009 proposed draft TN criteria should be significantly amended, as well as the 2009 amendment to the 2008 Section 303(d) lists in which NHDES posited that decreases in the eelgrass resource was caused by elevated nitrogen levels and reductions in transparency. It is now clear that the draft criteria's assumption that transparency, chlorophyll-a levels, and TN were the causal factors for eelgrass losses was incorrect and that the focus should be changed to macroalgae and DIN. Thus, EPA should not rely on the Section 303(d) lists or causal conclusions contained therein, nor should EPA rely on the 2009 draft criteria document. The apparent cause of eelgrass declines in the Bay is excessive macroalgae growth and increased DIN loadings, not TN and transparency. Presently, there is no identifiable DIN concentration that can be used as a simple instream nutrient objective, but accomplishing reductions to the mid-1990 levels seems advisable. An accelerated program to identify the level of DIN control needed to limit macroalgae growth and a survey of macroalgae impacts also needs to be developed. That will be a key focus of our Coalition's adaptive management plan which will implement DIN controls at key wastewater facilities.

Response #6A: See Response #14 below.

Comment #6B:

Exhibit 2- The Administrative Record Lacks Adequate Information on the Squamscott River

The Coalition, through its representatives, requested that EPA produce, under the Freedom of Information Act ("FOIA"), those agency records that support various claims that EPA has made in the permit Fact Sheet and in its public presentations regarding the proposed permit modification (FOIA Request No. 01-FOI-00148- 11). EPA provided that information on July 29, 2011. The FOIA response rather uniformly lacked Agency records addressing nutrient impacts on the Squamscott River, as follows (numbering follows that of original FOIA request):

1. Data from and analyses of the Squamscott River showing:

   a. changes in transparency caused the eelgrass losses in this system;

   b. whether the 0.75 Kd (the transparency basis for the 0.3 mgi1 TN numeric criteria) is attainable in this system;

   c. how other confounding/contributing factors, unrelated to algal growth, impact transparency in this system (i.e., color, turbulent mixing, turbidity);

   d. the relative importance of turbidity and color versus algal level in controlling transparency in the Squamscott River;

   e. whether it is proper to apply the 0.3 mg/1 TN median value developed by DES under low flow, limited dilution conditions to derive pem1it limits;

   f. the frequency of occurrence for the conditions used by EPA to generate the TN permit limits;

   g. that TN, rather than biologically available nitrogen (generally inorganic nitrogen (TIN) is the appropriate fom1 of nitrogen to control in this system;

   h. that there is sufficient detention time in this system to convert organic forms of nitrogen into inorganic nitrogen and significantly impact algal growth in the system;

   i. the degree to which chlorophyll-a in the Squamscott River affects transparency under average/median conditions; and

   j. that nutrients arc the limiting factor controlling algal growth in the Squamscott River and Great Bay.

2. Documentation showing where eelgrass originally was present in the Squamscott system and whether the habitat in those areas has changed in the past 40 years.

3. Documentation showing what the TIN, TN and algal levels were in the system when eelgrass was present in the Squamscott River.

4. Documentation showing what caused the loss of eelgrass in the Squamscott River prior to 1980.

5. Documentation showing that the causes of eelgrass decline in the Bay are the same factors that caused eelgrass losses in the Squamscott River decades earlier.

6. Documentation showing that DES has adopted and EPA has approved the proposed numeric criteria used to derive the Exeter permit limits.

7. Documentation of the public review process showing that the 0.3 mg/l TN criteria applied by EPA has undergone formal notice and comment by DES as part of the CWA Section 303(c) adoption process, as required by applicable federal rules (40 CFR 131.21).

8. Documentation showing that the 0.3 mg/1 TN criteria was based on an analysis of how conditions in the tidal rivers influence algal growth and transparency.

9. Documentation showing that attainment of the 0.3 mg/1 TN criteria will assure attainment of the 22% incident light at 2 meters (0.75 Kd) in the Squamscott River.

10. Documentation that promoting eelgrass growth in the Squamscott River requires the same degree of light penetration as the Bay (22% incident light at 2 meters).

11. Documentation on the degree of transparency improvement and algal growth reduction that will occur in the Squamscott River if the Exeter discharge is limited to 3 mg/1 as recommended in the draft permit.

12. Documentation showing that reduced transparency has occurred in Great Bay from 1990-2008 and that the change in transparency was sufficient to cause the eelgrass reductions occurring in the Great Bay system.

13. All documentation showing that the existing transparency level in the Bay is insufficient to maintain current eelgrass populations, even when the tidal variation in the Bay is considered.

15. Any correspondence /communications between EPA and NHDES indicating whether or not that EPA should impose the transparency-based TN criteria in the tidal rivers such as the Squamscott River.

16. Documentation showing that the TN objectives used by Massachusetts and Delaware referenced in the permit Fact Sheet were intended to be applied in tidal rivers with hydrodynamics similar to the Squamscott River.

Following EPA's July 29, 2011, response, the Coalition appealed EPA's partial response and requested that EPA provide any records responsive to the above categories for which no

documents were provided (FOIA Appeal No. HQ-APP-00167-11). EPA granted the Coalition's appeal on Oct. 28, 2011, and indicated that a second search for records produced one further responsive document, which was provided to the Coalition on Nov. 14, 2011. This additional record was a citation to a NH state regulation.

Consequently, this FOIA response further confirmed that the Administrative record lacks adequate information upon which the Agency could appropriately base a decision that 1) attainment of a 0.3 mg/1 TN instream objective in the Squamscott River is necessary to restore lost eelgrass beds in that waterway, and 2) that a 3 mg/1 total nitrogen monthly average limitation is necessary to ensure compliance with New Hampshire's narrative water quality standards and abate existing impairments in the Squamscott River.

We request that these FOIA responses be incorporated into the administrative record.

Response #6B: The Coalition's FOIA request pertains almost entirely to the Exeter NPDES permit and the Squamscott River. None of the information requested appears to pertain to the Newmarket NPDES permit or to the Lamprey River, the receiving water for Newmarket's discharge. In accordance with the Town's request, and because the material is specifically cited in the Town's comment, EPA is adding the FOIA response to the administrative record for the permit, but its specific relevance to this permit proceeding is unclear to EPA.

The administrative record for the Exeter permit contains all of the relevant and available information that was relied on in establishing the permit limits. Upon public notice of the draft Exeter permit, this record was available to any party that desired to review it. The Coalition did not seek to review the record, but rather submitted a FOIA request to identify documents it contends *should be* in the record based on the Coalition's various suppositions or theories about nutrient-related issues in the Great Bay Estuary. EPA supplied 1,467 pages of records in response to this FOIA request.

EPA disagrees that the record lacks information addressing nutrient impacts on the Squamscott River (or, for that matter, the Lamprey). EPA also disagrees that the record lacks adequate information upon which to base EPA's permitting determination that a 0.3 mg/L nitrogen threshold will attain and maintain applicable water quality criteria and fully protect designated uses in the Squamscott River, and that a 3.0 mg/l TN permit limit is as stringent as necessary to assure compliance with water quality standards. The basis for EPA's determination with respect to the Squamscott River and the Exeter permit limit will be set forth in the Fact Sheet and Response to Comments for the Exeter permit. Similarly, the basis for EPA's determination with respect to the Lamprey River and the Newmarket permit are set forth in the administrative record for this permit.

To the extent that there were specific records or categories of information requested under FOIA for which no data exist,[23] this does not necessarily present a bar to determining the need, and

[23] For example, the FOIA requests include "Documentation showing what the TIN, TN and algal levels were in the system when eelgrass was present in the Squamscott River." As the last known record of eelgrass in the Squamscott River was in 1948, and water quality monitoring for TIN, TN and algal levels began in the Squamscott in the 1990s, no such data are available.

establishing effluent limitations for, a pollutant of concern, as EPA is authorized to make a decision based on all reasonably available information at the time of permit reissuance. The ability of a commenter to identify information that might, should or could be obtained, given adequate time and resources,[24] and which might further inform EPA's decision, is by itself insufficient reason to delay establishment of a permit limit. Such an argument will always be available and could always be used to justify delay. The CWA clearly intended for the EPA to act in a timely manner when the available information indicates that a receiving water is impaired and that there is a reasonable potential that a pollutant is being discharged at a level that is causing or contributing to an impairment. Specific issues relating to transparency, algal growth, eelgrass impacts, the reasonable potential analysis, and the basis for the TN limit, including the role of the proposed numeric thresholds, are addressed in other responses.

Comment #6C:

Exhibit 2- The Administrative Record Lack Adequate Information to Support Region 1's Assertion That Limits of Technology (LOT) Must be Imposed

In meetings with the Town of Exeter and other Great Bay Municipal Coalition members, EPA Region I has asserted that, for impaired waters, "Limits of Technology" (LOT) must be imposed on point source discharges at the time of NPDES permit reissuance if a TMDL has not been completed for that water body. EPA has generally averred that this mandate has been identified by "EPA attorneys" based on some existing federal rule. Following this assertion, the Coalition submitted on Oct. 4, 2011, a FOIA request for all Region I records related to the background and basis for this assertion (FOIA Request No. 01-FOI-00004-12). Specifically, the Coalition requested the following records:

1. Any and all records Region I asserts demonstrates that the discharge of a pollutant to a water body listed as impaired for the pollutant requires limits of technology (LOT) at the time of permit reissuance if the TMDL has not yet been completed, including any regulations Region 1 considers to serve as the basis for this assertion;

2. Any legal opinion or analysis that forms the basis of EPA Region I's position (e.g., provide the "working law" of the agency on this matter);

3. Any records from EPA Headquarters to EPA Region 1 stating that this is an NPDES permit reissuance requirement;

4. Any federal register notice that informed the public that an LOT requirement was mandated for discharges to impaired waters at the time of NPDES permit reissuance;

5. All EPA Region I permit objections issued since 2000 that implemented the regulatory interpretation that is the subject of this FOIA request; and

[24] Or, as in the case of the previous footnote, are historic data that will never be available.

6. Any EPA NPDES permit writing guidance that supports the position of Region I on this matter.

On Nov. 3, 2011, EPA Region I responded that it has no information responsive to the Coalition's request. Thus, Region l's position that the proposed 3 mg/1 TN limitation is legally mandated is unsupported.

We request that this FOIA response be incorporated into the administrative record.

Response #6C: The commenter misapprehends the basis for the nitrogen limit imposed on the facility. To be clear, EPA does *not* take the position that the highest possible level of treatment (limit of technology, or LOT) is required where a water body is impaired and no TMDL is available. The permit's nitrogen limitation of 3.0 mg/l is not technology-based within the meaning of CWA § 301(b)(1)(B), and implementing regulations, which do not encompass effluent limitations for nitrogen. Rather, the limit is water quality-based and is designed to be as stringent as necessary to ensure compliance with applicable water quality standards, when taken in combination with nonpoint source reductions. The limit is not, in other words, being applied to "any facility that contributes a pollutant of concern to impaired waters," but on a case-by-case basis given the site-specific characteristics of the discharge and receiving water, and other material facts and policy considerations, as outlined in the *Reaffirmation of Nitrogen Effluent Limitation of 3 mg/l* section in *Background* above.

EPA does not intend to impose LOT on all POTWs discharging in the watershed. EPA will instead impose limits on a case-by-case basis, determined in large part by the size and location of the facility and other site-specific factors. EPA has already informed another POTW discharging to the Great Bay estuary that it will likely receive a limit of 8 mg/l. *See* Letter, Curtis A. Spalding, EPA Region 1, to John H. Bohenko, City of Portsmouth, July 31, 2012. More generally, as a factual matter, even a cursory review of permits recently reissued by Region 1 belies the commenter's claim that this action "mandates 'limits of technology' ('LOT') requirements for any facility that contributes a pollutant of concern to impaired waters." *See, e.g.*, Upper Blackstone Water Pollution Abatement District, NPDES Permit No. MA0102369 (5 mg/l TN limit) and North Attleboro WPCF, NPDES Permit No. MA0100595 (8 mg/l TN limit) (MA permits available at http://www.epa.gov/region1/massachusetts.html).

Comment #6D:

Exhibit 2 – The Squamscott River Monitoring Program Records

On October 4, 2011, the Coalition submitted a FOIA request to EPA Region I for records associated with the Region's Squamscott River sampling program (FOIA Request No. 01-FOl 00003-12). The Squamscott River monitoring records show the following:

a. Low dissolved oxygen (DO) is not caused by excess algal growth;
b. Low transparency at the mouth of the Squamscott River is <u>not</u> caused by algal growth;
c. Macroalgae are <u>not</u> growing excessively in the Squamscott River; and
d. Eelgrass beds just outside of the Squamscott River in the area of highest total nitrogen (TN) concentration are "lush" and apparently quite healthy.

We request that this FOIA response be incorporated into the administrative record. This information is supportive of the Coalition's earlier comments and confirms that the proposed permit modification is not scientifically defensible.

Response #6D: This comment is specific to the Squamscott River, the receiving water for the Exeter discharge, and does not pertain to the Newmarket permit or to the Lamprey River. It is unclear how the Town believes this comment pertains to its permit. More generally, EPA has explained its position regarding the propositions above (e.g., relationship between DO levels and algal growth) elsewhere in this Response to Comments.

EPA supplied the Coalition with its monitoring data for the Squamscott River from the summer of 2011 on November 18, 2011. However, the water quality sampling data did not receive final QA/QC review until January 30, 2012. Because of various issues identified in the QA/QC review (see January 30, Memorandum from Tom Faber to Dan Arsenault), the Region concluded that only data from the September 12 – 26, 2011 sonde deployment was useful for water quality assessment purposes. Specifically, the dissolved oxygen, pH, and conductivity data for the lower sonde (3 meters) and the dissolved oxygen and pH data for the upper sonde (1.5 meters) can be used for most water quality assessment purposes. The chlorophyll-a data for both the upper and lower sondes could not be verified, so it was recommended that these values be treated as estimated values and that these estimates should only be used as relative values and not compared with other values.

EPA disagrees with the Coalition's assertion that Squamscott River monitoring records show that low dissolved oxygen is not caused by excess algal growth. The DO saturation standard of 75% was violated at the upper sonde on September 15 and 16 (both at 71.5%) and at the lower sonde on September 15, 16, and 17 (70.9, 70.7, and 73.9%, respectively). The data from both the upper and lower sondes both clearly show DO rising and falling as chlorophyll-a values rise and fall. This is expected since the algae will grow during the day and produce oxygen and then during the night the algal levels will respire resulting in the lowering of dissolved oxygen levels. Additionally, chlorophyll blooms can have a delayed effect on the DO when large quantities of algae die, settle to the bottom, and consume oxygen as part of the decomposition process. This is also articulated by John Hall on behalf of the Coalition at the Newmarket public hearing:

> "The DO goes up and then goes down. The chlorophyll-a goes up and then comes down. We actually get our worst DO's with our lowest chlorophyll-a's. And there's probably a reason for that. I think it is in oxygen demand in the system might be partly due to settle algae, by the way, which means there could be a benefit to reducing algae." (Newmarket Public Hearing Transcript, November 30, 2011)

The upper sonde also show periods of DO supersaturation (DO% great than 100%) which is also indicative of excessive algal growth resulting from excessive loading of nutrients into the system.

EPA also disagrees that the Squamscott River data provided to the Coalition show that low transparency at the mouth of the Squamscott River is not caused by algal growth and that macroalgae are not growing excessively in the Squamscott River. With respect to algal growth and low transparency the upper sonde data for the period September 12 – 26, 2001 had a

chlorophyll-a range of 28 – 110 ug/l. The lower sonde had a range of 35 – 104. While the QA/QC report referenced above stated that the chlorophyll-a values should only be used as relative values, the data show a significant range of chlorophyll-a values that will clearly affect water column transparency. With respect to macroalgae growth in the Squamscott River, the data provided to the Coalition only looked at macroalgae appearing on the shoreline on one day. No subsurface evaluations were made to look at presence or abundance of macroalgae in the subtidal areas of the Squamscott River.

While the eelgrass beds at the mouth of the Squamscott River were characterized as "lush" and "healthy" the report also noted the presence of epiphytic growth on the eelgrass. It is also important to note that this information is from one small area within the Great Bay Estuary system and that the eelgrass coverage and biomass with the estuary continues to decline.

Comment #7:

<u>EPA's Proposed Discharge Limits are Based on an Inappropriate Interpretation of the NHDES Narrative Criteria</u>

Comment #7a: There remains significant uncertainty with respect to what the numeric nutrient criteria should be to establish discharge limits for treatment facilities in the Great Bay system. NHDES has not adopted numeric nutrient criteria. Existing State Surface Water Criteria (Env-Ws 1700) have narrative criteria, but as NHDES states in their June 2009 report on Numeric Criteria for the Great Bay Estuary ("2009 Criteria Report"), "Narrative standards are difficult to apply for impairment and permitting decisions." Some states have done extensive scientific studies to establish specific numeric criteria. Due to limited available resources, NHDES chose to take a "weight of the evidence" approach. NHDES analyzed the growing but still limited available data, and largely relied on precedent from other states to develop recommended numeric nutrient criteria for the Great Bay system that are being used as interpretations of the narrative criteria. These criteria have not been finalized or adopted as rules under RSA 541-A, and remain in draft form.

Response #7a: EPA's longstanding regulations lay out the process for the Agency to determine whether permit conditions are "necessary" to achieve state water quality standards and for the formulation of these conditions. 40 C.F.R. § 122.44(d). These procedures establish, among other things, methods for EPA to translate a State's narrative water quality standards into numeric criteria, since "EPA's legal obligation to ensure that NPDES permits meet all applicable water quality standards, including narrative criteria, cannot be set aside while a state develops [numeric] water quality standards." *National Pollutant Discharge Elimination System; Surface Water Toxics Control Program; Final Rule*, 54 Fed. Reg. 23,868, 23,877 (June 2, 1989). Thus, despite background uncertainty, and technical complexity in translating narrative criteria into water quality-based effluent limitations, EPA is still obligated to include limitations in NPDES permits that will comply with all applicable water quality standards, whether numeric or narrative. *See American Paper Inst.*, 996 F.2d at 350.

In determining the need for an effluent limitation, permit writers first determine whether pollutants "are or may be discharged [from a point source] at a level which will cause, or have the reasonable potential to cause, or contribute" to an exceedance of the narrative or numeric

criteria set forth in state water quality standards. *See* 40 C.F.R. § 122.44(d)(1)(i). EPA is authorized to base this "reasonable potential" analysis on "worst-case" conditions. If a discharge is found to cause, have the reasonable potential to cause, or contribute to an exceedance of a state water quality criterion, then a permit *must* contain effluent limits as necessary to achieve state water quality standards, "including State narrative criteria for water quality." 40 C.F.R. §§ 122.44(d)(1), 122.44(d)(5) (providing in part that a permit must incorporate any more stringent limits required by CWA § 301(b)(1)(C)).

Where state water quality standards are based upon narrative rather than numeric criteria, 40 C.F.R. § 122.44(d)(1)(vi) lays out procedures to translate those criteria into numeric effluent limitations. This provision describes three options available to permit writers when deriving effluent limits from narrative water quality standards, the first of which is relevant to the EPA's decision in this case. 40 C.F.R. § 122.44(d)(1)(vi)(A). The permitting authority must, in such circumstances, establish effluent limits based on a "calculated numeric criterion for the pollutant which the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and fully protect the designated use." The procedures outlined in 40 C.F.R. § 122.44(d)(1)(vi) authorize EPA to consider a wide range of information, including specifically "a proposed State criterion" and "relevant information."

Contrary to the Town's comment, EPA's decision to utilize the *NHDES Great Bay Nutrient Report*, among other sources of information, over the course of determining a protective instream threshold that would implement the narrative nutrient criterion was rational and in accordance with EPA regulations. When presented with technical data and analysis related to nitrogen, EPA's task under section 122.44(d)(1)(vi) is to determine whether the material is relevant to the derivation of a numeric water quality-based effluent limitation to implement the narrative water quality standard and whether it is appropriate to use the information, alone or in combination with other sources of information, to establish the limit. EPA is required under section 122.44(d)(1)(vi)(A) is to use available scientific information when deriving an appropriate numeric effluent limitation to implement a narrative criterion. The preamble to the regulation states that "[u]nder [Option A] the permitting authority should use all available scientific information on the effect of a pollutant on human health and aquatic life," suggesting a broad construction of both "relevant information" and "proposed State criterion" so long as it is based in scientific information. 54 F.R. 23868 at 23876. Therefore a logical and reasonable construction of "relevant" means of or relating to the pollutant and water body and pollutant at issue in the permit at issue and of "proposed" means derived by the state authority responsible for interpreting water quality standards and applicable to the water body in question.

The scientific analysis underlying the criteria documents are clearly "relevant" to this permit proceeding; this peer-reviewed, site-specific analysis after all directly relates to the receiving waters and pollutant of concern at issue in this permit proceeding. Its relevance under the operative regulation as a source of information to consider in the process of translating applicable narrative water quality criteria into a numeric effluent limitation does not turn on whether proposed numeric thresholds have been finalized, adopted as rules under RSA 541-A or submitted to EPA for approval as a revised water quality standard pursuant to section 303 of the Act. Similarly, nothing in the regulation or its preamble in the Federal Register suggest that "proposed" means that the criterion must have reached some specific point in the state legislative process prior to being employed, along with other relevant information, in the derivation of a

WQBEL under section 122.44(d)(1)(vi)(A). Indeed, it would make little sense to forbid the use of information because it has not been sufficiently "proposed" when the alternative is *less* site-specific and *more* generalized information. Moreover, NHDES construes its proposed numeric thresholds analysis as an interpretation of its narrative criteria for nutrients for those Great Bay waters that were the subject of the study. ("The numeric criteria will first be used as interpretations of the water quality standards narrative criteria for DES' Consolidated Assessment and Listing Methodology for 305(b) assessments."; see also NHDES, 2012b). This interpretation is non-binding, to be sure, but it represents NHDES's scientific assessment of *a* protective value for the receiving waters for the pollutant. As "relevant information" or as a "proposed State criterion," it is accordingly appropriate for EPA to consider NHDES's scientific analysis when deriving a WQBEL under section 122.44(d)(1)(vi).

As explained more fully below, EPA finds no merit in the Town's misapprehension that EPA "largely relied on precedent from other states to develop recommended numeric nutrient criteria for the Great Bay system."

Comment #7b: By including a new nitrogen limit in the draft Permit, EPA has relied heavily on the NHDES draft un-adopted numeric criteria, and on experience from other locations in interpreting the narrative criteria. The problem with this approach is that much of the cited precedent from other states is not relevant to the Great Bay system, and should not be directly applied to Great Bay. For example, EPA cites various eelgrass (or submerged aquatic vegetation - SAV) criteria from other locations as supporting documentation for the total nitrogen discharge permit limit. However, the cited criteria from other locations are intended to address water transparency problems caused by excessive algae growth fueled by nitrogen levels. There are significant data to show that in the Great Bay system nitrogen levels are not the controlling factor for light transparency and therefore eelgrass habitat.

Relying on precedent from dissimilar estuaries brings a high level of uncertainty with respect to what the numeric criteria need to be to protect the Bay and river. Based on NHDES's analysis, the likely range of Great Bay nitrogen criteria would appear to be somewhere between 0.3 and 0.45 mg/L total nitrogen ("TN") depending on which water quality objective (e.g., eelgrass in the Bay, eelgrass in the river, dissolved oxygen ("DO") in the river, DO in the Bay, macro algae, etc.) is believed to be impacted by nitrogen. The low end of this range is premised on the common eelgrass/nitrogen/Chlorophyll a/light transparency relationship observed in other estuaries, but which does not exist in the Great Bay system. There is no basis to impose transparency-based nitrogen criteria from other estuaries when the transparency in Great Bay and the river is most significantly controlled by other factors, including naturally-occurring organics and turbidity.

Response #7b: NHDES performed an independent scientific analysis to derive water quality thresholds for Great Bay waters and compared its values to what others had done as *a* factor, and not the only factor, in assessing their reasonableness, consistent with the weight-of-evidence approach. All of these water quality thresholds from other estuaries fell within a very narrow range. Contrary to the Town's characterization, neither EPA nor NHDES directly applied the Chesapeake Bay or Massachusetts criteria to Great Bay. The criteria cited from other estuaries are relevant to consider under section 122.44(d)(1)(vi) as they relate to the establishment of

ambient nitrogen thresholds to protect designated uses and may be employed to inform the derivation of the total nitrogen water quality-based effluent limit.

Contrary to the Town's understanding, the threshold values for other estuaries were not in all cases transparency-based but drew from a variety of methodologies, including reference-condition approaches.[25] While EPA disagrees with the assertion that nitrogen levels are not the controlling factor for light transparency and eelgrass habitat in the Great Bay estuary, see below and Response #24, the analyses for other estuaries are appropriate to consult even if the relationship described between eelgrass and transparency did not exist in this system, consistent with the weight of the evidence approach.

The existence of scientific uncertainty regarding the precise in-stream threshold for total nitrogen to utilize when implementing the state's narrative criterion for nutrients is unsurprising given the complexity of the environmental setting; uncertainty and complexity, however, do not by themselves bar EPA's ability to act. Even in the face of unavoidable scientific uncertainty, EPA is authorized to exercise reasonable discretion and judgment based on the record before it during the permit reissuance process. EPA assessed the reasonableness of considering the NHDES's scientific analysis for its proposed numeric thresholds when establishing the nitrogen limit to ensure that they were not *so* uncertain as to preclude reliance on them; in this assessment, EPA determined that NHDES's analysis was rationally related to the conditions in the receiving waters it was endeavoring to represent. The NHDES numeric nitrogen thresholds were derived from stressor-response relationships observed in a comprehensive analysis of nine years' worth of site-specific water quality data, as well as by reference to established nutrient response thresholds. Each data source utilized was chosen because of its relevance to a conceptual model for eutrophication in estuaries. Multiple lines of evidence were evaluated and a weight-of-evidence approach utilized to determine protective nitrogen thresholds. The weight-of-evidence approach reduces (though does not eliminate, as NHDES and EPA recognize) the inherent uncertainty associated with establishing thresholds in order to make informed management decisions. This approach to developing numeric nutrient criteria is consistent with EPA guidance (EPA, 2010). In addition, NHDES conducted a thorough and transparent analysis of

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[25] For example, the Massachusetts Department of Environmental Protection nitrogen thresholds document (MADEP/SMAST, 2003) that EPA cites to is clearly not based solely on water transparency. The nitrogen thresholds document indicates that:

> "Based on accepted estuarine principles, the best biological indicators of embayment health are those species that are non-mobile and that persist over relatively long periods if environmental conditions remain constant. The rationale in using such non-mobile and persistent species as indicators of overall system health is that these types of organisms integrate environmental conditions over seasonal and annual intervals. This approach is particularly useful in environments where high-frequency variations in structuring parameters (e.g. light, nutrients, dissolved oxygen, etc.) are common, making adequate capture of environmental conditions difficult."

MassDEP placed a focus on eelgrass versus macroalgal distribution and benthic animal communities when determining nitrogen threshold values.

uncertainty in its criteria development, including establishing goals for uncertainty in the regression analyses (NHDES, 2009a at 2) and applying those thresholds in assessing the results of the various lines of evidence (see NHDES, 2009a at 45-45; 50-52; 66). The analysis was peer reviewed. EPA's decision to act here and utilize the State's ambient water quality analyses upon an independent assessment, and in lieu of further modeling or study, makes sense given the severe ongoing nutrient impairments in the receiving waters and the lack of any nitrogen controls on point sources, among other reasons. Please see *Background* and Responses #15 and 7a.

As mentioned, the commenter's central objection—that NHDES's methodology is solely based on "eelgrass/nitrogen/Chlorophyll a/light transparency relationship," is incorrect, as is the further claim that such a relationship does not exist in Great Bay. As indicated in the NHDES *Great Bay Nutrient Report*:

> "The nitrogen threshold for the protection of eelgrass was derived using a weight-of-evidence approach which included the thresholds for macroalgae proliferation, regressions between total nitrogen and the light attenuation coefficient, offshore water background concentrations, reference concentrations in areas of the estuary which still support eelgrass, and the thresholds that have been set for other New England estuaries. Another source of information is the nitrogen concentrations in areas where eelgrass is still healthy. The only major assessment zones that DES did not determine to be impaired for eelgrass loss were in Portsmouth Harbor and Little Harbor (NHDES, 2008b), although recent declines in eelgrass cover show that these areas are not pristine (PREP, 2009). Following EPA guidance for the reference concentration approach, the threshold should be bound by the 75th percentile concentration in the reference area (EPA, 2001). For the Portsmouth Harbor and Little Harbor area, this reference concentration for total nitrogen is 0.34 mg N/L. This concentration is likely too high because of the declining trends in eelgrass in these areas."

Thus, the nitrogen thresholds that form the basis for the permit limit are not simply driven by the "eelgrass/nitrogen/Chlorophyll a/light transparency relationship," but are based on a weight-of-evidence approach that utilizes multiple lines of evidence.

Even if EPA's actions *were* based solely on such a relationship, as more fully described in Response #24, there is ample evidence that the "eelgrass/nitrogen/Chlorophyll-a/light transparency relationship" does indeed exist in Great Bay. Chlorophyll-a data in Great Bay is elevated compared to areas with relatively low nitrogen and is a contributing factor relative to light attenuation concerns, especially where eelgrass grows in deeper waters. Median chlorophyll-a in Great Bay is 3.4 ug/l with maximum concentrations as high as [illegible] ug/l. Near shore coastal areas removed from high nutrient loads may experience chlorophyll-a concentrations in the range of approximately 1 to 3 µg/l (EPA, 2001). Also, as indicated in the Fact Sheet, chlorophyll-a and eelgrass trends track total nitrogen trends.

The primary controllable drivers of water column light attenuation are particulate organic matter (which includes chlorophyll-a, zooplankton and other consumers and detrital organic matter) and inorganic particles. Increasing nitrogen concentrations cause a proliferation of algae and elevated primary productivity in general. The resulting increase in organic matter in the water column reduces the amount of light reaching eelgrass plants so they do not get enough light to survive. NHDES has shown that light attenuation in the Great Bay Estuary is more

strongly correlated with plant/organic matter in the water than any other factor (See NHDES, 2012a). The plant/organic matter has a disproportionate effect on light attenuation because the same weight of organic matter scatters more light than inorganic particles due to its lower density and higher surface area-to-volume ratio. See Response #24.

Moreover, EPA has been very clear that while chlorophyll-a driven light attenuation is a concern in Great Bay proper, it is not the only concern. Macroalgae proliferation, epiphyte growth, particulate organic matter, and the direct toxic effect of nitrogen on eelgrass are also concerns in Great Bay proper.

Excess nitrogen creates an environment in which epiphytes can grow on the leaves of eelgrass, and macroalgae can proliferate and displace eelgrass, as described by NHDES:

> "Increasing nitrogen concentrations in shallow estuaries favor the proliferation of ephemeral macroalgae over seagrasses and other perennial submerged aquatic vegetation. (McGlathery et al., 2007; Fox et al., 2008). Macroalgae have lower light requirements for survival than seagrasses and thrive in high nutrient environments (Fox et al., 2008). The proliferation of macroalgae species can be responsible for eelgrass loss due to shading and changes in water chemistry near the sediments (Hauxwell et al., 2001; Hauxwell et al., 2003). When macroalgae forms dense mats on the sediment surface, it can prevent the re-establishment of eelgrass in these areas (Short and Burdick, 1996). (NHDES, 2009a at 37)."

Eutrophication in seagrass ecosystems tends to proceed toward dominance of rapidly growing epiphytes and macroalgae that are considered superior competitors for light relative to seagrasses, and final dominance by phytoplankton at extremely high nutrient loadings. (Burkholder, 2007).

Field studies have demonstrated that macroalgae has increased significantly as nitrogen has increased in the estuary (Nettleton et al., 2011; Pe'eri et al., 2008). The well-documented increases in macroalgae growth and the recently documented evidence of extensive epiphyte growth (Short, 2011; Mathieson, 2012) further attenuate light that is critical for eelgrass survival.

The *NHDES Great Bay Nutrient Report* shows that between 1996 and 2007, the eelgrass area declined in Great Bay proper from 2421 acres to 1246 acres, a 48 percent loss. The 2007 information also showed 137 acres of macroalgae, predominantly in areas previously covered in eelgrass. Based on this information, and a median TN concentration of 0.42 mg/l for Great Bay proper, NHDES estimated that a TN water quality concentration of 0.38 mg/l would protect replacement of eelgrass by macroalgae (NHDES, 2009a at 37-39).

As to nitrogen toxicity, EPA has explained that elevated concentrations of nitrate and ammonia have been shown to have direct impacts on eelgrass by disrupting its normal physiology. Fact Sheet at 15. This disruption of normal physiology can lead to reduced disease resistance and mortality. Burkholder et al. (1992) demonstrated that eelgrass exposed to pulses of nitrate as low as 3.5 uM (~50ug/l) experiences shoot die-off, especially under high increasing temperature. This direct effect of excess nitrate was determined to be independent of indirect effects such as algal light attenuation (Burkholder et al., 1992, Touchette et al., 2003).

Estuarine systems have natural background levels of color and turbidity that are fully compatible with a healthy ecosystem that supports eelgrass habitat. The commenter has presented no persuasive evidence to indicate that color has increased over time. While there has been an increase in total suspended solids concentrations in Great Bay, this increase accelerated after the documented decline of eelgrass within the system (see NHDES, 2009a at B-3). The instability of sediments and associated increase in sediment resuspension that occurs as a result of eelgrass loss further exacerbates the light attenuation concerns.

Comment #7c: The upper end of the appropriate nitrogen criterion may even be higher than 0.45 mg/L. In watersheds with much organic nitrogen (from all sources), as is the case in portions of the Great Bay system, nutrient criteria are occasionally established on the basis of inorganic nitrogen with resulting higher than typically allowable total nitrogen concentrations. In EPA's fact sheet (p. 26), there is reference to the Massachusetts Department of Environmental Protection's ("MADEP") total nitrogen criteria of between 0.3 and 0.39 mg/L. In estuaries with much organic nitrogen, MADEP has set an inorganic nitrogen criterion that has resulted in allowable total nitrogen concentration of greater than 0.5 mg/L (e.g., Pleasant Bay).

Even if there were an eelgrass/nitrogen/Chlorophyll-a/light transparency relationship in Great Bay, there would be no basis to apply an eelgrass criterion to the Lamprey River. The actual cause of eelgrass loss in the Lamprey River is unknown and occurred more than 40 years ago (long before most documented eelgrass declines in Great Bay and before increasing Total Nitrogen ("TN") and decreasing transparency trends. Neither NHDES nor any other researchers have been able to link Lamprey River eelgrass losses with nitrogen conditions in the river. Further, the Great Bay Estuary Restoration Compendium, Figures 6 and 7, identify the Lamprey River as not suitable habitat for eelgrass restoration (Exhibit 4).

Response #7c: As indicated previously, MADEP thresholds were established based on reference sites having documented high quality biological health. The majority of Massachusetts site-specific nitrogen thresholds are significantly lower than the Pleasant Bay threshold. Unlike Pleasant Bay, all stations in Great Bay proper have shown eutrophication effects and all have total nitrogen concentrations below 0.5 mg/l. Following the Massachusetts approach, the nitrogen threshold to protect dissolved oxygen, based on a sentinel location, would be no higher than the median concentration in Great Bay (0.42 mg/l) where limited dissolved oxygen violations occur and consequently would be lower than the 0.45 mg/l threshold used in establishing permit limits.

The eelgrass threshold for the Pleasant Bay System in Massachusetts was established at 0.16 mg/l bioactive (dissolved inorganic) nitrogen using a sentinel location (Station PBA-12) in Little Pleasant Bay (MEP, 2003). That report indicated a bioactive nitrogen level for high quality eelgrass habitat of 0.16 mg/l based upon a healthy eelgrass community in both Bassing Harbor at 0.12 mg/l bioactive nitrogen and in Stage Harbor at 0.16 mg/l bioactive nitrogen. The higher value was used since the eelgrass habitat in Bassing Harbor was below its nitrogen loading limit at that time. This level of dissolved inorganic nitrogen is similar to the dissolved inorganic nitrogen threshold of 0.15 mg/l cited in EPA's Nutrient Criteria Technical Guidance Manual – Estuarine and Coastal Marine Waters (EPA, 2001) and the dissolved inorganic nitrogen water

quality standard for the State of Delaware of 0.14 mg/l. The median dissolved inorganic nitrogen concentration for the Lamprey River was 0.15 mg/l (NHDES, 2009a).

The *NHDES Great Bay Nutrient Report* indicates that "Nitrogen cycling results in constant shifts between the different forms of nitrogen. Setting criteria for dissolved inorganic nitrogen is problematic because the concentrations of this species is drawn down or fully depleted during periods of high productivity. Therefore, DES feels that total nitrogen is a more stable indicator to use for the water quality criteria. In guidance for establishing nutrient criteria for estuaries, EPA identified total nitrogen as the causal variable of specific concern." Consistent with recommendations in EPA Nutrient Criteria Manual, because of the recycling of nutrients in the environment it is best to limit total concentrations (i.e. total nitrogen) as opposed to fractions of the total.

The Amendment to the Section 303(d) list explains that the historic maps of eelgrass in the Lamprey River show 53.4 acres of habitat in 1948. It is not known when after that the eelgrass was lost.[26] NHDES has determined that eelgrass has historically been present in the lower portion of the Lamprey River. Eelgrass habitat is essential to achieving the water quality standards designated use for the protection of aquatic life.

Even if eelgrass habitat in the Lamprey River were not important in supporting the designated use, the total nitrogen discharge limit to protect eelgrass downstream in Great Bay and Little Bay would be still be 3.0 mg/l and an additional 10 - 20% reduction in the nonpoint source component would still be necessary (see NHDES, 2010, Appendix C).

The Great Bay Estuary Restoration Compendium referenced in the comment indicates that "Restoration via natural recolonization is the creation of suitable conditions for increasing eelgrass distribution. It requires an understanding of the causes of eelgrass decline. Those causes must then be remediated, which can include efforts such as identifying and addressing point and non-point nutrient discharges." As indicated in an August 8, 2011 letter to EPA from Thomas S. Burack, the reason the Lamprey River - North was not identified as suitable habitat for eelgrass restoration was due to its current degraded water quality. This letter also makes it clear that the criterion for the protection of eelgrass habitat applies to those sections of the Great Bay Estuary where eelgrass has historically existed.

Comment #7d: There is also insufficient data to show a linkage between river DO and nitrogen, and thus, there is an insufficient basis for EPA to impose a permit limit premised on an uncertain relationship between river DO and nitrogen. The work that is currently underway by the Great Bay Municipal Coalition under its Memorandum of Agreement with NHDES will provide substantial new information. EPA's final action on this proposed draft Permit should incorporate the monitoring and modeling efforts that are being undertaken by the Coalition now.

Response #7d: EPA disagrees with the comment. The Fact Sheet and Responses 25 and 29 amply detail the relationship between dissolved oxygen impairments and nitrogen levels. The dissolved oxygen threshold of 0.45 mg/l is based upon an extensive evaluation of the relationship

[26] Small areas of eelgrass have reappeared in 2003 (2.2 acres; disappeared in 2004) and 2011 (0.5 acres) (PREP, 2012) but the long term viability of this acreage remains in question.

between nitrogen concentrations and dissolved oxygen levels as documented in the *NHDES Great Bay Nutrient Report* (NHDES, 2009a at 45-54).

Dissolved oxygen impairments are clearly an important water quality issue in the Lamprey River. According to "Amendment to the New Hampshire 2008 Section 303(d) List Related to Nitrogen and Eelgrass in the Great Bay Estuary" (NHDES, 2009b), the Lamprey River is impaired for dissolved oxygen and biological and aquatic community integrity. According to the 303(d) list, the indicators showing dissolved oxygen impairment are chlorophyll-a, nitrogen, and instream dissolved oxygen monitoring. The indicators showing biological and aquatic community integrity impairment are estuarine bioassessments for eelgrass, light attenuation coefficient, and nitrogen. As explained in the Amendment to the Section 303(d) list, relative to the dissolved oxygen criteria (Env-Wq 1703.07), sufficient data were available for dissolved oxygen, dissolved oxygen saturation, total nitrogen, and chlorophyll-a. All of these indicators were categorized as impaired (Non Support) based on their individual criteria. There were no conflicting results between the indicators.

The evaluation of dissolved oxygen standards attainment for the Lamprey River was based on sonde data, which is the preferred data source. With respect to dissolved oxygen concentration, a total of 55 of 413 days (13.3 %) had minimum dissolved oxygen data less than the single sample minimum criterion of 5 mg/l. For dissolved oxygen saturation 50 out of 352 days (14.2 %) had daily average dissolved oxygen saturation below the standard of 75% saturation and 47 of 188 days (25 %) during the critical period also failed to meet standards. Because of this data, the Lamprey River was classified as 5-P (not supporting; impaired, poor water quality).

The data collected by the Coalition under the MOA are for the Squamscott River, not the Lamprey. In any case, the newly collected data for the Squamscott River are consistent with the existing data, showing dissolved oxygen minimums below the water quality standard and high chlorophyll-a and total nitrogen concentrations. The water quality monitoring contemplated by the MOA was also for the Squamscott River and is not "underway"; the Coalition has indicated that it does not intend to develop a water quality model for the Squamscott River until after upgrade of the Exeter WWTF. See Response #25.

Even if the limit was not based on protecting dissolved oxygen and eelgrass in the Lamprey River, it would still be established at 3.0 mg/l in order to protect eelgrass downstream (see NHDES, 2010).

Comment #7e: An underlying failing of EPA's justification for a total nitrogen limit of 3 mg/L is that the supporting basis for that limit as explained in the Fact Sheet focuses on the impact of the Newmarket WWTF discharge on the Lamprey River, and not Great Bay. On pages 27-29 of the Fact Sheet, EPA points to the high nitrogen values measured in the Lamprey River and the total nitrogen concentration in the river, and then calculates a total median nitrogen concentration in the Lamprey by adding the concentration from upstream of the Lamprey together with the increase in nitrogen due to the effluent discharge at the treatment plant at the point of discharge. As explained above, there is substantial question as to whether impairment for eelgrass is an appropriate basis at all for a nitrogen limit for the Newmarket WWTP, and the nitrogen-river DO relationship is also uncertain, pending the analysis underway by the

Municipal Coalition. Therefore, the basis for EPA's position of a nitrogen limit of 3 mg/L is without sufficient foundation. No final decision on the nitrogen limit should be imposed until a sufficient basis has been established, either by substantiating the DO-nitrogen relationship in the Lamprey River, or providing a more complete cause and effect relationship between nitrogen discharges from the Newmarket treatment plant and any impairments in Great Bay.

Response #7e: The justification for a total nitrogen limit of 3.0 mg/l appropriately focuses on the Lamprey River as it is the direct receiving water for the discharge and has extensive evidence of eutrophication related water quality impairments. EPA disagrees that there is a substantial question regarding use of the eelgrass threshold for the Lamprey River, see Response #7c, and based on data and other information in the record disagrees with the contention that the nitrogen-river DO relationship is uncertain, see Response #7d above.

While the Fact Sheet focuses more on the water quality of the Lamprey River because it is the immediate receiving water, the limit is also clearly necessary to meet nutrient criteria in Great Bay and Little Bay. As indicated in Responses #7c and 7d, the nitrogen limit necessary to achieve the eelgrass threshold in Great Bay proper would still be 3.0 mg/l. As the Fact Sheet indicates, the necessary magnitude of point source and nonpoint source nitrogen reductions has been estimated by the NHDES on an aggregate basis in the NHDES *Nitrogen Loading Reduction Report* (NHDES, 2010). For each of the watersheds draining to the Great Bay Estuary, NHDES has identified watershed nitrogen loading thresholds and percent reduction thresholds that are expected to result in attainment of water quality standards throughout the Estuary, both locally and throughout the estuary. According to the *NHDES Nitrogen Loading Reduction* report, the nitrogen loading threshold for restoring the Lamprey River designated uses is also consistent with the nitrogen reductions necessary to meet standards in Great Bay and Little Bay.

Comment #7f: EPA also inappropriately applies the near field low flow dilution factor of 55 to estimate the impact of Newmarket's discharge on the nitrogen level in the river. This "Extreme Low Flow Conditions" dilution factor as defined in Env-Ws 1705.02 is intended to be used for calculating protective limits for toxic parameters such as ammonia or metals. Nutrient criteria are intended to be applied to average or median river and tidal flushing conditions. In estimating the dilution factor at this extreme low flow condition, the data also indicated hydrodynamics in the river produce a fresh water lens over the salt water intrusion during flooding tides (pycnocline), potentially causing low DO conditions in the river. This misapplication of the dilution factor results in an overstatement of the TN concentration impacts of Newmarket's plant on the Lamprey River and Great Bay. This misinformation should be corrected.

Response #7f: There is nothing in the text of NH's water quality standards to indicate that the low flow conditions dilution factor is limited to calculating limits for toxic parameters. Rather, Env-Wq 1705.02(c) simply states, "For tidal waters, the low flow condition shall be equivalent to the conditions that result in a dilution that is exceeded 99% of the time." EPA believes that using a low flow condition to demonstrate the instream impact of Newmarket's discharge was appropriate under NH WQSs. As discussed elsewhere in this Response to Comments, EPA has determined that it is reasonable and protective to express the permit limit as a seasonal average. Please see Responses # 37-39.

Comment #8:

Seasonal Average Limits Rather than Monthly Average Total Nitrogen Limits

As documented in EPA's Reference Document, there is significant temporal variability in the performance of treatment facilities removing nitrogen to low levels. In Newmarket's draft permit, EPA rationalizes a monthly concentration limit as incentive to optimize plant operations. There is more than sufficient incentive to optimize monthly operations, however, as that will be the only way the seasonal average is attained. The State of Connecticut, which has led the way with respect to low level nitrogen requirements in New England, imposes annual (12 month rolling average) nitrogen mass limits with no monthly limits and with no concentration limits. Further, the annual mass TN limit translates to a seasonal average TN concentration of greater than 3 mg/L at all the plants in Connecticut. A seasonal (May thru October/6- month rolling average) average total nitrogen mass limit is the more appropriate permit basis that would allow compliance and meet water quality goals.

Response #8: In EPA's judgment, a mass-only limit would be inconsistent with the approach taken in the permit to, as a practical matter, maximize point source reductions. A mass limit would achieve this goal only if it was calculated at 3.0 mg/l at current flows, which would in theory then cap flows at this amount (since achieving concentrations lower than 3.0 mg/l is beyond currently available technology). Imposing concentration rather than mass limits will assure that effluent nitrogen concentrations are maintained at consistently low levels even below design flows. Given the uncertainty at this stage over how much nonpoint source nitrogen can be reduced, EPA does not believe that it would be protective to remove the point source mass or concentration limits. Therefore the permit contains both concentration and mass limits to ensure maximum reductions at the treatment plant.[27]

With respect to the timeframe to TN limit applicability, the spring algae bloom in Great Bay occurs in late winter/early spring (see NHDES, 2009a, Figure 8 and Figure 16). Therefore, it is necessary to have the limits in effect from April through October of each year.

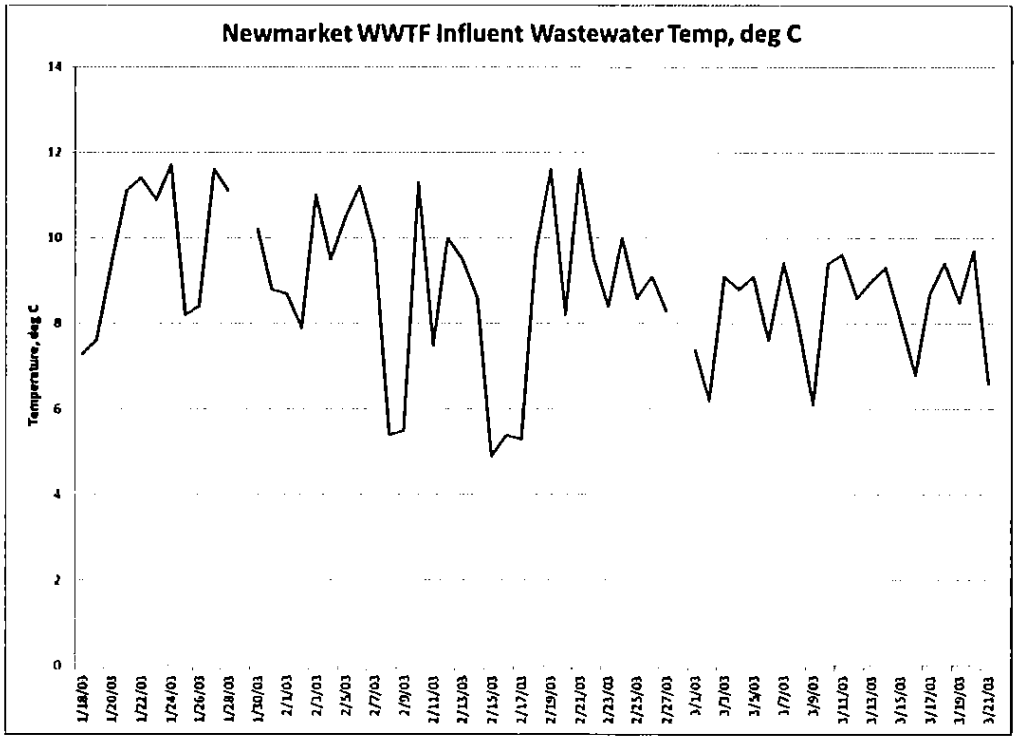
A seasonal (April - October) rolling average TN limit of 3.0 mg/l accomplishes the goal of maximizing point source reductions while allowing for effluent variability that may be hard to control, as explained in greater detail below. The rolling average limit ensures that the best possible result is achieved each month in order to ensure that the seasonal average limit is not exceeded. Accordingly, the final permit contains a seasonal rolling average limit for TN.

Comment #9:

[27] EPA's approach is in accord with federal regulations and New Hampshire WQSs. Under 40 C.F.R. § 122.45(f), permit limitations are required to have "limitations, standards and prohibitions expressed in terms of mass except [] [w]hen the applicable standards and limitations are expressed in terms or other units of measurement." The applicable New Hampshire narrative water quality standard for nutrients requires that Class B waters "shall contain no phosphorus or nitrogen in such *concentrations* that would impair any existing or designated uses, unless naturally occurring," NH Env-Wq 1703-14(b) (emphasis added). EPA also notes that *NHDES Great Bay Nutrient Report* expresses thresholds in terms of receiving water concentrations.

Extreme Wastewater Temperatures Prohibit Limit of Technology Limits

EPA's Reference Document addresses the impact of wastewater temperature on nitrogen removal. Most of the nitrogen removal data cited by EPA came from southern climate plants with wastewater temperatures in the range of 20 degrees Celsius. Temperature has a very significant impact on nitrogen removal efficiency and Newmarket's winter/spring time temperatures through April are very cold due to the climate and the magnitude of infiltration/inflow problems. As shown in the adjacent graph, Newmarket's influent wastewater temperature is typically 8 to 10 degrees Celsius in the winter and can get as low as 5 degrees Celsius. At temperatures as low as this, achieving a 3 or 4 mg/l TN limit is not practical. For this reason, the TN limit should begin in May and not April. This is consistent with the precedent set in Cranston and Woonsocket, RI based on Narragansett Bay water quality protection. With warmer temperatures there, one would assume that Narragansett Bay has an earlier start to the growing season than Great Bay.



Response #9: The proposed permit limit of 3.0 mg/l is based on the need to maximize point source reductions, while at the same time providing a framework for addressing other sources of nitrogen in the watershed. The limit of 3.0 mg/l accomplishes the goal of maximizing point source reductions within the capabilities of current technology.

While temperature clearly is a factor affecting nitrification and denitrification rates, it is a factor that can be addressed with a good treatment facility design and attention to operational details. The Municipal Nutrient Removal Technologies Reference Document (EPA, 2008b) states:

> "Temperature affects the rate of both nitrification and denitrification. At lower temperatures, the nitrification and denitrification rates decrease, leading to poorer performance in the winter if operational changes are not made to compensate for the decreased kinetic rates. Nitrification can occur in wastewater temperatures of 4 to 35 degrees Celsius (°C). Typical wastewater temperatures range between 10 and 25 °C (WEF and ASCE 2006, p. 41).
>
> Denitrification is also subject to temperature, although to a lesser extent than nitrification. On the basis of a wastewater temperature range of 10 to 25 °C, the denitrification rate would be expected to vary by a factor of only 1.5 (WEF and ASCE 2006, p. 73). Alternative carbon sources should be explored to determine if an additional carbon supply could provide better denitrification performance in cold weather than others."

The TN limits for Wareham, MA and Scituate, MA were increased from 3.0 mg/l to 4.0 mg/l based on issues raised relative to potentially high levels of dissolved organic nitrogen (DON) in the discharges that might prevent attainment of the 3.0 mg/l limits and claims that the DON is not as bioavailable as the inorganic forms of nitrogen. The concern that high DON might prevent attainment of a 3.0 mg/l limit has since proven to be unfounded, while concerns with the bioavailability of DON have increased (see below). In 2010, Scituate's effluent TN during the period from April through October averaged 2.7 mg/l (with a maximum monthly average of 4.9 mg/l) and Wareham's TN during the months of April through October averaged 2.8 mg/l (with a maximum monthly average of 5.16 mg/l). Both of these facilities averaged less than 3.0 mg/l TN despite only being required to achieve a limit of 4.0 mg/l. The April average low temperature in New Hampshire is only a few degrees lower than the April average low temperature in Massachusetts.[28]

While the above leads EPA to conclude that a TN concentration of 3.0 mg/l is possible in New Hampshire, EPA concurs with the commenter that the available information on effluent variability indicates that a effluent limit 3.0 mg/l may not be consistently achievable on a monthly basis in colder climates using currently available nitrogen removal technologies and may only be achievable over a longer seasonal period. EPA's reevaluation of LOT justifies a departure, on practicability grounds, from calculating the limit as a monthly average under 40 C.F.R. § 122.45(d)(2). A seasonal (April - October) rolling average TN limit of 3.0 mg/l accomplishes the goal of maximizing point source reductions while allowing for a reasonable amount of effluent variability (a seasonal averaging period also corresponds with the longer term impacts of nitrogen on aquatic ecosystems). The rolling average limit ensures that the best possible result is achieved each month in order to ensure that the seasonal average limit is not exceeded. Accordingly, the final permit contains a seasonal rolling average limit for TN.

Again, EPA cannot accede to the Town's request for the nitrogen to come into effect in May rather than April given the significant increase in algae growth that occurs at some monitoring stations in April. (see Figure 16 of the *NHDES Great Bay Nutrient Report*). The nitrogen limits for both Wareham and Scituate apply during the month of April.

[28] See http://www.usclimatedata.com for Epping, NH (April average low of 33° F); East Wareham, MA (April average low of 38° F); Simsbury, CT and Tahoe, NV.

Comment #10:

<u>The Vague References to Removing Phosphorus in the Draft Permit Should be Deleted</u>

Part 1, Section A.4 of the draft Permit provides as follows: "Existing discharges containing either phosphorus or nitrogen which encourage cultural eutrophication shall be treated to remove phosphorus or nitrogen to ensure attainment and maintenance of water quality." There is no documented scientific basis to impose a phosphorus limit on Newmarket's treatment plant. This vague provision in the draft permit does nothing but create confusion regarding EPA's intent. This paragraph should be deleted or clarified.

Response #10: The referenced language is a restatement of a provision (Env-Wq 1703.14(c)) within the narrative nutrient criterion as set forth in the NHDES water quality standards. The *NHDES Great Bay Nutrient Report* indicates that **t**hresholds were not established for phosphorus because nitrogen is the limiting nutrient in the majority of the estuary and that nitrogen is typically the limiting nutrient for primary productivity in estuaries (Howarth and Marino, 2006; NRC, 2000). It further states that phosphorus can be important in riverine estuaries with low salinities and that data from Great Bay Estuary follow these expected patterns. While it is possible that, in the future, phosphorus reductions in addition to nitrogen reductions may be determined to be necessary to achieve water quality standards, EPA concluded that at this time the facility's phosphorus discharges do not cause, contribute to, or have a reasonable potential to cause an exceedance of water quality standards. Therefore no permit limit on phosphorus is necessary. For nitrogen, EPA has included a nitrogen limit that is as stringent as necessary to ensure compliance with water quality standards, including the narrative nutrient criterion. This permit limitation, which will require treatment to achieve, will satisfy the requirements of narrative criterion above. In this context, EPA agrees that the restatement of the narrative nutrient criterion within the permit language is superfluous and may create confusion, and the language has therefore been removed.

Comment #11:

<u>Newmarket Will Need An Affordability-based Compliance Schedule</u>

EPA's proposed permit will require that the Town upgrade its treatment facility so that it will be capable of removing nitrogen to very low levels. As part of the facility planning process, the Town's financial capability was assessed in detail. Based on preliminary cost estimates developed by our consultant, the rate impacts of upgrading the plant to 8 and 3 mg/L limits were presented at the beginning of this document. To achieve limits of technology, sewer use rates are predicted to go up by a factor of 2.63 and exceed typical EPA affordability thresholds. This excludes any costs for non-point source reduction, Great Bay Restoration and mitigation efforts, public education, inflow and infiltration reduction, storm water abatement, water system upgrades or asset renewal.

Response #11: The implementation schedule established by EPA will take into account affordability concerns using, for example, EPA's guidance *Interim Economic Guidance for*

Water Quality Standards. Accurate cost estimates cannot be made until facilities planning and design work is completed. The implementation schedule can be modified, as appropriate, based on the results of the planning and design work. The impact of wastewater related costs on the average sewer fee will be based on actual water use and not a theoretical water use value. A phased implementation schedule will be allowed, to the extent appropriate, to address documented affordability concerns.

COMMENTS FROM THE GREAT BAY MUNCIPAL COALITION

Preliminary Issues Regarding the Ability to Identify Available Arguments and All Supporting Materials

Comment #12:

EPA's Failure to Provide Timely Access to Relevant Supporting Documents

The Coalition, through its representatives, has requested that EPA produce, under the Freedom of Information Act ("FOIA"), those agency records that support various claims that EPA has made in the permit Fact Sheet and in its public presentations. (*See* Ex. 2.) This information is critical to the preparation of comprehensive comments on the proposed permit. The completeness and applicability of EPA's response is yet to be determined. Therefore, the Coalition is unable to provide all available arguments and supporting information" relevant to the proposed permit. Upon review of the requested information, the Coalition intends to supplement these preliminary comments if necessary.

Response #12: EPA made the complete administrative record for the permit available for review by any party upon request at the time the draft permit issued. The commenter's ability to craft comments on the permit's nitrogen limit did not turn on its FOIA requests, which were expressly linked to the permit record, documents that the commenter was able to review if it wished. (EPA also observes that the Coalition could have initiated the FOIA process earlier). For the reasons stated in the preface to the Response to Comments, EPA is not accepting comments submitted after December 16, 2011, and is considering them untimely.

Comment #13:

Ongoing Water Quality Studies and Peer Review of Eelgrass Draft Numeric Criteria

Pursuant to the MOA, ongoing water quality modeling and peer review activities are underway regarding the draft numeric criteria that EPA relied upon in deciding to establish the proposed effluent limits. These studies relate directly to the scientific defensibility of EPA's assertion that a transparency-based 0.3 mg/l TN criterion must be achieved in the Lamprey River at the point of Newmarket's discharge to allow for recovery of eelgrass in this tidal river. In prior correspondence, EPA has acknowledged that such information will be considered after the close of the public comment period. Therefore, when such information is available, the Coalition will submit it to EPA as supplemental comments and information that must be considered in issuing this permit as proposed. EPA has also been separately collecting dissolved oxygen (DO),

transparency and macroalgae data for the bay. Whether and how EPA will use such data to reach technical conclusions impacting this permit is not known. When such information and analyses are publicly available, additional comment on such information may be provided, to the degree it affects Newmarket's permitting decision.

Response #13: EPA has indicated that it would consider any significant findings that come out of the Memorandum of Agreement (MOA) and has, for example, considered the data collected by the Coalition on the Squamscott River, although EPA did not concur with the conclusions that formed the basis for the MOA and was not a party to the MOA.

The MOA was designed to allow some limited time for the Coalition to conduct additional monitoring and modeling. The proposed monitoring and modeling focused on the Squamscott River and not the Lamprey River, which is the receiving water for the Newmarket discharge. Monitoring results have been provided. While the data validity review has not yet been completed, the preliminary data provided to EPA are consistent with multiple previous data sets showing elevated chlorophyll-a and nitrogen in the Squamscott River and large variations in DO consistent with eutrophication. *See* Response #6D relative to data collected by EPA.

Even with respect to the Squamscott River, the Coalition has made extremely minimal progress in developing a model, and indeed appears to have abandoned that effort for the time being. (Peschel, 2012 ("modeling the further effects of TIN reduction on the system is not practical at this time"); HydroQual, 2012) ("A decision on the benefit of further Exeter effluent TN reduction should be made with a calibrated water quality model, preferably calibrated with river field data collected after the Exeter WWTP upgrade")). Also, as noted previously, the State continues to believe that the proposed numeric thresholds represent the best available information for interpreting the narrative nutrient standard as evidenced by the use of the proposed numeric thresholds in determining water quality impairments for the recently released draft 2012 303(d) list.

An agreement between NHDES and the Coalition to conduct further studies to address uncertainty does not justify a delay in reissuing the Newmarket permit, in particular where there is no reasonable expectation that the further studies will lead to a significantly different result. Uncertainty and the desire for continued study are not sufficient reason to delay action necessary to address well-documented, severe water quality impairments.

While EPA has the discretion to consider important new information in making permit-related decisions regardless of whether it was submitted during the formal comment period (and typically will to the extent necessary to ensure its permitting determinations are sound and reasonable in light of all the information in the record), there is no requirement that EPA accept any and all information submitted after the public comment period closes as formal comments, requiring a response.

Comment #14:

<u>Assumptions Regarding Causes of Use Impairment are Premature and Unsupported</u>

The MOA between the Coalition and DES recognizes that use impairments exist in the Bay, but the causes of such impairments are still under investigation. EPA, however, presumed that all of

the existing impairment designations were properly determined and conclusively related to excess nitrogen levels, based on DES documents developed *prior to the MOA and subsequent MOA review committee analyses*. It is generally understood that all Section 303(d) impairment designations are based on limited data and relatively little analysis as to cause. That is why during the permitting or TMDL process it is necessary to document and confirm that (1) the impairment designation is fully supported and (2) the cause is independently verified. EPA, however, presumed that such preliminary impairment designations and causes were fully documented by DES, contrary to the MOA which confirms that they are under active review. In fact, the review procedure established under the MOA has indicated that transparency was not the cause of eelgrass decline in either the Bay or tidal rivers at issue (i.e., Squamscott and Lamprey Rivers). The following briefly summarizes the results of the MOA Review Committee and the updated information from various water quality assessments (e.g., Squamscott River sampling program).

Two meetings were held with a group of UNH researchers, DES, Coalition members, and Coalition members' consultants. An EPA representative was only present at the first meeting but was copied on all subsequent correspondence. The UNH participants were selected because of their specific expertise on key ecological issues of concern. Many of these participants are also members of the PREP review committee. The meeting minutes from those discussions are attached. (*See* Exs. 21 and 22.) Based upon those discussions, the following technical conclusions have been drawn:

a. Eelgrass losses in the portions of Great Bay and tidal rivers where nitrogen levels are elevated do not appear to be a result of either insufficient transparency or excessive epiphyte growth; eelgrass receive sufficient light over the tidal cycle (confirmed by Fred Short);

b. Macroalgae growth has significantly increased in the Great Bay over the past two decades, and this condition is adversely impacting habitat and eelgrass populations (confirmed by Art Mathieson) (Note: Such excessive macroalgae growth has not been documented in any of the Bay's tidal rivers or tied to any decline in eelgrasses in those areas.);

c. Macroalgae die back every winter, and their regrowth occurs primarily during warmer weather, peak light months (May to September) (confirmed by Art Mathieson);

d. The excessive macroalgae are most likely caused by increased dissolved inorganic nitrogen (DIN) loads to the Great Bay though certain invasive species may also tolerate low DIN levels (confirmed by Art Mathieson, DES); and

e. The level of DIN control required to control macroalgae is not known with any certainty, but these invasive species should be controllable through reduction of inorganic nitrogen loading levels to mid-1990 conditions when the eelgrass resource experienced a period of abundance (confirmed by group discussion).

Based upon this information, the 2009 proposed draft TN criteria are plainly in error and should be amended, as well as the 2009 amendment to the 2008 Section 303(d) lists in which NHDES posited that decreases in the eelgrass resource was caused by elevated nitrogen levels and reductions in transparency. It is now clear that the draft criteria's assumption that transparency, chlorophyll *a* levels, and TN were the causal factors for eelgrass losses in both tidal rivers and the Bay was incorrect. All of the water quality standards ("WQS") development documents based on that paradigm are equally in error and misdirected. The focus for the Bay restoration should be changed to macroalgae and DIN. Thus, EPA's reliance on Section 303(d) lists should be revised to indicate that the designated cause of eelgrass declines in the Bay is excessive macroalgae growth and increased DIN loadings. Presently, there is no identifiable DIN concentration that can be used as a simple instream nutrient objective, but accomplishing reductions to the mid-1990 levels seems advisable. An accelerated program to identify the level of DIN control needed to limit macroalgae growth and a survey of macroalgae impacts also need to be developed. Because of this new information, the Coalition is proposing an adaptive management plan which will implement DIN controls at key wastewater facilities.

Given this information that demonstrates the prior DES analyses and recommended numeric nutrient criteria are not scientifically defensible, the permit should be withdrawn to reflect the recommendations contained in the draft adaptive management plan (i.e., a season limit of 8 mg/l TN for Newmarket, Exeter, and Durham). Any continued reliance by EPA on the historical DES technical analyses would be arbitrary and capricious given the updated scientific information.

In addition, the impairment designations for the Lamprey River (and other tidal rivers) are plainly in error with respect to the causes of eelgrass losses and DO impairments. In the Lamprey River and several other tidal rivers, it is acknowledged that the habitat/water quality is not suitable for eelgrass. (*See, e.g.*, Ex. 3, Great Bay Restoration Compendium, September 2006, Figure 6.) The 2009 PREP report, as well as EPA's Fact Sheet (*see* Fact Sheet @ 17), confirmed the cause of the loss was "unknown." Therefore, EPA's assertions that excessive nitrogen concentration is the reason for eelgrass loss and the key to their restoration in the Lamprey River or where this river enters the Bay are entirely misplaced.

In addition, various reports, discussed herein, confirmed that periodic low DO conditions in the Squamscott and Lamprey Rivers were not associated with excessive algal growth. This finding is consistent with the PREP *2009 State of the Estuaries* report at 14: *"The causes of the sporadic low dissolved oxygen concentrations in the tidal rivers are unknown. Some possible explanations are algal blooms, benthic organism respiration, and oxygen demand from wastewater facility effluent. In some cases low concentrations may be natural phenomena."*

EPA's recent testing of the Squamscott River also confirmed that lower DO was associated with lower, not higher, algal growth in that system. (*See* Ex. 7, Diurnal DO Variation in the Squamscott River.) EPA's Nov. 18, 2011, FOIA response that provided copies of the data collected for the Squamscott River in August and September, 2011, is incorporated by reference, herein. Therefore, regulating TN would not eliminate low DO in these waters as originally thought by DES. EPA's reliance on the impairment listings and preliminary causes previously identified by DES is without legal or technical basis. Under federal and state laws, EPA needs to justify this permit action, if it can, based on a site-specific demonstration that nutrients are

causing the claimed impairments in the water body of concern and not based on generalized information or preliminary impairment designations that have subsequently been shown to be misplaced following more detailed assessments. Such site-specific analysis must be presented to the public for review before any further action on this permit may occur.

Response #14: As explained earlier in this Response to Comments, the Coalition misconstrues the causal threshold for imposing a water quality based-effluent limit on a discharge containing a pollutant of concern. Under the federal regulations implementing the NPDES program, permit issuers are required to determine whether a given point source discharge "causes, has the reasonable potential to cause, or contributes to" an exceedance of the narrative or numeric criteria set forth in state water quality standards. *See* 40 C.F.R. § 122.44(d)(1)(i). If a discharge is found to cause, have the reasonable potential to cause, or contribute to an exceedance of a numeric or narrative state water quality criterion, NPDES regulations implementing section 301(b)(1)(C) provide that a permit *must* contain effluent limits as necessary to achieve state water quality standards. *See* 40 C.F.R. §§ 122.44(d)(1), 122.44(d)(5) (providing in part that a permit must incorporate any more stringent limits required by CWA § 301(b)(1)(C)). Thus, EPA does not need to justify the decision to impose a permit limit based on a "site-specific demonstration that nutrients are causing the claimed impairments in the water body of concern," but need only demonstrate that the discharge causes, *has the reasonable potential to cause, or contributes* to an in-stream excursion above a numeric or narrative criteria within a state water quality standard. This is consistent with the Final Rule Preamble for 40 C.F.R. Part 122.44(d)(1), which states:

> "Several commenters asked if it was necessary to show in-stream impact, or to show adverse effects on human health before invoking [40 C.F.R. 122.44(d)(1)(vi)] as a basis for establishing water quality-based limits on a pollutant of concern. It is not necessary to show adverse effects on aquatic life or human health to invoke this paragraph. The CWA does not require such a demonstration and it is EPA's position that it is not necessary to demonstrate such effects before establishing limits on a pollutant of concern."

EPA has met and exceeded the required regulatory threshold in this case, where there are well-documented in-stream impairments and an abundance of site-specific information discussed in the Fact Sheet and throughout this Response to Comments implicating the role of nitrogen in those impairments.

The suggestion that EPA based its permitting determinations merely "on generalized information or preliminary impairment designations" is manifestly false. In arriving at its reasonable potential determination, and in deriving a permit limit as stringent as necessary to comply with the Act, EPA relied in part on Section 303(d) impairment listings, but also considered a range of other site-specific and peer-reviewed sources regarding cultural eutrophication in Great Bay (see Fact Sheet pgs. 16 - 28). While some listings are based on limited data, that is clearly not the case for the vast majority of the Great Bay Estuary. As documented in the Fact Sheet and in the administrative record for this permit, the Great Bay Estuary has been extensively studied for over a decade. As indicated in the Peer Review for the proposed New Hampshire nutrient criteria, the Great Bay estuary is rich in data on nutrient concentrations, dissolved oxygen concentrations, chlorophyll-a levels and distribution of seagrasses and macro-algae (see Response #15 below).

Where the data are limited, as in the Lower Piscataqua River, NHDES has indicated in the 303(d) list that there is insufficient information for determining impairment status.

EPA disagrees with the commenter's assertion relative to the role of transparency on eelgrass loss. Evidence of decreasing trends in transparency is provided by documented increases in factors that reduce transparency. The PREP *2009 State of the Estuaries Report* showed long-term increasing trends in TSS and chlorophyll-a (major components that result in decreased transparency) from sampling at Adams Point during the period of eelgrass decline (PREP, 2009a at 13). A similar trend is shown in Figure 4 of Exhibit 10 to the Comment, although the specifics of that figure were criticized by NHDES for, among other things, inappropriately mixing low- and high-tide data (NHDES, 2011). The more recent PREP data indicate that chlorophyll-a concentrations may be leveling off (no statistically significant trend when data through 2011 are considered), but that there have been significant increases in macroalgae and epiphytes (PREP, 2012 at NUT3b-2). (See also Short, 2011). Macroalgae effects eelgrass not only through direct smothering and shading but also by contributing to increased turbidity from particulate organic matter in the water column. NHDES has shown that light attenuation in the Great Bay Estuary is more strongly correlated with plant/organic matter in the water than any other factor (NHDES, 2012a).

The characterization in the comment regarding Dr. Short's understanding of the role of transparency on eelgrass health is incomplete and misleading. While transparency is a less important factor in Great Bay proper, due to the shallow depths, it is a contributing factor and in the tributaries it is a more significant factor (personal communication with Fred Short). Great Bay proper is a relatively shallow water body, which mitigates the effects of low light transmittance. The light attenuation thresholds applicable to Great Bay proper were developed to ensure adequate light transmittance to a depth of two meters. Many areas of Great Bay proper have mean depths less than two meters (low tide depths less than one meter) meaning that eelgrass beds in these locations may get adequate light to survive even though the light attenuation factor was not achieved.

In shallower areas of Great Bay proper on low tides, eelgrass leaves will float on the surface of the water. Thus, water column transparency does not have a significant impact on the plants at low tide, though they certainly would still affect the plants at other stages of the tide. Eelgrass losses have also been documented in these shallow portions of Great Bay proper. The prevalence of macroalgae and epiphytes (plants and animals that attach themselves directly to the surface of eelgrass leaves) will also block light from reaching these plants. Macroalgae tends to collect and grow up and smother eelgrass shoots. This process of overgrowing and smothering the shoots is not mitigated by tidal variation. The presence of epiphytes obviously represents a reduction in light reaching the plants and again is unmitigated by tidal variation (Short, 2011; Mathieson, 2012).

EPA also disagrees that limits should be in terms of dissolved inorganic nitrogen rather than total nitrogen. The *NHDES Great Bay Nutrient Report* indicates that "Nitrogen cycling results in constant shifts between the different forms of nitrogen. Setting criteria for dissolved inorganic nitrogen is problematic because the concentrations of this species is drawn down or fully depleted during periods of high productivity. Therefore, DES feels that total nitrogen is a more

stable indicator to use for the water quality criteria. In guidance for establishing nutrient criteria for estuaries, EPA identified total nitrogen as the causal variable of specific concern." (NHDES, 2009 at 79 (citing EPA, 2001)). In addition, recent research has documented that forms of nitrogen considered unavailable for plant growth are far more bioreactive than previously thought, further supporting the need to control total nitrogen rather than just DIN. (Wiegner et al., 2006; Sedlak, 2011 (portion of DON that is not bioreactive is only 10 – 29% of the effluent DON); Filippino et al., 2010 (between 31% and 96% of the effluent derived organic nitrogen (EON) was removed during biotic bioassays within the first 2 days)). Consistent with recommendations in EPA Nutrient Criteria Manual, because of the recycling of nutrients in the environment, it is best to limit total concentrations (i.e. total nitrogen) as opposed to fractions of the total.

EPA agrees that nuisance algae spurred by excess nitrogen is a problem in Great Bay proper and concurs with the Coalition's conclusion that increased discharges from the wastewater treatment facilities, including Newmarket, cause, or have a reasonable potential, to contribute to this impairment, justifying an effluent limitation as stringent as necessary to ensure compliance with water quality standards pursuant to Section 301(b)(1)(C). However, EPA does not agree that the degree of nitrogen control necessary to address that issue is unknown. NHDES determined a range of nitrogen levels to control macroalgae of 0.34-0.38 mg/l. EPA also does not concur with the Coalition's premise that meeting a macroalgae nitrogen threshold, in lieu of the eelgrass threshold in Great Bay proper and/or the eelgrass and dissolved oxygen thresholds in the Lamprey River, is sufficient.

There is no basis for the claim that simply restoring nitrogen levels to mid-to late 1990s conditions will be sufficient to achieve standards. The loss of eelgrass and proliferation of macroalgae and epiphytes often lags behind the tipping point in an estuary as measured by nitrogen concentrations (Bricker et al., 2007). Second, this suggestion considers only municipal loads, and fails to account for the significant increases in nonpoint source loads that have taken place in the interim. See also Response #28.

See Responses #7c and 36 relative to Lamprey River suitability for eelgrass growth and Responses #7d and 25 relative to the cause of low DO in the Squamscott and Lamprey Rivers and relative to the EPA DO data.

See Response #15 and 16 relative to the MOA.

<u>Procedural Issues and Objections</u>

Comment #15: The proposed permit action is premised on the conclusion that the underlying technical basis of DES' proposed draft numeric criteria used to justify the TN limits has been fully peer reviewed and is scientifically defensible. (*See* June 29, 2010, letter from EPA (Perkins) to DES (Stewart).) This is a requirement of 40 C.F.R. § 131.11.[1] These conclusions are in error from several perspectives. First, the Coalition and the impacted communities were excluded from the Regional Office peer review of the draft state numeric nutrient criteria. This violated the Clean Water Act's ("CWA") public participation mandate. (*See, e.g.,* CWA Sections 101(e) and 304(a); *see also* OMB Peer Review Bulletin, 70 Fed. Reg. 2664, 2668 (January 14, 2005) ("[m]ore rigorous peer review is necessary for information that is based on ***novel methods***

or presents complex challenges for interpretation. Furthermore, the need for rigorous peer review is greater when the information contains ***precedent-setting*** methods or models, presents conclusions that are likely to ***change prevailing practices***, or is likely to affect ***policy decisions*** that have a significant impact.") (emphasis added)).[2] The Coalition submitted relevant comments on the technical deficiencies in the DES numeric nutrient objectives to EPA and the deficiencies in the peer review charge questions which were not designed to elicit a probing review on the more obvious technical problems with the draft numeric criteria. In particular, these comments noted that the draft numeric criteria lacked documentation of basic cause and effect relationships and, therefore, cannot be "scientifically sound" as required by 40 C.F.R. § 131.11. (*See* Ex. 4, correspondence on the peer review.) However, these comments and the supporting assessments were never provided to the Region's chosen peer reviewers and, consequently, were never addressed by the two peer reviewers. (*See* EPA Peer Review Handbook, 3rd Ed., EPA/100/B-06/002, May 2006 ("If you obtain stakeholder input, include interested parties to the extent feasible based upon statutory, regulatory, budgetary and/or time constraints. Do not limit input to one stakeholder or one side of a controversial issue (e.g., a responsible party or environmental group).").) Therefore, the proposed permit's reliance on that peer review effort is inappropriate, as due process rights were violated and major technical issues were ignored by the peer reviewers. By excluding public participation on this critical review, EPA also violated mandatory duties under the Act. (*See* CWA §§ 101(e) and 304 (a).)

Second, the peer review concluded that there was no certainty that the proposed nitrogen criteria would actually result in restoration of the use impairments as claimed in the draft numeric criteria document. (*See* May 29, 2010, comments of Walter Boynton.) This is also consistent with the findings and conclusions of the MOA. Therefore, the peer review (and MOA) confirms that the proposed nutrient criteria are not sufficient to meet CWA objectives. (*See American Iron & Steel Inst. v. EPA*, 115 F.3d 979, 990 (D.C. Cir. 1997) ("We have already mentioned that permits must incorporate discharge limitations necessary to ensure that the water quality standards are met. This requirement applies to *narrative criteria as well as to criteria specifying maximum amounts of particular pollutants.*") (emphasis added).) Thus, the Region's reliance on the peer review results is arbitrary and capricious and otherwise not in accordance with the Act. (*See* 40 C.F.R. §122.44(d)(1)(vi)(A) (requiring a narrative standard-based effluent limitation to "fully protect the designated use").) By EPA's own expert's admission, the instream TN standard chosen for the Lamprey River will not protect the designated us

The issues raised in the correspondence to the peer reviewers must be addressed in this permit action. Moreover, in accordance with applicable water quality criteria public participation provisions, we request that the public be given an opportunity to present information to this peer review panel before such draft criteria are considered acceptable for use in NPDES actions.

[1] 40 C.F.R. § 131.11(a) states that "[s]uch criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use." 40 C.F.R. § 131.11(b) provides that "[i]n establishing criteria, States should: (1) Establish numerical values based on: (i) 304(a) Guidance; or (ii) 304(a) Guidance modified to reflect site-specific conditions; or (iii) Other scientifically defensible methods."

[2] Given the Region's stated intentions of employing these instream criteria throughout New Hampshire and the Great Bay watershed, EPA's permit limitation is akin to criteria development, a process that must include the opportunity for public comment. *See* CWA § 304(a)(3) ("Such criteria and information *and revisions thereof, shall be issued to the states and shall be published in the Federal Register and otherwise made available to the public*.")

(emphasis added).

Response #15: The commenter mistakenly assumes that 40 C.F.R. § 131.11 is applicable to this permit proceeding. Section 131.11 applies to the *adoption of new* water quality criteria under section 303 of the Act and not to the *interpretation or translation of existing* narrative criteria for purposes of establishing the need for water quality-based limits and calculating limits that ensure attainment of existing criteria, pursuant to sections 301 and 402 of the Act. The commenter's erroneous statement regarding the applicability of a criteria adoption regulation leads it to draw an equally misguided inference that EPA is using NHDES's proposed numeric thresholds because they meet the substantive and procedural requirements of 40 C.F.R. § 131.11— EPA is not. As explained earlier in this Response to Comments, the *NHDES Great Bay Nutrient Report* in EPA's view represents NHDES's effort to translate and give meaning to its narrative nutrient criterion and, independently, constitutes scientifically useful and relevant information. But they are not binding rules or exclusive interpretations of the State's narrative. New Hampshire's proposed numeric thresholds for Great Bay have not been adopted by New Hampshire, much less approved by EPA. They do not, in sum, possess important indicia of a water quality standard. *See* http://water.epa.gov/scitech/swguidance/standards/cwa303faq.cfm#faq4.

As Section 40 C.F.R. § 131.11 is not an issue in this permitting action, EPA is accordingly not required to fulfill the requirements of the criteria review and approval process in order to write a permit limit to implement an existing narrative criteria. EPA, therefore, finds no merit in the commenter's wholesale attempt to graft requirements pertaining to criteria adoption under the Act and implementing regulations (including public participation requirements related to criteria adoption) onto the NPDES permitting process and rejects it as rooted in a misunderstanding of two distinct regulatory processes. The fact that EPA indicated that it would utilize proposed numeric thresholds developed by NHDES after an independent assessment of their validity and protectiveness, along with all other relevant and available scientific information, in deriving appropriate thresholds for calculating proposed effluent limits in the reissuance of permits throughout the Great Bay Estuary is thus entirely consistent with the mandate to interpret narrative criteria.[29] Because the commenter's request for the public to be given an opportunity to present information to this peer review panel before such proposed numeric thresholds are considered acceptable for use in NPDES actions is grounded on a false premise, and an irrelevant regulation, EPA finds no merit in the request.[30]

EPA is instead relying on another, entirely separate provision — 40 C.F.R. § 122.44(d)(1)(vi) — which governs the translation of the narrative water quality criteria into numeric effluent limitations, and implements sections 301 and 402 of the Act. This regulation directs EPA to consider "relevant information" when deriving permit limits, and the NHDES *Great Bay Nutrient Report* is certainly that. These water quality thresholds were specifically developed for

[29] If EPA were in fact simply treating NHDES's proposed numeric thresholds as water quality criteria, there would be no reason for EPA to have undertaken any analysis as to their validity in the context of an NPDES permit proceeding; it simply would have applied the purported numeric "criteria" without additional analysis, as it does other numeric criteria in a State's water quality standards. When writing an NPDES permit, EPA need not look behind or otherwise assess the validity of the State's water quality standards.

[30] EPA observes that the public *was* afforded an extended period of time to comment on both the proposed numeric instream thresholds to implement the narrative nutrient criterion as well as the proposed permit limits in the context of the NPDES permitting process.

the Great Bay Estuary, and are clearly relevant to a source discharging into that estuary, and therefore relevant to the permit for that source. EPA is using these thresholds on a site-specific basis, i.e., to inform the derivation of permit limits for point sources located on the water body for which the water quality thresholds were developed.

Even if section 131.11 were applicable to EPA's translation of the narrative nutrient criteria into effluent limitations, it does not require peer review, only that criteria adoption be based on scientifically defensible methods. See Background and Responses #7c to 7e and 24 to 28 for a discussion of the scientific defensibility of the proposed numeric thresholds. While there is no requirement for proposed state criteria to be peer reviewed, and it is not clear what the commenter means by "fully peer reviewed," the Region voluntarily elected to subject the proposed numeric thresholds to such a process in an effort to provide greater assurance to the public and to the regulated community as to scientific and technical basis for this information. The proposed numeric thresholds were peer reviewed by two independent experts in the field of estuarine science (faculty members from Cornell University and University of Maryland). The peer review process was initiated and funded by EPA and administered through the N-STEPS (Nutrient Scientific Technical Exchange Partnership Support) program, which is a partnership between academic, state, and federal agencies to provide technical information to States and Tribes in developing nutrient criteria.

The peer review conducted through N-STEPs on the proposed numeric thresholds was consistent with EPA's Peer Review policy (EPA, 2006), which was developed to be consistent with OMB Peer Review Bulletin (OMB, 2005). There is no requirement for a peer review process to include public participation. As stated in the OMB Peer Review Bulletin, a peer review process should not be confused with a public review process. The peer review process should be transparent and available to the public but it is a review by independent technical experts and, consistent with the guidance, it should not allow parties supporting the proposed criteria or opposing the proposed criteria to influence the process. The peer review process is designed to draw on "independent, expert information and in-depth analyses" regarding limited "specified technical issues," while public comment is open to any interested party who wishes to comment on any issue. (EPA, 2006 at 14). EPA may, at its discretion, choose whether or not to include a public participation component within the peer review process. (OMB, 2005 at 2670). EPA is not required to include any stakeholder input on the charge to the peer reviewers, and only where the Agency chooses to include stakeholder input need it ensure that such input is from both sides of an issue. (EPA, 2006 at 58). Still, the material provided to the peer reviewers by EPA included copies of comments received by NHDES on the proposed numeric thresholds document. EPA thus finds no merit in the assertion that the Coalition and the impacted communities were excluded from Regional Office peer review of the proposed state nutrient thresholds.

CWA § 304(a) refers to EPA's water quality criteria guidance, not state water quality criteria, so that provision is not applicable to EPA's use of the *Great Bay Nutrient Report* in deriving an effluent limitation for the Facility. EPA criteria under 304(a) would be relevant here only to the extent that any were available for use (none are for total nitrogen) in establishing effluent limits for individual permits in accordance with 40 C.F.R. § 122.44(d)(1)(vi).

With respect to the peer review of Dr. Boynton, the Coalition mischaracterizes the cited document. Dr. Boynton's review merely addresses the inherent uncertainty in scientific analysis

of such a complex system, and concludes that NHDES handled this inherent uncertainty appropriately. Dr. Boynton's full statement, made in response to the charge question of whether the recommended criteria will be adequately protective, is:

> "The basic answer to this question at this time is "who knows?" In any fundamental way, we can't be sure. But, in a practical fashion, there are strong arguments here that the suggested levels will be protective and, as I read the document, if achieved would favor improved habitat conditions relative to the benthos, eelgrass communities and DO conditions. Furthermore, the author took the point of view that if these criteria are achieved and the system does not fully response as expected, then additional steps for further reductions in TN concentrations will be taken. He makes the same argument for phosphorus (i.e., if P appears to be a player in all this then P controls in tidal waters will need to be developed)."

(Boynton, 2010). The other peer reviewer, Dr. Robert Howarth, similarly concludes that the proposed numeric thresholds are appropriate, while also noting that ongoing monitoring might ultimately lead to a reassessment that would adjust the thresholds downward if the system does not respond as expected. His full comment is:

> "The proposed nutrient criteria seem quite protective of the designated uses of the Great Bay estuarine system. The criteria could be made even more protective if they are used in the context of adaptive management. The State of New Hampshire should be encouraged to continue to monitor both total nitrogen concentrations and the response of sensitive indicators (dissolved oxygen, chlorophyll, light penetration, water clarity, and eelgrass and macro-algal distributions). These monitoring data should feed into a periodic re-assessment of the nutrient criteria, and the criteria adjusted downward if necessary to protect designated uses of the Great Bay estuary."

(Howarth, 2010). Neither peer review document includes any statement about the Lamprey River in particular, let alone the assertion in the comment that the "in stream TN standard chosen for the Lamprey River will not protect the designated use." *Id.*

Thus, contrary to the commenter's claim, neither the peer review nor the MOA "confirms that the proposed nutrient criteria are not sufficient to meet Clean Water Act objectives" and the peer reviews do not equate to an "admission" that instream TN thresholds chosen for the Lamprey River will not protect the designated uses as claimed by the commenter (see Response #16 for specifics on the MOA). Both the *NHDES Great Bay Nutrient Report* and the peer reviews correctly describe the complexity of the natural system and are transparent about the uncertainties associated with any analysis of such a complex system. As indicated in Response #7, water quality-based effluent limits are required even when there is some degree of uncertainty regarding both the precise pollutant discharge levels and the potential causal effects of those discharges. In complex decisionmaking with unavoidable uncertainties, the regulatory agencies are required to exercise their professional judgment.

To the extent that the comment suggests that each detailed individual issue raised in the peer reviewer correspondence should be specifically addressed in this permit action, EPA finds no merit in that suggestion. The vague reference to "issues raised" in correspondence regarding a NHDES document does not fall within the requirement of EPA's regulations that it must respond

to "significant comments on the draft permit". 40 C.F.R. § 124.17(a)(2). However, EPA notes that in all significant ways, the peer review affirmed the approach taken in the *NHDES Great Bay Nutrient Report*. The peer review correspondence includes the following statements:

> "The Great Bay nutrient criteria report was a joy to read and provides an excellent basis for protecting this estuarine ecosystem from nutrient pollution. While many states have narrative nutrient criteria, very few have addressed the difficult challenge of establishing numeric criteria. I applaud the State of New Hampshire for providing some excellent leadership in this area." (Howarth, 2010 at 1).

> "The reliance on a weight-of-evidence approach, using several approaches and sources of information, is a strong point of the report. Of the approaches analyzed, some worked better than others. For example, the use of the health of the benthic invertebrate community proved problematic, while relating eelgrass habitat suitability to nitrogen through a relationship to water clarity and penetration worked very well. Similarly, the use of continuous oxygen data proved much more useful for setting nitrogen criteria than did the use of spot sampling for oxygen. The Great Bay report did a beautiful job of explaining the rationale behind each of the approaches tested, as well as in explaining the reasons for using some over others in setting numeric nitrogen criteria. I agree with the report's use of low dissolved oxygen and loss of eelgrass habitat as the two most sensitive and appropriate approaches for setting numeric criteria." (Howarth, 2010 at 1).

> "Assumptions in the Great Bay report are well explained and generally well supported by appropriate literature and reasoning. The Great Bay estuary is surprisingly rich in data on nutrient concentrations, dissolved oxygen concentrations, chlorophyll levels and distribution of seagrasses and macro-algae, and these data were well used in this report." (Howarth, 2010 at 1).

> "The report uses data from a variety of sampling studies, and uses a weight-of-evidence approach in the assessment of these data. For the most part, the sampling and analytical methods behind these data seem straightforward and are consistent with commonly used and accepted approaches. (Howarth, 2010 at 4).

> "The author makes clear at the start that the development of the TN criteria uses a weight-of- evidence approach. Given the "state of the art" in estuarine science I think this is a very reasonable approach. In addition, the author used multiple analyses in many portions of the work and that provides enhanced confidence in the results. Simply said, this is a good approach to use in systems as complicated and variable as estuaries." (Boynton, 2010 at 1).

> "The analysis is very empirical. That is, it is based on local measurements…quite a pile of local measurements made at many sites during a 9 year period. In addition, there is good reference to the appropriate scientific literature and to adjacent estuarine areas. I think this was a well-grounded analysis." (Boynton, 2010 at 1).

> "I was very pleased to see that a conceptual model was used to guide the development of these analyses. What I mean here is that there was a mechanistic basis for the variables used in these analyses. The author used many water quality measurements to develop

regression models between TN and chlorophyll-a, DO and water clarity. In addition, continuous monitors were used to estimate DO impairments and finally, relationships between water quality and water clarity were quantified based on light attenuation measurements via in-situ sensors and hyperspectral imagery. All solid approaches." (Boynton, 2010 at 2).

Comment #16: EPA's proposed actions are inconsistent with the current position of DES regarding the reliability and use of the draft numeric criteria/narrative criteria interpretation, as documented by the MOA. (Ex. 1.) The MOA concurs that the impact of nitrogen on eelgrass losses, via transparency, is uncertain and requires further peer review assessment. (*See* MOA Coalition Provision V and Whereas provisions.) Due to these uncertainties, DES, the document author, has stated that the draft criteria should not be used for NPDES derivation purposes until the subsequent peer review confirms that the criteria are necessary and appropriate. (*See* MOA Provision Mutual Agreement II and III.) EPA's proposed permit is using the draft criteria in a manner inconsistent with the directives and intent of the state. This is prohibited under 40 C.F.R. § 122.44(d) when translating a state's narrative criteria. (*See Clarifications Regarding Certain Aspects of EPA's Surface Water Toxics Control Regulations*, USEPA, August 14, 1992, Response @ 4 (stating that permit writers are required to use formally-adopted state policies in interpreting narrative standards); *Kentucky Waterways Alliance v. Johnson*, 540 F.3d 493469 n.1 (6th Cir. 2008) ("In interpreting a state's water quality standard, ambiguities must be resolved by 'consulting with the state and relying on authorized state interpretations."); *Marathon Oil Co. v. Environmental Protection Agency*, 830 F.2d 1346, 1351-1352 (5th Cir. 1987) (EPA is merely an "interested observer" as to how a state interprets its WQS provisions); *American Paper Inst. v. EPA*, 996 F.2d 346, 351 (D.C. Cir. 1993) ("Of course, that does not mean that the language of a narrative criterion does not cabin the *permit writer's* authority at all; rather, *it is an acknowledgement that the writer will have to engage in some kind of interpretation to determine what chemical specific numeric criteria--and thus what effluent limitations--are most consistent with the state's intent as evinced in its generic standard.*") (emphasis added).) Moreover, the applicable federal regulations do not allow EPA to take a draft, yet to be published for adoption criterion and apply that draft value as if it were the adopted standard. DES has explicitly acknowledged that it needs to propose the draft criterion for adoption and has not yet done so in light of the admitted technical uncertainties. (*See* Ex. 1, MOA – DES Agreement II; *see also* 40 C.F.R. § 131.20). This applies to both narrative and numeric criteria interpretations. EPA's actions run roughshod over the state's proposed approach and use the draft criteria in a manner expressly inconsistent with state guidance/policy on the use/interpretation of this narrative criteria interpretation. EPA's action plainly violates 40 C.F.R. § 122.44(d)(1)(vi)(A), as well as the public comment and notice provisions included in 40 C.F.R. § 131 (*see* Comment No. 3, below) applicable to the adoption of narrative criteria interpretations of general/regional applicability.

Response #16: EPA disagrees that its use of the proposed numeric thresholds is inconsistent with "the directives and intent of the state." Contrary to the commenter's understanding, the state continues to believe that the proposed numeric thresholds represent the best available information for translating its narrative nutrient criterion, as reflected in correspondence and other materials post-dating the MOA. *See* Correspondence from NHDES Commissioner Burack to Town of Newington Chairs of Board of Selectmen and Conservation Commissioner (June 8,

2011): "The Department of Environmental Services (DES) is in complete agreement that the situation in Great Bay requires prompt attention and that nitrogen reductions will be needed from all sources, including municipal wastewater treatment facilities. DES further agrees that nitrogen discharge limits ought to be set in such a way as to improve the overall ecological health of the estuary. DES has already taken steps to address the problems of low dissolved oxygen and eelgrass loss by proposing Nutrient Criteria for the estuary. *These criteria are the result of comprehensive analyses by DES scientists, which have been peer reviewed. DES stands by those criteria*." (emphasis added). See also correspondence from NHDES Commissioner Burack to CLF, Great Bay Trout Unlimited and N.H. Coastal Protection Partnership (June 8, 2011): "The situation in Great Bay requires prompt attention, and nitrogen reductions will be needed from all sources, including municipal wastewater treatment facilities, in order to improve the overall ecological health of the estuary. DES has clearly articulated the problems of low dissolved oxygen and eelgrass loss in the proposed Nutrient Criteria for the estuary. *DES stands by those criteria*." (emphasis added). This is further evidenced by the use of the proposed numeric thresholds in determining water quality impairments for the recently released draft 2012 303(d) list.[31]

EPA also disagrees that its use of the proposed numeric thresholds is barred by the guidance document relied on by the Coalition. The regulations at 40 C.F.R. § 122.44(d)(1)(vi) require EPA to use "a *formally adopted* state regulation or policy" to establish numeric effluent limits for an individual permit, "if such a *formally-adopted* state regulation or policy exists." *See Clarifications Regarding Certain Aspects of EPA's Surface Water Toxics Control Regulations, USEPA*, August 14, 1992. A formally-adopted state regulation or policy is typically "part of either a state's water quality standards or total maximum daily load for the water body in question, and would be subject to EPA approval." *Id.* "If the state has not formally adopted a state regulation or policy pursuant to 40 CFR 130 or 131, or if it has not been approved as part of the state NPDES program, the permit writer must develop limits, using any one of the options set forth in section 122.449d)(1)(iv)." *Id.* The Coalition's reliance on this guidance and case law is off point, because neither the State's expressed position in the MOA, nor for that matter the proposed numeric thresholds, is a "formally adopted state regulation or policy"—it is not part of the State's water quality standards or any TMDL and has not been submitted as a policy to EPA for approval, much less approved by EPA.[32] There is no indication that the State meant the MOA to reflect a formal State policy with continuing effect, as opposed to a position negotiated in an agreement. EPA is therefore not required to adhere to its recommendations. EPA also notes that the proposed numeric thresholds were developed over a lengthy evaluation, including

[31] In terms of the continuing relevance of the MOA, EPA notes that the MOA was designed to allow some limited time for the Coalition to conduct additional monitoring and modeling. That time has passed and only limited monitoring results have been provided and those results are consistent with multiple previous data sets. Following data collection, the Coalition determined that it would not develop a water quality model for the Squamscott River. See Response #25.

[32] Under section 301(b)(1)(C), EPA has an independent duty to ensure compliance with applicable water quality standards when issuing an NPDES permit. Contrary to the commenter's assertion, NHDES cannot override EPA's responsibilities under the section 301 of the CWA simply by means of a bilateral agreement to which EPA is not a party.

extensive water quality data and analysis. The MOA is a subsequent statement by the State expressing reservations at a particular point in time regarding whether certain thresholds should be applied in the NPDES permitting context in light of scientific uncertainty. Upon assessing all the available information, EPA has not learned of more extensive site-specific scientific analyses than that conducted by NHDES, or other information that persuasively undermines that analysis. Neither has EPA been apprised that such information exists. Accordingly, EPA concludes that the statement by the state in the MOA does not provide persuasive evidence to counter the voluminous and compelling body of the scientific information that was previously collected.

If there is no such formal policy, or if it has not been approved, the permitting authority is required to establish effluent limits using one of the options of 40 C.F.R. §122.44(d)(1)(vi). (EPA, 1992 at 4). Section 122.44(d)(1)(vi)(A) requires EPA to establish limits using a calculated numeric water quality criterion that EPA demonstrates will attain and maintain applicable water quality criteria and fully protect designated uses. The regulation indicates that in calculating an instream threshold EPA "may" use "a proposed state criterion or an explicit State policy or regulation interpreting its narrative water quality criterion, supplemented with other relevant information….". There is no state policy or regulation interpreting the narrative language in the New Hampshire water quality standards; there are, however, proposed numeric thresholds available and EPA was not restricted in utilizing this material as a source of relevant technical information by any federal regulation. To the contrary, 122.44(d)(1)(vi)(A) explicitly envisions the permitting authority using proposed state criteria. EPA has not treated the proposed numeric thresholds as a water quality standard, or as a definitive and binding translation of the applicable water quality criteria; instead, it has used the proposed numeric thresholds as a source in interpreting an existing narrative nutrient criterion in the course of establishing numeric effluent limits for an individual permit. EPA utilized the proposed water quality thresholds after careful consideration of the justification for the proposed numeric thresholds and the uncertainty associated with those values. EPA's translation of the narrative, as well as its proposed permit limits, were subject to public comment, and EPA remained open to considering alternative thresholds and effluent limits based on those comments, and would not have been in any way precluded from incorporating such values so long as they could also be shown to be protective. (Likewise, NHDES's listing decisions, which are informed by the proposed numeric thresholds, are subject to public comment, including with respect to the validity of thresholds themselves and their application to a particular water body.) EPA also concluded that the *NHDES Great Bay Nutrient Report* was (and continues to be) reflective of the State's intent regarding implementation of its narrative nutrient criteria. Consequently, EPA's action was consistent with 40 C.F.R. § 122.44(d)(1)(vi)(A) (as mentioned elsewhere, 40 CFR Part 131 applies to developing and adopting water quality standards not interpretation of narrative standards).

See Background and Responses #7a – 7e and 20 relative to the appropriateness of the proposed numeric thresholds and the weight-of- evidence approach to developing the thresholds. The proposed thresholds are not simply based on transparency.

Comment #17: EPA is applying an unadopted and unproposed numeric nutrient value to derive the permit limitations and conclude that limits of technology ("LOT") requirements should be applied to all point sources in this basin. There is nothing site-specific or waterbody specific with regard to the methods EPA employed to conclude that a 0.3 mg/l TN numeric criterion must be

achieved. EPA has verbally indicated that this same standard will be used as the basis for revising permits for all of the major municipal facilities tributary to Great Bay. Thus, it is apparent that EPA is *de facto* adopting the draft narrative criterion interpretation as the applicable numeric standard for the Great Bay region, without undertaking the formal adoption process required by state and federal law. Specifically, the CWA and implementing statutes mandate that state water quality standards (WQS), including new narrative criteria interpretation approaches, undergo a public review and adoption process BEFORE being used in the regulatory process pursuant to EPA's "Alaska rule."[3] This also applies to new narrative translator procedures. (*See* Ex. 6, United States Environmental Protection Agency Determination on Referral Regarding Florida Administrative Code Chapter 62-303, Identification of Impaired Surface Waters, July 6, 2005, EPA Florida Determination at 9 ("Provisions that affect attainment decisions made by the State and that define, change, or establish the level of protection to be applied in those attainment decisions affect existing standards implemented under section 303(c) of the Act. These provisions constitute new or revised water quality standards.").[4] Failure of the state and EPA to undertake this process has violated federal law, state law, and the due process rights of the communities and individuals affected by the proposed numeric nutrient criteria. The communities must be afforded the opportunity to submit comments within the designated standard adoption process and appeal, if appropriate, this rule adoption action.

State authority over water quality standard decision-making, in general, must be respected by EPA pursuant to applicable federal rules. (*See* 33 U.S.C. §1313, *et seq.*[5]) EPA is supposed to implement the state's interpretation of the state's narrative criteria application. (S*ee* Comment No. 2, above.) EPA proposed permit action presumes that the draft numeric standards for Great Bay constitute the state's adopted narrative criteria interpretation of necessary water quality objectives to protect designated uses. However, under the MOA, which was issued after the publication of the draft criterion, the state has indicated that these values should not be used in a permitting context until additional scientific evaluation occurs. (*See* MOA Mutual Provisions II and III.) Moreover, DES has determined that the DO-based nutrient objectives are the concern in the tidal rivers, not the transparency-based objectives. (*See generally* MOA.) Thus, assuming the underlying technical basis for a transparency-based TN criterion was adequate, EPA has failed to properly apply the relevant draft numeric value consistent with the state's intended use of that criterion. Application of the draft DO-based objective, if justified, would produce a significantly different effluent limit requirement. Because EPA's narrative criteria interpretation authority is subject to these state decisions, the permit has been improperly drafted and must be withdrawn. (Note: To the degree that DES is now requesting that EPA apply the draft criterion in the tidal rivers, that request is legally and technically flawed as discussed herein. No site-specific data show that TN levels have anything to do with tidal river eelgrass loss or restoration, and DES has never adopted either a narrative or numeric TN criterion for the Great Bay watershed or any waterbody therein.

[3] Criteria, regardless of whether they are narrative or numeric, must be vetted through a thorough public notice and comment process. 40 C.F.R. § 131.13; 40 C.F.R. § 131.20(a), (b), and (c).

[4] *See also* EPA's "Alaska Rule" governing adoption and modification of state water quality standards – 40 C.F.R. §131.21, 65 Fed. Reg. 24641, 24647 (April 27, 2000) ("During the adoption of the detailed procedures, all stakeholders and EPA have an opportunity to make sure that important technical issues or concerns are adequately addressed in the procedures. *** This approach is particularly useful for criteria which are heavily influenced by site-specific factors such as nutrient criteria or sediment guidelines. Such procedures must include a public

participation step to provide all stake-holders and the public an opportunity to review the data and calculations supporting the site-specific application of the implementation procedures."); U.S. Environmental Protection Agency, Water Quality Standards Handbook, Second Edition, EPA 823-9-94-005a (August 1994), available at http://water.epa.gov/scitech/swguidance/standards/handbook/index.cf, at 3-22 ("Where a State elects to supplement its narrative criterion with an accompanying implementing procedure, it *must formally* adopt such a procedure as a part of its water quality standards. The procedure *must* be used by the State to calculate derived numeric criteria that will be used as the basis for all standards' purposes, including the following: *developing TMDLs*, WLAs, and limits in NPDES permits . . . .") (emphasis added); *id.* at 3-22 ("To be consistent with the requirements of the Act, the State's procedures to be applied to the narrative criterion *must* be submitted to EPA for review and approval, and will become a part of the State's water quality standards. (*See* 40 C.F.R. § 131.21 for further discussion.)") (emphasis added); *id.* at 3-24 ("Where a State plans to adopt a procedure to be applied to the narrative criterion, it *must* provide full opportunity for public participation in the development and adoption of the procedure as part of the State's water quality standards.") (emphasis added).

5 EPA's ability to promulgate new or revised standards is extremely limited. *See* 33 U.S.C. §§ 303(a)(2), (b)(1), and (c)(4); 40 C.F.R. §§ 131.21 and 131.22.

Response #17: EPA, as permitting authority in New Hampshire, has used the State's proposed numeric thresholds for Great Bay as one source, supplemented by other sources, to interpret the State's narrative water quality standards and establish numeric effluent limitations for an individual permit. As explained above, EPA was not required to apply these values, and there was nothing to foreclose the use by NHDES, EPA or any other party of different thresholds if they existed, or the development of new ones, for a particular water so long as those values could be shown to achieve applicable water quality criteria and protect uses. As permitting authority, EPA is *required* to interpret narrative water quality standards where no numeric standards exist. 40 C.F.R. § 122.44(d)(1)(vi). EPA is authorized to use information sources like proposed criteria[33] and underlying technical analyses as a source in translating those narrative standards to derive thresholds that will be protective of the State's narrative criteria and from which to calculate proposed effluent limitations. *Id.* EPA finds no merit in the assertion that it is applying the *NHDES Great Bay Nutrient Report* as de facto criteria. The commenter's claim that "There is nothing site-specific or waterbody specific with regard to the methods EPA employed to conclude that a 0.3 mg/l TN numeric criteria must be achieved," is simply belied by the record;

[33] Contrary to the commenter's suggestion in their use of the term "unproposed," nothing in the regulation or its preamble in the Federal Register suggest that "proposed" means that the criterion must have reached some specific point in the state legislative process. The preamble to the regulation does state that "[u]nder [Option A] the permitting authority should use all available scientific information on the effect of a pollutant on human health and aquatic life," suggesting a broad construction of "proposed State criterion" so long as it is based in relevant scientific information. 54 F.R. 23868 at 23876. Therefore a logical and reasonable construction of "proposed" means derived by the state authority responsible for translating water quality standards and applicable to the water body in question. As stated in the preamble to the regulation, the purpose of Option A is to use the best available scientific information to perform a task the permitting authority is required to perform, and it would make little sense to forbid the use of relevant information because it has not been sufficiently "proposed" when the alternative is less site-specific and more generalized information.

With this said, EPA is not required to use a "proposed State criterion" under Option A. The only requirements under Option A are that the permitting authority "[e]stablish effluent limits using a calculated numeric water quality criterion for the pollutant which the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and will fully protect the designated use. 40 C.F.R. §122.44(d)(1)(vi)(A). The permitting authority "may" use a "proposed State criterion, or an explicit State policy or regulation," but is not required to use either. Id. Thus the only requirement to using a source under Option A is that it help demonstrate the derived numeric criteria will attain narrative criteria. The permitting authority may look at any and all relevant scientific information so long as the resulting numeric criterion attains narrative standards and protects designated uses.

the *Great Bay Nutrient Report* is a technical analysis of waters in the Great Bay Estuary that draws heavily on site-specific data from those waters over a period of many years, and EPA's assessment of that information necessarily involved a site-specific assessment of the criteria's relevance to those same waters. The eelgrass total nitrogen threshold, as well as other proposed numeric thresholds, were used by EPA in establishing the total nitrogen permit limit only after taking into account the scientific validity of the proposed thresholds, including nitrogen thresholds established in the scientific literature and nitrogen thresholds established for other estuarine systems.

That the State's analysis would be relevant to more than one point source discharging into the same water body that is subject to same set of water quality standards stands to reason and does not render it a de facto criteria. All of the areas evaluated by NHDES have a similar biology and similar responses to increased nitrogen concentrations. The areas are primarily distinguished by differences in flushing which, in combination with nitrogen loadings, determines the resulting nitrogen concentrations. The measured nitrogen concentrations in the various parts of the estuary were evaluated by NHDES (and later by Region 1 in the context of this permit proceeding) relative to multiple response variables consistent with national guidance on the development of nutrient criteria. Total nitrogen versus transparency was only one of the many lines of evidence evaluated in the development of the NHDES's proposed numeric thresholds. More recent analyses conducted by NHDES documented the relationship between light attenuation and increasing nitrogen concentrations in the Great Bay Estuary, even when evaluating areas of the estuary separately. The same relationship is evident between total nitrogen and algae growth (see NHDES, 2012a).

The proposed numeric thresholds are neither new nor revised water quality standards, so the alleged significance of the "Alaska Rule" is misplaced. In this instance, the only applicable standard in the state water quality standards are *existing* approved narrative criteria for nutrients. The *NHDES Great Bay Nutrient Report* is a non-binding, site-specific analysis that yielded instream thresholds that NHDES concluded would be stringent enough to achieve the applicable narrative water quality criteria and would protect uses.

New Hampshire also has not adopted translator mechanisms. Translator mechanisms are generally-applicable formulae used to derive numeric criteria from narrative standards. 54 Fed. Reg. 23,868, 23,876, June 2, 1989; EPA, 1988 at 10). As explained above, narrative water quality criteria necessarily require some amount of translation (i.e., derivation of an instream threshold on a site-specific basis) in order to be implemented. That site-specific analysis may focus on a small area, or may encompass a much larger area, as is appropriately the case here. The *NHDES Great Bay Nutrient Report* contains site-specific ecological and water quality analyses of various portions of specific bodies of water. Utilizing site-specific analysis and information of this sort is entirely consistent with 40 § 122.44(d)(1)(vi)(A).

There is no requirement that all information EPA uses in interpreting the narrative criteria must have undergone an independent public review process. It is enough that such information is available for public review and comment during the NHDES permit issuance process, as has occurred here. But in any case, the proposed numeric thresholds did undergo public review conducted by the State.

EPA is required to use "formally adopted" (following EPA approval) state regulations, policies, or interpretations of narrative criteria if they exist. (EPA, 1992). As explained above, the *Great Bay Nutrient Report* is not a formal state policy. The *NHDES Great Bay Nutrient Report* binds neither NHDES nor EPA. See also Response #15 and 16 relative to the MOA.

Absent formal state interpretation approved by EPA of narrative water quality standards, EPA, as permitting authority, is required to develop effluent limitations for individual source permits that the Agency determines are most consistent with the state's narrative water quality standards. *American Paper Inst. v. EPA*, 996 F.2d 346, 351 (D.C. Cir. 1993); *see also Upper Blackstone Water Pollution Abatement Dist. v. United States EPA*, 2012 U.S. App. LEXIS 16145 at *4-5, 23 (1st Cir. 2012). EPA has used the *Great Bay Nutrient Report* as a relevant source in discharging its required duty to develop proposed effluent limitations based on the state's narrative standards. No federal regulation prohibits EPA from using proposed numeric thresholds and accompanying site-specific analysis by a State as a source for interpreting the narrative standards, and EPA is explicitly permitted to use a "proposed State criterion" supplemented by other sources to establish numeric effluent limits. 40 C.F.R. § 122.44(d)(1)(vi)(A). Barring the use of this information where appropriate would cut against the very purpose of subsection (A), which is as the commenter points out to pay appropriate heed to the State's reading of their own water quality standards.

Interpreting narrative criteria for purposes of deriving proposed permit limits does not constitute a promulgation of new or revised criteria. The state has not established a generally applicable or binding interpretation of the narrative nutrient criteria; they have simply proposed a site-specific derivation of the narrative criteria as it applies to various Great Bay waters through the development of numeric nitrogen thresholds for Great Bay and subsequently articulated some uncertainty associated with the proposed numeric nitrogen thresholds (see also Response #15).

See Responses #7c and 7d relative to the appropriate nitrogen thresholds in the Lamprey River.

Comment #18: EPA's reliance on nutrient objectives adopted for other estuaries in the country as the basis for determining the numeric criteria for Great Bay is not allowable under either 40 C.F.R. §§ 131 or 122.44(d). Nowhere in the Act, or in its implementing regulations, is EPA authorized to conclude that the actions of other states may be used to govern or justify a narrative criteria interpretation in a different state, excepting where the actions of one state adversely affect standards compliance in another state. (*See* 40 C.F.R. §122.4(d)). The specific physiological characteristics of a state and of the water body types in that state must be fully considered to establish the specific nutrient values necessary to protect those waters from the adverse impacts of cultural eutrophication. (*See* SAB's *Review of Empirical Approaches for Nutrient Criteria Derivation*, April 27, 2010, at 38 ("Numeric nutrient criteria developed and implemented without consideration of system specific conditions (e.g., from a classification based on site types) can lead to management actions that may have negative social and economic and unintended environmental consequences without additional environmental protection.").)[6] EPA's approach for the Lamprey River ignored the pertinent site-specific characteristics, contrary to published EPA guidance on nutrient criteria derivation and the recommendations of EPA's Science Advisory Board. Such actions are "per se" arbitrary and capricious. (*See Texas Oil & Gas Ass'n v. United States EPA*, 161 F.3d 923, 935 (5th Cir. 1998) ("When an agency adopts a regulation based on a study [that is] not designed for the purpose and is limited or criticized by its authors on points essential to the use sought to be made of it the administrative

action is arbitrary and capricious and a clear error in judgment.") (*quoting Humana of Aurora, Inc. v. Heckler*, 753 F.2d 1579, 1583 (10th Cir. 1985), *cert. denied*, 474 U.S. 863 (1985)); *see, e.g., Pac. Coast Fed'n of Fishermen's Ass'ns, Inc. v. Nat'l Marine Fisheries Serv.*, 265 F.3d 1028, 1037-38 (9th Cir. 2001) (agency acted arbitrarily and capriciously by ignoring its own expert advice where no contrary recommendations existed in the record).) The failure to consider the relevant physical, chemical, and biological differences between the Lamprey River and the relevant conditions upon which other state criteria were based renders EPA's analysis fatally flawed and nothing more than speculation.

[6]Available at http://yosemite.epa.gov/sab/sabproduct.nsf/0/E09317EC14CB3F2B85257713004BED5F/$File/EPASAB-10-006-unsigned.pdf; *see also Nutrient Criteria Technical Guidance Manual – Rivers and Streams*, USEPA, July 2000, at 13 ("Initial criteria should be verified and calibrated by comparing criteria in the system of study to nutrients, chl *a* and turbidity values in water bodies of known condition to ensure that the system of interest operates as expected.").

Response #18: At the outset, EPA notes that 40 C.F.R. Part 131 does not apply to the establishment of permit limits. The operative regulation here is section 122.44(d)(1)(vi), which clearly indicates that all relevant information can be used in interpreting a narrative criteria. The regulation does not prohibit the consideration of numeric criteria used in other states or other estuaries; indeed the regulation is intended to provide flexibility to permit writers to consider a wide-variety of information. The commenter's reading of the provision is overly narrow and unpersuasive. In the absence of site-specific data or proposed numeric nitrogen criteria, EPA would still be required to interpret the narrative criteria and reasonably consider nitrogen thresholds in the literature and nitrogen thresholds established for other estuarine systems. See Response #20 for additional detail regarding the SAB review and EPA's response. While the referenced SAB review applies to criteria development and not interpretation of narrative criteria for purposes of permit issuance, the primary basis for the proposed numeric thresholds was site-specific data. Nitrogen thresholds from the literature and from other estuarine systems were considered as part of a weight-of-evidence approach and as a check on the thresholds established using site-specific data. EPA did not reflexively apply nutrient criteria from other states but considered them as part of the total mix of information. EPA reviewed what other states had derived for nitrogen criteria for seagrass. This review was to assure that the NHDES numbers were within the range of other published values. The NHDES nitrogen value fell within the relatively small range derived by prior studies, which gives EPA additional confidence in its efficacy. Furthermore, EPA guidance specifically references consideration of established (e.g., published) nutrient response thresholds (see Responses #7b).

Comment #19: EPA's failure to consider site-specific factors before concluding that the Newmarket facility contributes to transparency-based eelgrass restoration criteria violations "at the point of discharge" (Fact Sheet @ 10) is another serious deficiency in the Region's justification for imposition of stringent TN limitations. Nothing in the record shows that TN is controlling transparency levels at the point of discharge (or downstream from that location), or that the relative importance of factors influencing transparency in the Bay are the same in the Lamprey River at the point of Newmarket's discharge. As noted earlier, there are several expert technical reports that show eelgrass restoration is not possible in the Squamscott and Lamprey Rivers due to habitat and other factors. Moreover, information presented by the Coalition at the

public hearing confirmed TN levels were not controlling transparency in the Squamscott River. The same conclusions apply to the Lamprey because the Squamscott River data played a pivotal role in DES' numeric criteria evaluation. The riverine transparency data used to generate the TN/transparency relationship are not controlled by the level of algal growth present. That fact is easily demonstrated by plotting Kd as a function of chlorophyll-a level. (*See* Ex. 23, Lamprey River transparency analysis; Ex. 20, Squamscott River Kd Versus Chlorophyll-a.) Thus, use of those data in the regression analysis was a gross scientific error. Thus, EPA's assumption that a 0.3 mg/l TN objective in the Lamprey River is required to meet state narrative criteria objectives is not scientifically defensible.

Response #19: The Coalition's understanding of how the permit limits were established is incorrect. The *NHDES Nitrogen Loading Reduction Report* evaluated point source and nonpoint source reductions in nitrogen required to meet various nitrogen thresholds in the Lamprey River and downstream in Great Bay. The point for compliance with the eelgrass threshold of 0.3 mg/l TN is located downstream from Newmarket's discharge below the "Lower Narrows" where eelgrass has historically been present. (NHDES, 2010, Appendix B, Table 10 and Attachments A to C, Grid C)

The plots of Kd against chlorophyll-a for the Lamprey River (Ex. 23) and Squamscott River (Ex. 20) are based on individual sampling data points that are not expected to consistently show the same relationship as the long term median data that were the basis for the proposed numeric thresholds. As discussed in *Criticism of NHDES Great Bay Nutrient Report* at 17, above, NHDES consciously selected this approach to present a clearer picture of long-term relationships and conditions, and there is no scientific error in this approach. NHDES has more recently conducted additional analysis showing that light attenuation in the Great Bay Estuary is more strongly correlated with plant/organic matter in the water than any other factor (NHDES, 2012a).

Please see Responses #24 and 35 relative to transparency and Responses #7c, and #36 relative to eelgrass in the Lamprey River.

Comment #20: EPA's proposed permit asserting a need for stringent TN limitations at the Newmarket facility is not based on the latest available scientific information. Moreover, as explained below, EPA's Fact Sheet analysis is based on a gross oversimplification and misapplication of the available information. In short, the proposed effluent limitations are not scientifically defensible and have not been demonstrated necessary to achieve applicable standards to protect the designated uses, contrary to Section 301(b)(1)(C) of the Act. Specifically, the fundamental "cause and effect" connections are missing from EPA's analyses (which rely on erroneous DES reports), in particular with respect to addressing eelgrass losses and low DO in the estuary arms.[7] Nowhere in the record, or in EPA's Fact Sheet discussion, is the public presented with a scintilla of evidence that (1) eelgrass were present in the Lamprey River in the vicinity of Newmarket's discharge, (2) changes in transparency or nutrient levels likely caused the eelgrass losses in this tidal river, or (3) that controlling nutrients will significantly improve transparency in this tidal river, allowing eelgrass to repopulate historical areas near the mouth of the Lamprey River. Other DES documents (e.g., Great Bay Nitrogen Loading Analysis @ 10) confirm tidal river eelgrass losses have occurred even where waters are not considered nitrogen impaired (e.g. Winnicut River). EPA's Science Advisory Board has admonished the Agency for presuming, rather than demonstrating, that cause and effect exists

when it is developing nutrient criteria. (*See* SAB's *Review of Empirical Approaches for Nutrient Criteria Derivation*, April 27, 2010, at 6 ("Without a mechanistic understanding and a clear causative link between nutrient levels and impairment, there is no assurance that managing for particular nutrient levels will lead to the desired outcome."); *id.* at 38 ("Large uncertainties in the stressor-response relationship and the fact that causation is neither directly addressed nor documented indicate that the stressor-response approach using empirical data cannot be used in isolation to develop technically defensible water quality criteria that will protect against environmental degradation by nutrients.").) As discussed in Comment No. 5 (above) narrative criteria implementation requires site specific data showing that the pollutant of concern is the cause of the use impairment. There are no such data for the Lamprey River and, to the degree the issues have been analyzed by local experts, those analyses have confirmed that nitrogen is *not* the cause of the impairments EPA is intending to address. (*See, e.g.*, Jones et al., *Impacts of Wastewater Treatment Facilities on Receiving Water Quality* (April 2007) (New Hampshire Estuary Project Report).) Thus, EPA has failed to properly interpret the state's narrative standard and failed to demonstrate, with credible site-specific information, that nutrients are the cause of alleged eelgrass losses in the Lamprey River.

[7] It is a general principle of the Clean Water Act, or any environmental statute for that matter, that pollutants be regulated if and only if they are causing harm or impairment. In generating numeric water quality criteria, EPA must abide by the same principle. (*See* CWA §§ 303(c)(2)(A) and 304(a); 40 C.F.R. § 131.3(b); *Leather Indus. of Am. v. EPA*, 40 F.3d 392, 401 (D.C. Cir. 1994) ("EPA's mandate to establish standards 'adequate to protect public health and the environment from any reasonably anticipated adverse effects of each pollutant,' does not give the EPA blanket one-way ratchet authority to tighten standards.").)

Response #20 EPA disagrees with the general characterization of the basis for the TN limitations as set forth in the first three sentences of this comment. See also Responses # 1 to 14. With respect to the specific comments, the cause and effect connection between total nitrogen concentrations and eelgrass losses and low DO in the estuary has been established through a multiple lines of evidence approach that includes a conceptual model to provide a mechanistic understanding of nutrient levels and impairments and extensive analysis of stressor-response relationships that is entirely consistent with the conceptual model. See Background and Responses #7c, 7d, 24 and 35. The permit record contains ample evidence that:

1) Eelgrass was present in the Lamprey River in the vicinity of specific location in the River chosen for evaluating compliance with the nitrogen threshold. Neither EPA nor NHDES has suggested that eelgrass was present in the vicinity of the Newmarket discharge. See Response # 7c and 36.

2) Eelgrass losses in this tidal river are consistent with current available data regarding low transparency and elevated nutrient concentrations. While the comment is correct that there is no specific data on the loss of these particular eelgrass beds, the data do clearly indicate that nutrient concentrations are sufficiently high to be responsible for loss of eelgrass beds and are inconsistent with eelgrass survival, and therefore have a reasonable potential to cause, or contribute to, water quality standards violations. See Response 36.

3) Controlling nutrients will significantly improve transparency, based on NHDES' analysis of the components of water clarity and turbidity as set forth in the 2009 NHDES Great Bay Nitrogen Report at 66. EPA notes that the commenter's disagreement with the NHDES analysis, and its submission of a methodologically flawed alternative analysis, does not constitute a lack of evidence on this point. See also Response # 24.

The comment on the Winnicut River mischaracterizes the cited document. The *NHDES Loading Reduction Report* (NHDES, 2010 at 10) states: "Eelgrass loss has been documented in this [the Winnicut River] subestuary but there are insufficient data on nitrogen concentrations to formally add this subestuary to the 303d list." This does not "confirm tidal river eelgrass losses have occurred even where waters are not considered nitrogen impaired" as suggested in the comment. In fact, the limited available data on the Winnicut River indicates nitrogen concentrations are in fact well above the proposed numeric thresholds. (PREP, 2009c at 7 (TN range at WNC-02 of 0.428 to 0.921 mg/l)).

EPA notes that the Coalition's comments repeatedly, misleadingly and without foundation cite statements regarding purported lack of data as "confirmation" of the Coalition's point of view. The commenter similarly mischaracterizes the conclusions of Jones et al. (2007). That report concludes:

> "Thus, the link to WWTF effluent or other sources is not at all obvious from these observations. Despite being a consistently significant source of nutrients to the river, DO conditions at the outfall pipe were never below target levels. However, the oxygen demanding processes that are stimulated by nutrients may not take place immediately at the outfall pipe. Thus, the widespread low DO levels on 8/19/05 downstream of the WWTF may have been caused by discharged nutrients, as well as the more confined low DO levels observed on 8/5/05. The elevated chlorophyll-a levels observed downstream of the Exeter WWTF on two dates also supports this scenario."

EPA observes that the lack of an "obvious link" based on three sampling dates does not "confirm[] that nitrogen in not the cause of impairments," as suggested in the comment. That is particularly the case where the report itself indicates that "the widespread low DO levels . . . may have been caused by discharged nutrients." (Jones, et al, 2007 at 37; see also Response #25).

Finally, while the comment accurately quotes the SAB document, Review of Empirical Approaches for Nutrient Criteria Derivation (2010), in this case the stressor-response approach was not used "in isolation" or "[w]ithout a mechanistic understanding and clear causative link." Rather, the analyses that underlie the permit limits are based on a multiple lines of evidence approach that is fully consistent with the recommendations of the SAB. The NSteps peer reviewers specifically cited to the comprehensiveness and clarity of the weight of evidence approach used to develop the proposed nitrogen thresholds as well as the vast quantity of site specific data available and utilized in the analyses. The peer reviews were completed in June 2010, after the SAB report on the EPA guidance manual.

A thorough review of the background of the SAB review may be useful in dispelling apparent confusion over its conclusions and to place the *NHDES Great Bay Nutrient Report* into proper context. In September 2009, EPA's Science Advisory Board (SAB) initiated a peer review of a draft guidance document developed by the Office of Water entitled Empirical Approaches for Nutrient Criteria Derivation. The purpose of the document is to provide guidance for technical experts on a methodology for deriving numeric nutrient criteria. The peer review by the SAB was a public process with participation from many interested parties among the regulated community.

The SAB transmitted comments to EPA Administrator Lisa Jackson in a letter dated April 27, 2010. While the SAB provided many comments on the stressor-response approach described in the draft document it also noted that the stressor-response approach is a legitimate, scientifically based method for developing numeric nutrient criteria if the approach is appropriately applied (i.e., not used in isolation but as part of a weight-of-evidence approach).

The guidance document was finalized in November 2010 under a different title, Using Stressor-Response Relationships to Derive Numeric Nutrient Criteria (the "Guidance"). The Guidance incorporated many of the SABs recommendations for revising and restructuring. Additionally the Guidance was revised to more clearly state the scope and intended use of the Guidance, emphasizing that the analytical methods covered are specifically applicable to data most often available to states and tribes engaged in deriving numeric nutrient criteria, and revisions to include more detailed descriptions of the current scientific understanding of how changes in nutrient concentrations can influence designated uses as well as more complete covering of the assumptions and limitations inherent in the use of different statistical techniques.

According to the Guidance, there are three types of empirical analyses that can be used to develop numeric nutrient criteria: 1) the reference condition approach; 2) mechanistic modeling; and 3) stressor-response analysis. The reference condition approach derives candidate criteria from observations collected in reference waterbodies. Reference waterbodies represent least disturbed and/or minimally disturbed conditions within a region that support designated uses. Therefore, the range of conditions observed within reference waterbodies provides appropriate values upon with criteria can be based. Criteria for a particular variable (e.g. total phosphorus or total nitrogen) are derived by compiling measurements of that variable from reference waterbodies and selecting a representative value from the resulting distribution.

The mechanistic modeling approach represents ecological systems using equations that represent ecological processes and parameters for these equations that can be calibrated empirically from site-specific data. These models can be used to predict changes in the system, given changes in nitrogen and phosphorus concentrations.

Empirical stressor-response modeling is used when data are available to accurately estimate a relationship between nitrogen and phosphorus concentrations and a response measure that is directly or indirectly related to a designated use of the waterbody. Then nitrogen and phosphorus concentrations that are protective of designated used can be derived from the estimated relationship.

The Guidance points out that each of these three analytical approaches is appropriate for deriving scientifically defensible numeric criteria to address the effects of nitrogen and phosphorus pollution when applied with consideration of method-specific data needs and available data. In addition to these empirical approaches, consideration of established (e.g. published) nutrient response thresholds is also an acceptable approach for deriving criteria.

Stressor-Response Approach

The November 2010 Guidance focuses on the stressor-response approach for deriving numeric nutrient criteria and outlines a four step approach. First, conceptual models are developed to represent known relationships between changes in nitrogen and phosphorus concentrations, biological effects, and attainment of designated uses. These conceptual models not only provide a mean of communicating the current state of knowledge regarding the effects of nitrogen and phosphorus in aquatic systems but also provide and important tool for guiding subsequent analyses.

Second, data are assembled and initial exploratory analyses performed. Variables are selected during this step that represent different concepts shown on the conceptual model, including variables that represent nitrogen and phosphorus concentrations, variables that represent responses that can be directly linked with designated uses, and variables that can potentially confound estimates of stressor-response relationships. After selecting variables and assembling data, these data are explored to provide insights into how different variables are distributed and how groups of variables covary with one another. These exploratory analyses inform subsequent development of formal statistical models.

Third, stressor-response relationships are estimated between nitrogen and phosphorus concentrations and the selected response variables, and criteria are derived from these relationships. The Guidance presents an analysis approach that emphasizes classification, to maximize the accuracy and precision of estimated stressor-response relationships, and simple linear regression, to provide stressor-response relationships that can most easily be interpreted for criteria development.

Finally, the accuracy and precision of estimated stressor-response relationships are evaluated and the analyses documented. The accuracy of estimated relationships is evaluated with regard to possible influence of known confounding variables as identified by the conceptual model or by exploratory data analysis.

Cause and Effect

The approach utilized by NHDES has been criticized by the Coalition and related parties because the stressor-response relationship does not prove cause and effect. It is well established that anthropogenic activities resulting in high levels of nitrogen and phosphorus in the water stimulates excessive plant and microbial growth. This excess growth produces deleterious physical, chemical and biological responses in surface waters and impairs designated uses in both receiving and downstream waterbodies. Nitrogen and phosphorus pollution can cause the over stimulation of vegetative growth and changes the assemblage of plant and algal species

present in the ecosystem. Specifically, algal blooms can decrease water clarity and aesthetics, which in turn can affect the suitability of a waterbody for primary and secondary contact recreation. Algal blooms can adversely affect biological processes by decreasing light availability to submerged aquatic plants (which serve as habitat for aquatic life), degrading food quality and quantity for aquatic life, and increasing the rate of oxygen consumption. Additionally, nitrogen and phosphorus pollution can promote the growth of less palatable nuisance algal species that result in less food available for filter feeders, and can alter the habitat structure and function by covering the stream beds with periphyton rather than submerged aquatic plants.

Stressor-response approaches use field data to estimate the relationship between nitrogen or phosphorus concentrations and a response measure that is either directly or indirectly related to the designated use. These approaches do not establish cause and effect because statistical correlation can never prove causation. The SAB's review of this approach was very clear in its support by stating "The stressor-response approach is a legitimate, scientifically based method for developing numeric nutrient criteria if the approach is appropriately applied (i.e. not used in isolation but as part of a weight-of-evidence approach)." Thus it is recommended to combine the stressor-response approach with other information that documents cause and effect.

The proposed numeric thresholds developed by the NHDES did not use the stressor-response approach in isolation. It used a weight of evidence approach with multiple lines of evidence. The estuarine eutrophication model used by NOAA (Bricker, 2007) relating external nutrients to primary (phytoplankton blooms and proliferation of macroalgae) and secondary (low dissolved oxygen and loss of submerged aquatic vegetation) symptoms was used as a guide for the analysis. Additionally, the NHDES assessed cause and effect data from the literature, criteria developed in other states, and reference concentration approach (NHDES utilized Portsmouth Harbor and Little Harbor as reference sites although declines in eelgrass acreage at these location indicates these areas are not pristine) in the development of its proposed numeric thresholds.

Comment #21: EPA's interpretation of CWA § 301(b)(1)(C) is in error. This provision of the Act does not mandate that a facility receive effluent limitations that ensures it does not "cause or contribute to" a WQS exceedance, it only requires that limitations be imposed as "necessary to [a]chieve water quality standards established under Section 303 of the CWA." (40 C.F.R. § 122.44(d)(1).) Federal rules only prohibit "causing or contributing" where new facilities are being permitted, not existing facilities. (Compare 40 C.F.R. §122.4(i) with § 122.44(d).[8]) Moreover, nowhere in the Fact Sheet does EPA demonstrate that a 3 mg/l TN monthly maximum limitation, as opposed to a less stringent limitation, is "necessary to achieve water quality standard" compliance in the Lamprey River, as required by the Act and implementing regulations (e.g., 40 C.F.R. § 122.44(d)(1)). EPA seeks to rely on a draft document prepared by DES which analyzed several possible permitting scenarios, depending upon which yet-unadopted, numeric nutrient criteria is used as the basis for analysis. The draft DES report is nothing more than a straw man and does not provide a technical basis for concluding a specific set of limitations must be incorporated into Newmarket's permit. The very language of the report discloses that no decision regarding the proper instream criteria or plant effluent limits was being established: "If the WWTPs receive permits that limit effluent nitrogen concentrations to protect eelgrass in downstream locations, non-point sources would have to be reduced by -- percent."

(Great Bay Nitrogen Loading Analysis - Draft Report @ 12, discussing the Lamprey Subestuary.) Moreover, the analysis specifically assessed annual and multiyear average load reductions, not monthly maximum conditions as interpreted by the Region. Thus, to the degree EPA relied on this report as the basis for imposing limitations, EPA misapplied the results.

[8] New sources of discharges are prohibited from causing or contributing to a violation of water quality standards. (*See* 40 C.F.R. § 122.4(i) ("No permit may be issued: … (i) to a new source or a new discharger, if the discharge from its construction or operation will cause or contribute to the violation of water quality standards.").) Whereas, the trigger for existing sources is when a permitting authority determines that a specific discharger's effluent is at a level which is causing or contributing to a water quality standard excursion. (*See* 40 C.F.R. § 122.44(d)(1)(i) (A WQBEL analysis occurs when a discharger's effluent "[is] or may be discharged at a level which will cause, or have the reasonable potential to cause, or contribute to an excursion above any State water quality standard.").)

Response #21: Although EPA should have quoted Section 301(b)(1)(C) of the Act precisely, EPA disagrees that it misapplied the appropriate legal standard under Section 301(b)(1)(C) in establishing the limitation for nitrogen. As explained in the Fact Sheet and the *Reaffirmation of the Nitrogen Effluent Limitation of 3 mg/l* above, EPA has in accordance with Section 301(b)(1)(C) imposed a limit as stringent as necessary to ensure compliance with water quality standards. Under NPDES regulations implementing section 301, a limit is "necessary" if a pollutant has a reasonable potential to cause or contribute to an excursion above any water quality standard, including State narrative criteria for water. 40 C.F.R. § 122.44(d)(1)(i). In the Fact Sheet, EPA explained that based on existing levels of nitrogen in the discharge, the facility contributes to violations of water quality standards, thus triggering the need for a limit:

> "EPA has concluded that at existing levels, nitrogen in the Newmarket facility's discharge contribute to water quality violations at the point of discharge in the Lamprey River, as well as further downstream in Great Bay." Fact Sheet at 10.

EPA then concluded that a limit of 3 mg/l would need to be imposed to ensure compliance with applicable water quality standards:

> "EPA's analysis of available information, including the information in the NHDES report 'Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non Point Sources in the Great Bay Estuary Watershed-Draft' shows that the facility's nitrogen discharge has a reasonable potential to cause or contribute to a violation of water quality standards and that a total nitrogen effluent limitation of 3 mg/l, coupled with significant reductions in non point source discharges of nitrogen is necessary to ensure compliance with water quality standards. EPA is therefore including a monthly average concentration limit of 3 mg/l, applicable during the months of April through October." Id."

Section 301 of the Act and implementing regulations call for the imposition of effluent limits as stringent as necessary to ensure compliance with applicable water quality standards; EPA applied that standard in determining the stringency of the limit to ultimately impose.

EPA agrees that the *NHDES Nitrogen Loading Reduction Report* contains "no decision regarding the proper in stream criteria or plant effluent limits." However, that report is not a "straw man" and does provide a technical basis for EPA's determination as to the appropriate permit limit for

the Newmarket discharge. The *NHDES Nitrogen Loading Reduction Report* indicates that even after maximizing point source nitrogen reductions, additional nonpoint source reductions will be necessary (see Responses #3 and 4). Consequently, while nitrogen thresholds are based on multi-year averaged data, maximizing point source reductions is necessary in order to achieve those thresholds (see Response #8). The limit of 3.0 mg/l as a monthly average was established based on the need to maximize point source reductions. As indicated in Response #8, 3.0 mg/l as a seasonal average is now believed to more appropriately reflect the maximum point source reduction that can be achieved in cold weather climates.

Comment #22: In other forums, EPA has informed courts that extended schedules should be allowed to develop "quality TMDLs" where complex point and non-point interactions affect nutrient impacts. (*See* Ex. 24, EPA order files in Black Swan Case.) In this instance, EPA is relying upon a draft WLA document that has never been adopted as a TMDL nor even explores the nutrient dynamics central to understanding and remedying the alleged impairments. Accepting such a poor quality draft analysis that has not undergone formal public review violates the TMDL development procedures of the Act and treats New Hampshire communities differently than those in Montana. The Administrative Procedure Act ("APA") does not countenance either action.

Response #22: Whether EPA has taken the position that an extended amount of time should be allowed for completion of complex nutrient TMDLs in other contexts is not relevant to the question raised in this proceeding: whether EPA need defer setting a water quality-based effluent limit for total nitrogen in an NPDES permit until completion of a TMDL. EPA regulations at 40 C.F.R. § 122.44(d)(1)(vii) specifically contemplate that permit issuers will establish numeric permit limits when there is no TMDL or wasteload allocation. *See Upper Blackstone Water Pollution Abatement Dist. v. United States EPA*, 690 F.3d 9, 14 (1st Cir. 2012); *In re Upper Blackstone Water Pollution Abatement Dist*., NPDES Appeal Nos. 08-11 through 08-18, slip op. at 38-39 (EAB May 28, 2010), 14 E.A.D. EPA's decision to proceed in the absence of a TMDL is reasonable where, as here, no TMDL is planned, much less underway; where nutrient-driven water quality impairments are significant and ongoing; and the permittee contributes to such impairments. There can be no telling when a TMDL will be completed if at all and, in EPA's view, it makes little sense to forestall necessary nitrogen reductions on the mere possibility that a TMDL will someday be completed, especially where it not obvious that such a TMDL would lead to any less stringent controls on the point source. EPA is not treating the *NHDES Nitrogen Loading Reduction Report* as a draft WLA or as a TMDL but as a source of relevant information under section 122.44(d)(1)(vi) to inform the establishment of a numeric effluent limitation and implement the State's narrative nutrient criteria. The commenter's mere assertion that NHDES's report amounts to a "poor quality draft analysis" in not only inaccurate but is at odds, at least with respect to point source loading by Coalition communities, with earlier positions taken by the Coalition. *See* Memorandum of Understanding at 1.

Comment #23: EPA is reinterpreting its rules to mandate LOT requirements for any facility that contributes a pollutant of concern to impaired waters, which is an illegal modification of applicable federal rules and is inconsistent with the framework of the Act. Nowhere does the Act provide authority for mandating a technology-based limitation simply because waters are found to be impaired and an existing discharge contributes some amount of a pollutant to those waters.[9]

The Supreme Court in *Arkansas v. Oklahoma* indicated that the water quality management planning provisions of the Act (i.e., Section 303(d) TDML process) are the vehicle for resolving the establishment of limitations necessary to achieve applicable water quality standards.[10] There are thousands of nutrient-impaired waters throughout the country, and EPA has never issued a rule or statutory interpretation that required imposition of LOT where a water body is impaired, in advance of TMDL development. The Region, via the NPDES process, is not authorized to establish, adopt, or amend rules of general applicability or to set technology-based limits for POTWs. If this were a federal requirement, the entire drainage basin for the Mississippi River would be subject to this mandate due to nutrient impacts on the Gulf of Mexico. Thus, EPA's regulation of Newmarket is in conflict with EPA's historical application of the Act and implementing regulations, as well as prior permitting decisions in this Region (e.g., Attleboro decision). This unfair and inequitable treatment of similarly situated facilities violates due process, equal protection, and is fundamentally unfair.

[9] The only technology-based limitation applicable to POTWs is the secondary treatment rule, which does not apply to nutrients. (*See generally Maier v. EPA*, 114 F.3d 1032 (10th Cir. 1997); *Natural Resources Defense Council, Inc. v. EPA*, 790 F.2d 289 (3d Cir. 1986); 40 Fed. Reg. 34522, 34522 (Aug. 15, 1975) ("[s]econdary treatment processes were developed to biologically remove degradable organic materials from wastewater. The term 'secondary treatment' eventually became synonymous with the biological treatment of wastewater *for the removal of carbonaceous organic material.*").)

[10] *Arkansas v. Oklahoma*, 503 U.S. 91, 108 (U.S. 1992) ("The [CWA] does, however, contain provisions designed to remedy existing water quality violations and to allocate the burden of reducing undesirable discharges between existing sources and new sources. *See, e.g.*, § 1313(d).").

Response #23: EPA finds no merit in any suggestion that its decision to proceed without waiting to develop a TMDL or wasteload allocation was in error. Development of TMDLs can be time and resource intensive. Neither the CWA nor EPA regulations require that a TMDL, or its equivalent, be completed before a water quality-based limit may be included in an NPDES permit.[34] Rather, water quality-based effluent limitations in NPDES permits must be "consistent with the assumptions and requirements of any *available* [emphasis added] wasteload allocation." 40 C.F.R. § 122.44(d)(1)(vii)(B). *Id.* Thus, an approved TMDL is not a precondition to the issuance of an NPDES permit for discharges to an impaired waterway. *Id.* This interpretation is consistent with the preamble to 40 C.F.R. § 122.44(d)(1), which expressly outlines the relationship between subsections 122.44(d)(1)(vi) (*i.e.*, procedures for implementing narrative criteria), and (d)(1)(vii):

> The final point about paragraph (vi) is that in the majority of cases where paragraph (vi) applies waste load allocations and total maximum daily loads will not be available for the pollutant of concern. Nonetheless, any effluent limit derived under paragraph (vi) must satisfy the requirements of paragraph (vii). Paragraph (vii) requires that all water quality-

[34] *See, e.g.*, 43 FR 60662, 60664 (December 28, 1978) ("EPA does not consider the establishment of TMDL's as essential to setting of water quality based effluent limits. Development of TMDL's pursuant to section 303(d) is not a necessary prerequisite to adoption or enforcement of water quality standards, and therefore, will not determine the validity of existing, revised or new water quality standards.")

> based effluent limitations comply with "appropriate water quality standards," and be consistent with "available" waste load allocations. Thus for the purposes of complying with paragraph (vii), where a wasteload allocation is unavailable, effluent limits derived under paragraph (vi) must comply with narrative water quality criteria and other applicable water quality standards.

See 54 Fed. Reg. 23,868, 23,876 (June 2, 1989). If a TMDL is completed and approved by EPA, the effluent limitation in any subsequently issued NPDES permit must be consistent with the wasteload allocation assigned to the Newmarket facility. In the meantime, relevant regulations *require* that EPA develop water quality based effluent limitations based on the existing applicable water quality standard in order to ensure that the permit complies with the EPA regulations requiring permits to include requirements "necessary to achieve water quality standards" (40 C.F.R. § 122.44(d)(1)) and limits "derived from, and [that comply] with" water quality standards (§ 122.44(d)(1)(vii)). These requirements implement Clean Water Act section 301(b)(1)(C), which mandates inclusion of "any more stringent limitation, including those necessary to meet water quality standards" in NPDES permits. *See, e.g., In re Upper Blackstone Water Pollution Abatement Dist*., NPDES Appeal Nos. 08-11 to 08-18 & 09-06, slip op. at 38-40 (May 28, 2010), 14 E.A.D. .

EPA does not intend to impose LOT on all POTWs discharging in the watershed. EPA will instead impose limits on a case-by-case basis, determined in large part by the size and location of the facility and other site-specific factors. EPA has already informed another POTW discharging to the Great Bay estuary that it will likely receive a limit of 8 mg/l. See Letter, H. Curtis Spalding, EPA Region 1, to John H. Bohenko, City of Portsmouth, July 31, 2012. More generally, as a factual matter, even a cursory review of permits recently reissued by Region 1 belies the commenter's claim that this action "mandates 'limits of technology' ('LOT') requirements for any facility that contributes a pollutant of concern to impaired waters." *See, e.g.*, Upper Blackstone Water Pollution Abatement District, NPDES Permit No. MA0102369 (5 mg/l TN limit) and North Attleboro WPCF, NPDES Permit No. MA0100595 (8 mg/l TN limit) (MA permits available at http://www.epa.gov/region1/massachusetts.html).

<u>Scientific Issues and Objections</u>

Comment #24: The Agency's permitting analysis relies heavily on prior DES decisions regarding impairments occurring in the system, the causes of such impairments, and as of yet unadopted criteria derived to address the causes of impairment. (*See* Fact Sheet @ 10-19.) The Great Bay communities have met with DES to review the prior technical conclusions related to the impairments and have presented information showing that those decisions were seriously flawed (discussed in greater detail below). As discussed in the Coalition's public hearing comments (incorporated by reference herein), the Bay and tidal rivers are not suffering from insufficient transparency due to excessive plant growth, and the periodic low DO levels in the tidal rivers do not appear to be a function of the algal growth in those areas. There is no analysis anywhere in the record showing (1) transparency has decreased during the period of eelgrass decline, (2) existing transparency in Great Bay is insufficient given the tidal variation in the system, or (3) nitrogen has triggered excessive plant growth lowering ambient transparency levels in either the tidal rivers or the Bay. Absent such information, there can be no legally or scientifically defensible conclusion that transparency is a cause of eelgrass decline, as presumed

in EPA's assessment, or that reducing TN levels is the solution to the alleged impairments. Analyses prepared by the Coalition's consultants (*see* Ex. 5) confirm that (1) transparency in the Bay was not materially impacted by increased algal growth during the period of significant eelgrass decline and that (2) controlling nitrogen cannot ensure attainment of the transparency objectives underlying the 0.3 mg/l TN water quality objective used as the basis for this permit limitation. These are fundamental deficiencies in the scientific basis for this proposed permit action. EPA recently attended a meeting with DES and the Coalition where Prof. Fred Short, the primary eelgrass expert relied upon by EPA, confirmed that transparency and epiphyte growth are not major factors limiting eelgrass growth in these waters as originally presumed. These statements are reflected in the MOA group meeting minutes that EPA had an opportunity to review and comment on. (*See* Exs. 21 and 22.) Thus, continued reliance on prior studies by this author to reach an opposite conclusion would be inappropriate and violate EPA's scientific integrity policies.

Response #24: EPA disagrees that the Great Bay communities have presented information showing that NHDES' data or analyses are "seriously flawed." As discussed further below, the information provided by the Coalition mischaracterizes NHDES analyses; confuses analyses pertinent to specific geographic regions of the estuary with other areas of the estuary; utilizes subsets of the data that are not characteristic of the long-term data; and presents alternative analyses that are themselves methodologically flawed. NHDES has not accepted the Coalition's conclusion regarding purported flaws in the analysis, as evidenced by their continued use in determinations of impairment for the 2012 listing (see NHDES, 2012a and 2012b). [35] And neither does EPA.

Over many years, NHDES has collected a large volume of water quality and habitat data. The water quality data included, but was not limited to, dissolved oxygen, chlorophyll-a and nitrogen concentrations. As part of their Amendment to the New Hampshire 2008 Section 303(d) list Related to Nitrogen and Eelgrass in the Great Bay Estuary, NHDES compared trends in the aquatic habitat/eelgrass with trends in various water quality parameters. NHDES concluded that the Lamprey River, Newmarket's receiving water, was impaired for Dissolved Oxygen and for Biological and Aquatic Community Integrity. The specific indicators considered for this evaluation were high chlorophyll-a concentrations, low dissolved oxygen concentrations, high nitrogen concentrations and a complete loss of eelgrass where it historically occurred within this system. EPA has independently reviewed the data and analyses as sources for interpretation of the state's narrative water quality standards, consistent with our obligation under 40 C.F.R. § 122.44(d)(1)(vi), and found the determinations that NHDES has made on the level of impairment to be well founded and supported by the large volume of data NHDES has collected through the years.

[35] *See also* Letter from Thomas S. Burack, Commissioner, NHDES, to Cities of Portsmouth, Dover and Rochester, dated, October 19, 2012 ("DES maintains that the Great Bay Estuary exhibits all the classic signs of eutrophication and that excessive nitrogen is causing or contributing to these water quality problems in the estuary.").

EPA disagrees with the public hearing comments that "the Bay" is not suffering from insufficient transparency due to excessive plant growth.[36] Contrary to the Coalition's assertions, the record in this permit proceeding contains substantial analyses that (1) transparency has decreased during the period of eelgrass decline; (2) existing transparency in Great Bay proper has led to a reduction in viable eelgrass habitat and (3) nitrogen has triggered excessive plant growth lowering ambient transparency levels.

Decrease in Transparency During Eelgrass Decline

Evidence of decreasing trends in transparency is provided by documented increases in factors that reduce transparency. The PREP *2009 State of the Estuaries Report* showed long-term increasing trends in TSS and chlorophyll-a (major components that result in decreased transparency) from sampling at Adams Point during the period of eelgrass decline (PREP, 2009a at 13). (A similar trend is shown in Figure 4 of Exhibit 10 to the Comment, although the specifics of that figure were criticized by NHDES for, among other things, inappropriately mixing low- and high-tide data (NHDES, 2011).) The more recent PREP data indicate that chlorophyll-a concentrations may be leveling off (no statistically significant trend when data through 2011 are considered), but that there have been significant increases in macroalgae and epiphytes (PREP, 2012 at NUT3b-2). (See also Short, 2011). Macroalgae affects eelgrass not only through direct smothering and shading but also by contributing to increased turbidity from particulate organic matter in the water column. NHDES has shown that light attenuation in the Great Bay Estuary is more strongly correlated with plant/organic matter in the water than any other factor (NHDES, 2012a).

Existing Transparency Insufficient to Protect Eelgrass

Even accounting for the large tidal range in Great Bay proper, there is ample evidence suggesting that existing transparency in Great Bay proper is insufficient to protect eelgrass. Eelgrass acreage and biomass show a long term downward trend (PREP, 2009b). NHDES extensively discusses transparency requirements in relation to tidal variations (as related to the difference between the minimum and maximum depth of eelgrass beds, Zmin and Zmax) in the *Great Bay Nutrient Report*.[37] In Table 9, the measured Kd values for each section of the estuary have been paired with tidal amplitudes to estimate Zmin and Zmax following the procedures in Koch (2001). The depths in this table are relative to mean tidal level (e.g., mid-tide). In the Squamscott, Lamprey, Oyster, Bellamy, Cocheco, and Salmon Falls Rivers, the model predicts

[36] EPA assumes that when commenters refer to the Bay or Great Bay, they are referring only to Great Bay proper, not the associated tributaries, and when they refer to the Great Bay Estuary, their comments are inclusive of the tributaries.

[37] The minimum depth of eelgrass beds (Zmin) can be predicted from the tide height in the estuary because eelgrass cannot survive above the mean low water line. The tidal range in the estuary is approximately 2 meters. Therefore, ignoring effects of wave action, Zmin will be 1 meter below mean tidal level throughout the estuary. The maximum depth of eelgrass beds (Zmax) in different areas can be predicted from measurements of the light attenuation coefficient and the minimum transmission of surface irradiance needed by eelgrass for survival. The difference between Zmin and Zmax can be used to predict the presence or absence of eelgrass. Koch and Beer (1996) determined that Zmax should be at least 1 meter below (less than) Zmin for eelgrass survival. (NHDES, 2009a at 55-56).

that Zmax is above (greater than) Zmin, which matches observations that eelgrass does not currently exist in these areas (PREP, 2009b; NHDES, 2008). In the Great Bay, Little Bay, and Upper Piscataqua River, the Zmax is below (less than) Zmin but the difference is less than 1 meter. This result is consistent with observations that eelgrass in these areas is either declining or has recently disappeared (PREP, 2009b; NHDES, 2008). (NHDES, 2009a at 56; see also Table 8 and Figure 32 at 58-59).

There are some areas within Great Bay proper where water column transparency should be less of an issue for eelgrass survival. In shallower areas of Great Bay proper on low tides, eelgrass leaves will float on the surface of the water. Thus, water column transparency does not have a significant impact on the plants at low tide, though they certainly would still affect the plants at other stages of the tide. Eelgrass losses have also been documented in these shallow portions of Great Bay proper. The prevalence of macroalgae and epiphytes (plants and animals that attach themselves directly to the surface of eelgrass leaves) will also block light from reaching these plants. Macroalgae tends to collect and grow up and smother eelgrass shoots. This process of overgrowing and smothering the shoots is not mitigated by tidal variation. The presence of epiphytes obviously represents a reduction in light reaching the plants and again is unmitigated by tidal variation.

Finally, tidal variation does not mitigate direct nitrogen toxicity to eelgrass shoots. The increase in macroalgae in the shallow areas of Great Bay proper where eelgrass has been lost suggests that macroalgae may be responsible for eelgrass loss in these shallow areas. The proliferation of the nuisance algae now found in these shallow areas of Great Bay proper are known to be spurred by elevated concentrations of nitrogen. (See discussion later in this response under *Eelgrass Biomass in Lower Piscataqua River and Little Bay*)

Nitrogen as Trigger for Excessive Plant Growth and Decreased Transparency

The record also shows that nitrogen has triggered excessive plant growth, thus lowering ambient transparency levels. The *Great Bay Nutrient Report* set forth multiple lines of evidence, including correlations between nitrogen, chlorophyll-a and water clarity in connection with well-established conceptual models for estuarine eutrophication (Bricker et al., 2007; Cloern, 2001; McGlathery et al. 2007); information from maps of macroalgae species; and information that the turbidity was largely caused by autochthonous suspended organic matter. (NHDES, 2009a at 79). The NHDES Response to Public Comment on the Draft 2012 Consolidated Assessment and Listing Methodology (NHDES, 2012a) includes additional information, including demonstrating that the relationships between total nitrogen and both phytoplankton blooms and light attenuation occur within salinity zones and therefore is not explained by dilution.

EPA also finds no merit in the Coalition's claim that its Exhibit 5, titled "Evaluation of Proposed Numeric Nutrient Water Quality Criteria for the Great Bay Estuary," dated June 30, 2010 ("Coalition's Criteria Memorandum"), includes analyses that "confirm" that (1) transparency in the Bay was not materially impacted by increased algal growth during the period of significant eelgrass decline and that (2) controlling nitrogen cannot ensure attainment of the transparency objectives underlying the 0.3 mg/l TN water quality objective used as the basis of this permit

modification."[38,39,40]

While the vast majority of the Coalition's Criteria Memorandum consists of allegations regarding supposed deficiencies in the proposed numeric thresholds pertaining to transparency, algal growth and eelgrass decline, rather than analyses "confirming" the commenter's claims, there appear to be two arguments related to assertions (1) and (2) above.[41] First, the Evaluation presents eelgrass biomass data for the period from 2001 to 2008 from sites in the Lower Piscataqua River and Little Bay from Beem and Short (2009) and includes corresponding median

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[38] According to the authors, the Coalition's Criteria Memorandum is intended to "(1) outline the legal/regulatory requirements associated with the criteria adoption/impaired waters designations; (2) evaluate the technical merits of the proposed criteria; and (3) present an alternative strategy to resolve scientific uncertainties with the proposed approach that minimizes unnecessary adverse social and economic impacts while attaining applicable environmental goals."

The legal/regulatory requirements associated with criteria adoption are not applicable to permitting decisions based on existing criteria, such as the New Hampshire narrative nutrient criterion applicable in this proceeding, and issues associated with impaired waters designation are more appropriately addressed through the 303(d) listing process. Independent of any State decisions associated with 303(d) lists, EPA clearly documented a reasonable potential to exceed the narrative nutrient criteria in the Fact Sheet and has affirmed that conclusion through this response to comments. The alternative adaptive management approach advocated by the Coalition is not consistent with the regulatory requirements of the Clean Water Act, which mandate the establishment of water quality-based effluent limitations as stringent as necessary to ensure compliance with water quality standards irrespective of cost or technological feasibility at the time of permit reissuance, in that it amounts to insufficient "low cost" point source reductions; vague commitments to non-point source/habitat restorations issues; and delaying water quality-based limits while further study is conducted. Consequently, EPA's responses below to the Coalition's Criteria Memorandum are focused on those analyses relating algal growth to eelgrass decline, and to analyses pertaining to the control of nitrogen and the attainment of the transparency objectives underlying the 0.3 mg/l TN objective.

[39] In reviewing the record, EPA determined that Exhibit 10, "Review of New Hampshire DES Total Nitrogen Criteria Development for the Great Bay Estuary," dated January 10, 2011, also includes analyses on these two issues. EPA has addressed both documents in this response.

[40] In their public hearing presentation the Coalition states that the natural transparency in the Squamscott River is 1/2 meter and that this is a natural condition that cannot be changed. It is unclear how the Coalition determined the transparency of the Squamscott River is 1/2 meter. However, EPA disagrees that this condition can be characterized as natural.

[41] The Coalition's Criteria Memorandum contains a long list of analyses and claims that these analyses are necessary to show "cause and effect" between TN levels and eelgrass losses/low DO levels. EPA finds no merit in the assertion that all of these analyses are necessary to show cause and effect. That notwithstanding, as is evident, many such analyses *have* been conducted and are discussed in cited NHDES publications, e.g., median TN controls phytoplankton growth; areas of increased turbidity are correlated to reduced eelgrass populations; the role of factors other than nitrogen that influence light penetration; eelgrass losses are associated with nitrogen increases; the relationships between chlorophyll-a and oxygen impacts; and increased chlorophyll-a levels occurring in the tidal tributaries result from phytoplankton growth in the saline and not fresh water sections of the watershed.

While the available data are unusually abundant and comprehensive, the myriad analyses the commenter claims are necessary have not all been conducted. While it is almost always possible to identify additional analyses that might be performed given infinite data and resources, permitting decisions must be made based on all the reasonably available information. Please see Response #7a and 7b relative to EPA's responsibility to interpret narrative criteria using the best available information and the role of scientific uncertainty in regulatory decision making.

TN, chlorophyll-a and Kd for the same period (page 22 of Exhibit 5), and argues that these data demonstrate that factors other than nitrogen and turbidity may be affecting eelgrass survival. Second, the Coalition's Criteria Memorandum attempts to characterize the organic matter component of turbidity, in order to show that a significant component of Great Bay Estuary turbidity is associated with inorganic matter and therefore not responsive to nitrogen control. EPA believes that both of these analyses are methodologically unsound and misleading and, accordingly, finds no merit in these conclusions, as set forth below.

Eelgrass Biomass in Lower Piscataqua River and Little Bay

Based on the data presented in the Coalition's Criteria Memorandum (from Beem and Short, 2009)), the Little Bay site shows a complete loss of eelgrass during the period from 2005 to 2007 with a median Kd of 1.06 m^{-1}, TN of 0.41 ug/l, and median chlorophyll-a of 3.0 ug/l. The Kd value and the TN concentration are greater than the proposed numeric thresholds. The Piscataqua sites show a complete loss of eelgrass, and TN and chlorophyll-a median values less than the proposed numeric thresholds. The Coalition concludes from these data that the decline in eelgrass in the Piscataqua River is not due to nitrogen and turbidity because the median TN and Kd do not exceed the proposed numeric thresholds. The Coalition notes the paucity of Kd values for both of these stations and paucity of all data for the Lower Piscataqua River-North stations.

In EPA's assessment, there is little confidence that the water quality in the Lower Piscataqua River has been adequately characterized. As even the Coalition notes, there are much less data available for the Lower Piscataqua River than there is for other parts of the estuary. The Lower Piscataqua River-North and -South assessment units are both listed as having insufficient information for determining nitrogen impacts. While the limited available data suggest that light attenuation coefficients and total nitrogen concentrations for these assessment units meet the proposed numeric thresholds, measured values of light attenuation and total nitrogen upstream (Upper Piscataqua River) and downstream (Portsmouth Harbor) of these assessment units exceed the proposed numeric thresholds. NHDES specifically addressed the issue of incomplete characterization in its *NHDES Great Bay Nutrient Report*, stating:

> "However, the results for the lower Piscataqua River are confusing because very little eelgrass remains in this area despite the apparent good water clarity (NHDES, 2008b; PREP, 2009). This discrepancy is most likely the result of incomplete data on water clarity in this area. Only a total of 13 K_d measurements have been made in the Lower Piscataqua River assessment zones (north and south). The measure median K_d in this area (0.50-0.59 m^{-1}) is lower than would be expected given the median values observed upstream (1.3 m^{-1}) and downstream (0.63 m^{-1}) and is probably not correct. (NHDES, 2009a at 56)."

Beem and Short (2009) showed that eelgrass decline has been most prevalent in the deeper portions of the Piscataqua River. Eelgrass at multiple locations along the river showed steep declines in biomass and percent cover from the early to mid 2000s until 2006 and 2007, when eelgrass completely disappeared. The decline, beginning in the deeper portion of the meadows in the Piscataqua, supports the premise that reduced water transparency is the causative agent.

Finally, it is possible that a site-specific factor may have contributed to eelgrass loss in this one

section of the Lower Piscataqua. The Lower Piscataqua is subject to unique stresses relating to intensive boating and shipping activities. NHDES again specifically addressed this issue, stating:

> "DES also acknowledges that other factors besides water quality can damage eelgrass populations, such moorings and poor substrate (see page 55). However, water clarity is a requirement for eelgrass survival. Without adequate water clarity, there would be no eelgrass present to be impacted by these other factors. The criteria presented in this report focus on the water quality requirements for light transmission needed for eelgrass survival."

(NHDES, 2009a at 79). The view that the entire analysis underlying the *NHDES Great Bay Nutrient Report* is invalid simply because eelgrass loss has occurred in one area where the criteria did not predict it to occur is unreasonable, not only in light of plausible explanations that might reasonably account for the anomaly (i.e., limited water quality data for this area do not adequately represent actual conditions or some site-specific factors other than water quality, such as vessel traffic may be at play), but also because of the complexity of the environmental context and the scientific analysis being undertaken.

A similar argument regarding eelgrass biomass and light attenuation is made in Exhibit 10 ("Review of New Hampshire Total Nitrogen Criteria Development for the Great Bay Estuary, January 11, 2011, memorandum prepared for John Hall by Hydroqual") ("HydroQual's Technical Memorandum"), which presents eelgrass biomass data in Great Bay proper from Morrison et al. (2008) for the years 1990-2004 and compares it to long-term nitrogen monitoring data at Adams Point. The analysis starts with the premise that "eelgrass biomass was considered to be a better indicator of eelgrass abundance and therefore used instead of eelgrass coverage." EPA believes that both eelgrass biomass and coverage should be used together, not one endpoint in lieu of the other. NHDES set forth a rational explanation for using only eelgrass coverage, stating:

> "DES, with input from the Piscataqua Region Estuaries Partnership (PREP) Technical Advisory Committee, spent considerable time researching the appropriate indicators for eelgrass habitat and concluded that eelgrass biomass data had too much uncertainty and insufficient quality control/quality assurance procedures to be used for regulatory purposes (DES, 2008). In order for data to be used for assessment purposes, EPA recommends, and DES requires (DES, 2010b), adequate metadata, documented procedures, and documented quality control/quality assurance. Therefore, for impairment determinations and nutrient criteria development, DES has used eelgrass cover as the indicator. Regardless, we believe that the trends in eelgrass biomass and cover tell the same story. Eelgrass biomass in Great Bay has declined by 64% since 1990, which is faster than the decline in eelgrass cover (37%) (PREP, 2009). Eelgrass biomass in Great Bay maintained high levels (>1500 metric tons) through 1996, before the current decline began. Trends in both eelgrass biomass and eelgrass areal extent indicate that the eelgrass population in the Great Bay Estuary is in steep decline."

(NHDES, 2011). Regarding the years of biomass mass data used in HydroQual's Technical Memorandum, NHDES noted in its Comments on HydroQual's Technical Memorandum (NHDES, 2011), "that the current dataset for biomass, which has been published and distributed

widely, extends for another four years to 2008. These data show that there is a statistically significant, declining trend for eelgrass biomass in Great Bay proper (see tables in PREP, 2009). It is not clear why HydroQual did not review the full dataset for eelgrass biomass. HydroQual did not provide a citation for the Morrison et al. (2008) report."

Using its biomass data and inorganic nitrogen data from Adams Point, HydroQual compiles a chart graphing eelgrass biomass and nitrate/nitrite concentration versus time (chart 1) and a second chart graphing eelgrass biomass and dissolved inorganic nitrogen (nitrate/ nitrite plus ammonia) concentration versus time (chart 2). HydroQual's Technical Memorandum, Figure 5. On chart 1, a line representing a nitrate concentration of 50 ug/l was also plotted. This figure corresponds to a literature value from Burkholder et al. (2007) at which direct eelgrass toxicity is triggered. From this chart, the Coalition concludes that eelgrass biomass was "abundant" despite nitrate concentrations exceeding 50 ug/l (although no biomass data is presented for those years) and that, "In [sic] several occasions, in Figure 5 (1988-2009 data), eelgrass biomass seems stable or even increasing when nitrate levels are greater than the stated threshold."

EPA has identified a number of flaws in these charts and the resulting conclusions being drawn from them. Nitrogen concentrations vary dramatically both geographically and temporally. The Coalition's charts represent nitrogen from one location in Great Bay proper and implicitly make the assumption that this one location is representative of the entire estuary. The nitrogen concentrations are also presented as annual averages, which masks any seasonal changes. HydroQual does provide a chart (Figure 6.1) that depicts seasonal changes in nitrogen concentrations, which shows that during the growing season (April to October) ambient nitrogen concentrations are substantially lower than during the non-growing season. Eelgrass biomass is a measure that is taken once a year, usually to depict peak biomass in any given year. Peak biomass at the latitude of Great Bay occurs between July-September. Nitrogen concentrations before the growing season and after the eelgrass biomass samples were collected have no impact on eelgrass biomass and therefore no relevance. The Coalition's analysis incorrectly characterizes the independent variable (nitrogen), thus any conclusion that they put forth on its effect on the dependent variable (eelgrass biomass) is invalid.

NHDES also pointed out many deficiencies in this analysis in its comments on this same document (NHDES, 2011). Primarily, NHDES observed that the effects of elevated nitrate are not immediate and their effects on eelgrass should be viewed over multiple years. When viewed that way, the data for the period from 1974 to 1981 show a median nitrate concentration of 51 ug/l, right at the threshold for direct effects, while the 1992-2009 data shows a median concentration of 81 ug/l, 62 % above the threshold for direct effects. NHDES further noted that it was likely that indirect effects, such as light attenuation, also played a role in eelgrass decline during this period, and concluded that the data do not support the conclusion by HydroQual that eelgrass biomass increased when elevated median nitrate concentration were above the threshold for direct effects.

Finally, Hydroqual cites its graph of inorganic nitrogen and biomass and concludes that increasing inorganic nitrogen concentrations may be the result of decreased eelgrass biomass. This conclusion is inconsistent with accepted eutrophication models, reversing cause and effect. It is far more likely that the increasing nitrogen concentrations resulted in the decline of eelgrass than it is that declining eelgrass (by some other mechanism) resulted in increased inorganic nitrogen of the magnitude seen in the data, especially when viewed in context with nitrogen load

estimates made by EPA for the years of 1962, 1974, and 1998 using the Nitrogen Loading model developed by Valiela et al. (1997), that show increasing nitrogen load to the estuary from land-based sources. (Latimer et al., 2009). In addition, eelgrass is not the only primary producer in the system that uses nitrogen. Great Bay proper has seen substantial increases of macroalgae, which would capitalize on nitrogen in the water column. Macroalgae is a more efficient scavenger of nitrogen from the water column than eelgrass. Eelgrass absorbs nitrogen from the sediments, while macroalgae must absorb nitrogen directly from the water column.

Components of Turbidity and Effectiveness of Nitrogen Controls

EPA also finds no merit in the Coalition's second claim, i.e., that the Coalition's Criteria Memorandum (Exhibit 5) "confirm[s] that . . . controlling nitrogen cannot ensure attainment of the transparency objectives underlying the 0.3 mg/l TN water quality objective used as the basis of this permit modification."[42] The Coalition uses as a point of departure for its argument basic information from the *NHDES Great Bay Nutrient Report*, specifically:

- Water clarity is a function of absorption and scattering of light by phytoplankton, turbidity, colored dissolved organic matter (CDOM), and water itself. (page 61, first para).

- On average, 32 percent of light attenuation is due to water itself, 29 percent is due to turbidity, 27 percent to CDOM, and 12 percent is due to chlorophyll-a (page 61, third para).

- Light attenuation due to water and CDOM cannot be controlled. CDOM is primarily due to the decomposition of plants and organic soils in the watershed and is not controllable, leaving attenuation due to turbidity and phytoplankton as the only controllable components (page 61, first para).

On the basis of this information, and Morrison et al. (2008), the Coalition purports to show that phytoplankton and organic particulate matter play such a small role in reduced light attenuation that control of this component will not result in attainment of the light attenuation thresholds and will not therefore protect eelgrass. Their calculations lead them to the conclusion that inorganic, rather than organic particles are causing reduced clarity. This is erroneous.[43]

In general terms, the *NHDES Great Bay Nutrient Report* and EPA's interpretation of the New Hampshire narrative nutrient standard are based on multiple lines of evidence, including site-specific data and analyses of other estuaries, and demonstrate a clear relationship between nitrogen, eelgrass, and turbidity. More recent analyses conducted by NHDES documented the relationship between light attenuation and increasing nitrogen concentrations in the Great Bay

[42] This analysis appears on pages 18-21 of the Exhibit.

[43] These same basic issues were raised in HydroQual's Technical Memorandum, but the estimates regarding the inorganic versus organic components of turbidity were done differently in the two reports. NHDES responded to this analysis in its "Comments from the New Hampshire Department of Environmental Services on HydroQual's Technical Memorandum dated January 10, 2011." NHDES did not prepare a response to the Coalition's Technical Memorandum.

Estuary, even when evaluating areas of the estuary separately. The same relationship is evident between total nitrogen and algae growth (see NHDES, 2012a).

In the Coalition's Criteria Memorandum, the Coalition parses turbidity into organic and inorganic components using a chart relating average turbidity to particulate organic carbon (the basic chart is Figure 35 in the *NHDES Great Bay Nutrient Report*) and then overlaying a line that purports to relate POC to turbidity. This line is based on an assumption that one mg/l of organic carbon is equal to two mg/l of suspended solids, and that turbidity in NTU equals TSS in mg/l multiplied by 0.5. Finally, the Coalition estimates turbidity due to inorganic matter by the difference between the NHDES regression line correlating turbidity to particulate organic carbon and a line purporting to predict turbidity for a given value of POC.

EPA has reviewed this chart and the underlying calculations, and it is unclear why the Coalition concludes that the difference between the two lines on the graph represents turbidity due to inorganic matter. A more reasonable interpretation is simply that their estimates of turbidity associated with particulate organic matter, based on a theoretical relationship between POC mass and turbidity, do not agree with the measured data. Organic matter in general is less dense than inorganic matter, has greater surface area to volume ratio (Madej, 2005; Sedell et al. 1978), and has different optical properties. A given mass of POC is therefore expected to result in greater turbidity, measured in NTU, than would result from inorganic matter alone or a mix of organic and inorganic. Use of conversion factors that are not based on organic matter will inevitably understate the POC component.[44] HydroQual fails to explain why their theoretical (and seriously flawed) estimates should be considered superior to the measured data, and EPA finds no merit in these conclusions.

A similar methodological flaw is seen in the HydroQual Technical Memorandum (Exhibit 10), where HydroQual uses a different method of parsing turbidity into organic and non-organic components using suspended solid samples it collected in 2010. Based on these samples, it estimated the non-volatile suspended solids component of the total suspended solids samples collected in 2010 as 85 percent (making the volatile suspended solids VSS component 15 percent) and then concludes that this relatively low VSS percentage, which is attributable to algae and other plant life, means that the primary driver in water quality clarity is inorganic material.

NHDES identified the fundamental flaw in the calculations in the HydroQual Technical Memorandum relating TSS to turbidity, pointing to scientific literature showing that it is incorrect to assume that weight, as measured by TSS, is a measure of optical properties of particles, which are rather a function of particle size, shape, and composition, and that organic particles, having lower densities than inorganic particles will have more particles for a given unit weight. (NHDES, 2011). NHDES also added the 2010 data provided by the Coalition to its database and found that these data were consistent with data collected in previous years. NHDES analyzed the data provided by HydroQual and found that the only component of TSS

[44] As an example, assuming that the estimate in Exhibit 10 of 15% organic matter (by mass) is correct, that would correspond to approximately 32% of the total volume of suspended sediment (based on the density difference between inorganic and organic matter) and an even higher percentage of surface area. NHDES's finding that 47% of turbidity could be explained by particulate organic carbon therefore is not contradicted by the HydroQual analyses.

significantly related to water clarity was chlorophyll-a

Furthermore, there is no analysis provided in the Coalition's Criteria Memorandum (Exhibit 5) of the actual impact of reducing POC and chlorophyll-a on light attenuation, simply a conclusion that nitrogen control will not appreciably reduce the long term Great Bay median light attenuation of 1.11/m to the threshold value of 0.75 /m. Similarly in HydroQual's Technical Memorandum (Exhibit 10), HydroQual simply asserts that because chlorophyll-a is quite low, algae are a "minor contributor" to the reduction in water column transparency, consistent with the Morrison results.

In EPA's estimation NHDES assessment provided a far more reasonable explanation than the Coalition of the role of organic matter in turbidity in its *Great Bay Nutrient Report*. As described in that report, NHDES paired particulate organic carbon measurements with corresponding chlorophyll-a measurements and then performed calculations estimating the amount of organic carbon that would be associated with the chlorophyll-a measurements (NHDES, 2009a at Figure 34). NHDES then compared the particulate organic carbon predicted from chlorophyll-a to the measured particulate organic carbon. Based on these comparisons NHDES estimated that only about 5 percent of the particulate carbon was associated with living phytoplankton, meaning the remainder was due to zooplankton and other consumers, and detrital organic matter. DES further showed that particulate organic carbon accounts for about 47 percent of the turbidity variance. Turbidity due to inorganic matter does account for a portion of the total turbidity, but not to the extent concluded by the commenters.

Additionally, the response to comments included with the *NHDES Great Bay Nutrient Report* documented the role of increasing TSS as a result of eelgrass decline, which further exacerbates the light attenuation factor. This pattern of increasing suspended solids concentrations following eelgrass loss is a negative feedback cycle that has been documented in the scientific literature (Burkholder et al., 2007). The physical presence of eelgrass reduces sediment suspension by binding the sediments with its roots and rhizomes and its leaves, facilitating particle deposition (Burkholder et al., 2007). The loss of the physical presence of eelgrass allows for sediments to be resuspended back into the water column. The increased turbidity from destabilized sediments further decreases light availability for the eelgrass, meaning it is likely that a portion of the inorganic matter component of turbidity would be controlled if nitrogen was reduced and eelgrass restored.

Moreover, organic matter–driven light attenuation is the largest component of light attenuation that is controllable (as the Coalition has indicated, some inorganic-driven light attenuation may be controllable through BMPs on nonpoint sources). Even if control of this component is not sufficient to achieve the light attenuation thresholds, it will improve light transmittance and significantly benefit eelgrass. As described earlier, as eelgrass is restored, reductions in inorganic matter in the water column would be expected.

NHDES further documented in its Comments on HydroQual's Technical Memorandum that HydroQual's analysis of the water quality data it collected in 2010 failed to consider their own measurements of water clarity. "When these data are included, the study provides more evidence that phytoplankton, and therefore nutrients, are important factors for controlling water clarity in Great Bay." NHDES further notes that HydroQual's claim that total nitrogen load reductions to Great Bay will not substantially improve the water column transparency, "…is not supported by

any of the data or analysis included in HydroQual's Technical Memorandum. HydroQual improperly constructed a time series of water quality trends, analyzed a small subset of the available dissolved oxygen data, and then failed to analyze water clarity measurements made for its own study in 2010." (NHDES, 2011)

In summary, EPA concludes that the Hall/Hydroqual conclusions that "(1) transparency in the Bay was not materially impacted by increased algal growth during the period of significant eelgrass decline and that (2) controlling nitrogen cannot ensure attainment of the transparency objectives underlying the 0.3 mg/l TN water quality objective used as the basis of this permit modification are not supported by the available data," and their methods attempting to demonstrate these propositions, are scientifically flawed.

Finally, the characterization in the comment regarding Dr. Short's understanding of the role of transparency on eelgrass health is incomplete and misleading. While transparency is a less important factor in Great Bay proper, due to the shallow depths, it is a contributing factor and in the tributaries it is a more significant factor (personal communication with Fred Short). Great Bay proper is a relatively shallow water body, which mitigates the effects of low light transmittance. The light attenuation thresholds applicable to Great Bay proper were developed to ensure adequate light transmittance to a depth of two meters. Many areas of Great Bay proper have mean depths less than two meters (low tide depths less than one meter) meaning that eelgrass beds in these locations may get adequate light to survive even though the light attenuation factor was not achieved.

To the extent that the Coalition is basing its arguments on the fact that some eelgrass remains in Great Bay proper in spite of the median nitrogen concentration exceeding the proposed numeric thresholds, this was predicted by NHDES in the *Great Bay Nutrient Report* in the simplified model it ran using the measured light attenuation to predict the presence or absence of eelgrass beds (see pages 55-57). This model did not predict either the complete presence or the complete absence of eelgrass beds in Great Bay proper. Rather, the model produced values indicating a declining eelgrass presence, consistent with the measurements of both eelgrass cover and biomass.

While other factors such as disease can results in eelgrass loss, the nature of the observed decline is not consistent with such other causes. Eelgrass meadows suffering from chronic light limitation exhibit a predictable response. Shoot density declines to reduce self-shading and increase light reaching the remaining shoots. As a result, biomass will also decline. Decline in the areal extent of coverage is the final response with the deep edge of the meadow retreating into shallower water. In contrast, disease outbreaks are very distinctive as the leaves turn black and entire meadows will die and disappear within weeks to month. The recent declines observed in Great Bay, the tributaries and the Piscataqua River were chronic in nature, occurring over a number of years (Beem and Short, 2008). The pattern of the decline, one of a downward trend over 6 years, is indicative of a long-term decline in environmental conditions. Eelgrass is an excellent indicator species and would be more sensitive to water quality changes than random point sample measurements. The plants are integrators of conditions around the clock, not just a reflection of a few instantaneous points in time. Thus, they could respond to subtle changes in water quality that point source water quality testing with limited sampling power may not detect.

EPA also notes that *even if* it were to accept the Coalition's argument and the light attenuation criteria was proven to be incorrect, NHDES provided multiple lines of evidence that support only slightly less stringent nitrogen criteria necessary to support eelgrass. Specifically, a criteria based on observed concentrations in waters where eelgrass is still healthy (Portsmouth Harbor) is 0.34 mg/l, the criteria to protect against macroalgae replacement of eelgrass is 0.38 mg/l (in Great Bay proper), and criteria in other estuaries in New England range from 0.35 to 0.38 mg/l. The median total nitrogen concentration in the Lamprey River is 0.451 mg/l and the median in Great Bay proper is 0.421 mg/l, both exceeding any of the eelgrass criteria developed by NHDES. The Lamprey median value is also at the DO criteria.

Comment #25: EPA has also asserted that the Newmarket discharge is responsible for low DO conditions found in this system. (*See* Fact Sheet @ 28-29.) That position is plainly misplaced. Analysis of data for the Lamprey River showed that low DO's occurred where low algal growth existed due to the system hydrodynamics and stratification. (*See* Pennock (2005), cited in *Numeric Nutrient Criteria for Great Bay – draft* (NHDES 2009) at 51 (hereafter 2009 DES Report)). None of the river-specific data indicated a significant relationship between minimum DO and algal growth, confirming that (1) preliminary impairment causes of low DO were not well supported, and (2) the system wide analysis used by DES to generate the DO-based TN numeric criteria provided misleading results.

DES' consideration of this information is what led the parties to conclude that a water quality model was required to properly assess the components affecting the DO regime and the remedial measure appropriate for improving the DO condition (assuming it is not otherwise natural). Therefore, EPA's reliance on the DES assumption that algal growth is the key factor influencing this DO condition is premature at best, if not demonstrably incorrect.

Response #25: It is well documented that stratification, which occurs in the Lamprey River but not in the Squamscott River, can amplify dissolved oxygen impairments (see NHDES, 2009a at 51). It is also well documented that the Lamprey River has high chlorophyll-a levels and high total nitrogen levels (NHDES, 2009 at 30).

Lamprey River median total nitrogen (mg/l) = 0.451
Range (mg/l) = 0.265 – 0.97
Chlorophyll-a Median (ug/l) = 3.12
Chlorophyll-a Range (ug/l) = 0.33 - 145.45

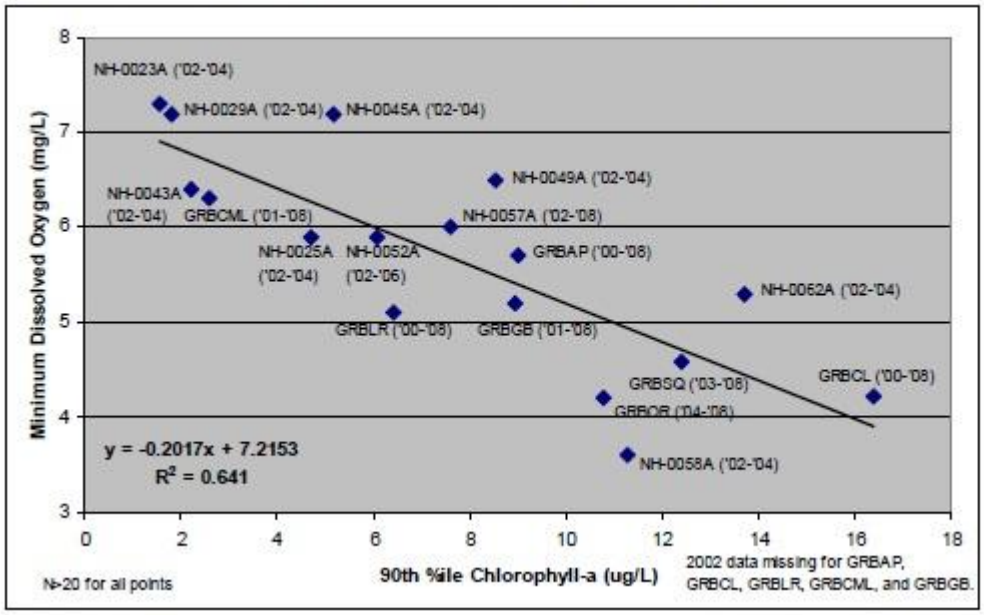
While Pennock (2005) does state, "The vertical profiles taken during the surveys do suggest that there is a significant stratification in the upper reached of the tidal portion of the Lamprey River," the study also states, "These results suggest that low dissolved oxygen is a concern for the upper tidal reaches of the Lamprey River. Whether this is a long-term (and natural?) characteristic of this system or whether human perturbation (e.g. historic dam building, dredging/deepening of the basin, enrichment of oxygen consuming organic or inorganic runoff/water, etc…) would require a detailed study of the biological and chemical demand in the system.

It is not clear on what basis the Coalition cites Pennock (2005) for the proposition that low DO occurs "where low algal growth existed"; the dataset reported in Pennock did not include chlorophyll-a or other measure of algal growth and the Pennock report does not mention algae or

chlorophyll-a. Indeed, on two of the sampling dates for this study (August 12, 2004 and October 26, 2004), the data sonde in the Lamprey River shows periods of dissolved oxygen supersaturation which is indicative of excessive algal growth. (Pennock, 2005 at Figures 4 and 5). So, while stratification in this system is an issue, high levels of nitrogen causing algal blooms also affect dissolved oxygen concentrations as well.

EPA also disagrees with the assertion that "[n]one of the river-specific data indicated a significant relationship between minimum DO and algal growth." Long-term trend monitoring from the tidal rivers, including the Lamprey River, are part of the statistical analysis performed by NHDES in connection with the proposed numeric thresholds showing a statistically significant relationship between minimum DO and 90th percentile chlorophyll-a. (NHDES, 2009, Figure 27 (reproduced below)). Data from NH-0025A, at the mouth of the Lamprey River, is fully consistent with the overall trend. NHDES did note that the GRBLR datasonde, located just below the tidal dam in the Lamprey, should be used with caution because "dissolved oxygen impairments were observed but were likely amplified by stratification and possibly sediment oxygen demand"; so that a 0.45 mg/l threshold for the estuary as a whole would be used, even though dissolved oxygen violations were encountered at GRBLR with a median TN concentration of 0.451 mg/l. The major implication of the GRBLR data is that the Lamprey River may be more sensitive to algal growth and nitrogen concentrations due to stratification effects; the Coalition has failed to suggest any interpretation that would indicate that a *higher* TN threshold would be sufficiently protective in such a stratified environment.

Figure 27: Relationship between Minimum Dissolved Oxygen and Chlorophyll-a at Trend Stations



The comment also mischaracterizes the conclusions of the Jones (2007) report. While that study did not find a clear link between DO levels and nutrient and chlorophyll-a concentrations based on the specific dataset, the study states that this may be due to the complexity of the system and the potential for the "oxygen demanding processes that are stimulated by nutrients" to take place in areas other than the immediate vicinity of the outfall pipe. The report specifically states that

"the widespread low DO levels on 8/19/05 downstream of the WWTF may have been caused by discharged nutrients, as well as the more confined low DO levels observed on 8/5/05. The elevated chlorophyll *a* levels observed downstream of the Exeter WWTF on two dates also supports this scenario." (Jones, 2007 at 37).

EPA disagrees that the Coalition's proffered information undermines support for the causes of DO impairment that form part of the basis for the permit limits, or that there is anything misleading about the system-wide analysis performed by NHDES. In fact, given the complexity of the ecological setting, the variability of tidal systems and the time lag between stressors and responses in eutrophic settings, short-term, limited sampling and monitoring of the type presented in the comment would not be expected to demonstrate statistically significant relationships among these variables. Contrary to the commenter's assertion, this does not indicate lack of correlation or causation, but instead underscores the inconclusive and potentially misleading nature of short-term analyses of such systems based on limited data. The analysis presented in the Fact Sheet, based on multiple long-term, comprehensive and system-wide datasets, is a superior methodology and confirms the relationship between DO and chlorophyll-a in the Lamprey River.

With respect to "the parties" and their "conclu[sion] that a water quality model was required," EPA assumes this is a reference to the MOA, to which EPA was not a party and the conclusions of which EPA does not share. See Responses #15 and 16 relative to the MOA. The fact that NHDES believes that a collaborative effort to build a dynamic, calibrated hydrodynamic water quality model would, if successful, help resolve some of the scientific uncertainty associated with dissolved oxygen and nitrogen impairments in no way suggests that EPA's interpretation of the narrative nutrient criteria and establishment of a water quality-based nitrogen limit are incorrect or should be indefinitely delayed while awaiting such a model. In any case, the MOA refers to a model of the Squamscott River, not the Lamprey, and modeling of the Squamscott River is not underway. See Response #13. EPA observes that the Coalition has made extremely minimal progress in developing such a model, and indeed may even have abandoned that effort for the time being, so there is no obvious reason to delay issuance of the permit. The most recent information from the Coalition indicates the intent to defer development of a water quality model until after upgrade of the Exeter WWTF to an activated sludge system. (Peschel, 2012 ("modeling the further effects of TIN reduction on the system is not practical at this time"); HydroQual, , 2012 ("A decision on the benefit of further Exeter effluent TN reduction should be made with a calibrated water quality model, preferably calibrated with river field data collected after the Exeter WWTP upgrade")). Also, as noted previously, the State continues to believe that the proposed numeric thresholds represent the best available information for assessing whether the narrative water quality criterion is being met as evidenced by the use of the thresholds in determining water quality impairments for the recently released draft 2012 303(d) list. (NHDES, 2012b).

Finally, EPA did not, as characterized in the comment, "rely" on any "DES assumption" regarding the relationship between DO and algal growth. EPA has conducted an independent review of the available data, including but not limited to the analyses performed by NHDES and the additional information provided by the Coalition, and has concluded as a technical matter that DO impairments in the Lamprey River are related to algal growth. The information cited in the comment does nothing to disturb that conclusion.

Comment #26: The Bay does have a macroalgae problem due to invasive species, as confirmed by several UNH researchers. (*See* Exs. 21 and 22 – MOA Group Meeting Minutes.) However, the degree of nitrogen control necessary to address that issue is not known. The 2009 DES Report hypothesized that possible Great Bay TN objectives to address this area of concern might range from 0.34 - 0.38 mg/l TN. DES estimates that somewhere between a 10-20% TN reduction may be needed to reduce the growth of such species. (*See* 2009 DES Report.) This level of reduction would reflect TN levels in the mid-to late-1990s when macroalgae growth was minimal. Subsequent MOA group meetings indicated that DIN, not TN, would be the form of nitrogen that could control macroalgae growth. It is reasonable that a mid-range reduction of 15% TIN would be used as a starting point, given the uncertainties with this endpoint and the lack of understanding regarding the ability to control the invasive species. This level of reduction would not require point sources to achieve TN limits less than 8 mg/l which would ensure municipal loads (and likely system DIN loads) are well below pre-1990 levels when macroalgae growth was minor. Thus, there is no basis for EPA to conclude that a 3 mg/l TN level is necessary to protect the Bay or the tidal rivers from cultural eutrophication.

Response #26: EPA agrees that nuisance algae spurred by excess nitrogen is among the nutrient-driven problems afflicting Great Bay proper. However, EPA does not agree that the degree of nitrogen control necessary to address that issue is unknown. In EPA's judgment, NHDES identified a reasonable range of nitrogen levels to control macroalgae of 0.34-0.38 mg/l. (NHDES, 2009a). EPA also does not concur with the Coalition's premise that meeting the macroalgae nitrogen threshold will alone be sufficient to comply with the Act, in light of the instream thresholds relative to eelgrass in Great Bay proper and eelgrass/dissolved oxygen in the Lamprey River that EPA has concluded will attain and maintain applicable water quality criteria and fully protect designated uses. (see Response #7a and 7b).

Even if the macroalgae threshold (0.34-0.38 mg/l) were the only one that needed to be met, a 15% reduction in the ambient total nitrogen concentration in Great Bay proper (from the existing 0.42 mg/l to 0.36 mg/l (midpoint of thresholds)) requires a greater than 15% reduction in the watershed nitrogen loadings, as shown below.[45]

Since ocean water also contributes nitrogen and is not susceptible to reduction, the relationship between watershed load reduction and reduction in ambient concentration is not one-to-one (see NHDES Nitrogen Reduction Report. To explain further, if salinity = 9 ppt (Lamprey GRBLR ave) and ocean water is 32 ppt , using the equation $Q_0/Q_{fw} = S/(S_0-S)$, the ratio of ocean water to fresh water (Q_0/Q_{fw}) is 9/(32-9) or 0.39, or 39 parts ocean water to 100 parts fresh water.

So, for a freshwater concentration of 1 mg/l and an ocean water concentration of 0.2 mg/l (constant), the resulting ambient concentration would be:

$$[(1*100) + (0.2*39)]/139 = 0.78 \text{ mg/l.}$$

[45] EPA is assuming for the moment there is a reasoned or rational basis for selecting this particular percent reduction, which EPA does not perceive from the comment. Why the existence of uncertainty would lead the commenter to select this value is not clear.

A 15 percent reduction in freshwater concentration (0.85 mg/l) would yield an ambient concentration of:

[(0.85*100) + (0.2*39)]/139 = 0.67 mg/l (a 14 percent reduction)

So, because of the limited dilution from seawater there is almost a 1 to 1 relationship between freshwater reduction and ambient reductions in the Lamprey.

For an area with more seawater dilution, the relationship between freshwater concentration reduction and ambient concentration reduction changes. For Great Bay proper, with a salinity of about 20 (GRBGB), the ratio of ocean water to freshwater is 20/(32-20) or 1.67, or 167 parts of ocean water for 100 parts of freshwater.

So, for a freshwater concentration of 1 mg/l and an ocean water concentration of 0.2 mg/l the resulting ambient concentration would be:

[(1*100) + (0.2*167)]/267 = 0.50 mg/l.

A 15 percent reduction in freshwater concentration (0.85) would yield an ambient concentration of:

[(0.85*100) + (0.2*167)]/267 = 0.44 mg/l (an 11 percent reduction).

So, a given freshwater concentration will result in a higher instream concentration in a less diluted (lower salinity) portion of the estuary than in a more diluted (higher salinity) portion. This can be seen by comparing the 0.78 mg/l ambient concentration calculated for the Lamprey River with the 0.49 mg/l calculated for Great Bay proper using the same freshwater concentration.

However, a change in the freshwater concentration will have a lesser impact in the area with more dilution than it will in the area with lower dilution. This can be seen by comparing the percent reduction value of 14 percent in the Lamprey River calculations to the 11 percent reduction calculated for Great Bay proper. This effect is due to the nitrogen in the ocean water, which contributes a much greater amount of nitrogen in the high dilution areas than in the low dilution areas, which tends to reduce the effect of reducing freshwater contributions.

Thus, even if the nitrogen criteria were 0.36 mg/l, achieving this threshold would still require a point source limit of 3.0 mg/l and additional, although somewhat reduced, levels of nonpoint source control. See also Responses #7c and 7d.

The comment's suggestion of an 8 mg/l permit limit seems not to be based on any analysis of limits to achieve a particular nitrogen threshold (0.38 mg/l or otherwise), but on "ensur[ing] municipal loads are well below pre-1990 levels when macro algae growth was minor." This is not an appropriate basis for a permit limit. First, there is no basis for the claim that simply restoring nitrogen levels to mid-to late 1990s conditions will be sufficient to achieve standards. The loss of eelgrass and proliferation of macroalgae and epiphytes often lags behind the tipping

point in an estuary as measured by nitrogen concentrations (Bricker et al., 2007). See Responses #3 and 14. Second, this suggestion considers only municipal loads, and fails to account for the significant increases in nonpoint source loads that have taken place in the interim.

Comment #27: As noted above, EPA is recommending regulation of the wrong form of nitrogen. The invasive species and macroalgae are stimulated by excess inorganic nitrogen; therefore, the form of nitrogen to control would not be TN, which contains a substantial organic N component not available for plant growth. Given the system dynamics and relatively short detention time (18 days – Fact Sheet @ 12), there is no reason to believe that organic nitrogen cycling plays any role in stimulating plant growth in this system. Furthermore, no analysis shows that it is a significant factor influencing plant growth in this system. If nitrogen control is necessary to address excessive plant growth (via macroalgae), then only inorganic nitrogen forms need to be regulated. Likewise, there is no information showing that TN versus TIN would be the appropriate parameter to regulate in the tidal rivers (assuming it is the pollutant controlling algal growth – another undocumented assumption). The detention time in the Lamprey River is even shorter (estimated about 1.5 days) rendering this form of nitrogen completely irrelevant in that part of the system. EPA's July 29, 2011, FOIA response regarding the Squamscott River, herein incorporated by reference, has acknowledged that EPA has no information regarding the degree to which organic nitrogen converts to inorganic nitrogen in this system. (*See* July 29, 2011, EPA Response to FOIA Request No. 01-FOI-00148-11.) Absent such information, regulating this nitrogen form is not scientifically defensible.

Response #27: EPA disagrees that limits should be in terms of total inorganic nitrogen rather than total nitrogen. Consistent with recommendations in EPA Nutrient Criteria Manual, because of the recycling of nutrients in the environment it is best to limit total concentrations (i.e. total nitrogen) as opposed to fractions of the total (EPA, 2001). The *NHDES Great Bay Nutrient Report* document also indicates that "Nitrogen cycling results in constant shifts between the different forms of nitrogen. Setting criteria for dissolved inorganic nitrogen is problematic because the concentrations of this species is drawn down or fully depleted during periods of high productivity. Therefore, DES believes that total nitrogen is a more stable indicator to use for the water quality criteria. In guidance for establishing nutrient criteria for estuaries, EPA identified total nitrogen as the causal variable of specific concern." (NHDES, 2009a at 79 (citing EPA, 2001)). In addition, recent research has documented that forms of nitrogen considered unavailable for plant growth are far more bioreactive than previously thought, further supporting the need to control total nitrogen rather than just DIN. (Wiegner et al., 2006; Sedlak, 2011 (portion of DON that is not bioreactive is only 10 – 29% of the effluent DON); Filippino et al., 2010 (between 31% and 96% of the effluent derived organic nitrogen (EON) was removed during biotic bioassays within the first 2 days)).

Comment #28: Coalition analyses show that, by achieving an 8 mg/l TN value, inorganic nitrogen loadings during the period of concern for macroalgae (May/June to September) will produce DIN loadings well below mid-1990 levels. (*See* Exs. 24 and 25 – DIN loading analysis and the reduction in DIN associated with an 8 mg/L TN limit for the Lamprey). This provides reasonable assurance that narrative criteria will be met through a lesser level of TN control over the next 10 years. Consequently, EPA's proposed limits [sic] of 3 mg/l TN is clearly more restrictive than needed to achieve applicable water quality objectives. The proposed permit

should be withdrawn and republished to reflect an 8 mg/l TN level of treatment should be sufficient to abate the increases in macroalgae that have occurred in the system.

Response #28: The comment's suggestion of an 8 mg/l permit limit seems not to be based on any analysis of limits to achieve a threshold nitrogen criterion (0.38 mg/l or otherwise), but on "ensur[ing] municipal loads are well below pre-1990 levels when macro algae growth was minor." This is not an appropriate basis for a permit limit. First, there is no basis for the claim that simply restoring nitrogen levels to mid-to late 1990s conditions will be sufficient to achieve standards. The loss of eelgrass and proliferation of macroalgae and epiphytes often lags behind the tipping point in an estuary as measured by nitrogen concentrations (Bricker et al., 2007). *See* Response to Comment 24. Second, the Coalition predicates its conclusions from the DIN loading analysis on the control of macroalgae in the system, which is incorrect. As explained in Responses #26, macroalgae is not the only concern within the system. Algal blooms (particularly in the tidal tributaries), epiphytic growth, and direct toxic effects to eelgrass are also concerns within the Great Bay Estuary. Third, this suggestion considers only municipal loads, and fails to account for the significant increases in nonpoint source loads that have taken place in the interim.

EPA also notes several errors in the Coalition's DIN analysis as shown in Exhibits 24 and 25. First, the analysis uses only a subset of the relevant data. While Exhibit 24 shows average NPS DIN loads of 146 lb/day to the Lamprey River, Exhibit 25 shows a Lamprey NPS load of approximately 110 lbs/day. The Coalition explains this elsewhere as the result of excluding the non-point source loads from 2006 – 2009 because these were "more than a hundred year wet period." Ignoring these years is not appropriate because it underestimates the nitrogen contribution from the tributaries. Further, water quality standards are not just intended to be met under average rainfall years. EPA also notes that rainfall data presented by the Coalition show an increasing trend in the amount of rainfall.

Second, the Coalition drastically underestimates the DIN load that would result from a permit limit of 8 mg/l. The Coalition's Exhibit 25 is based on an assumption that a monthly average permit limit of 8 mg/l TN would require the treatment plant to meet a long term average (LTA) of 6 mg/l TN, and that only 3 mg/l of that nitrogen is DIN. The Coalition provides no references in support of those assumptions, and EPA disagrees with those assumptions. With respect to the LTA, the relationship between a monthly average permit limit and the long term average concentration is dependent on the variability of the effluent and the number of samples taken per month. (EPA, 1991).[46] The assumption of a LTA of 6 mg/l, where sampling occurs 8 times per month, represents a high level of variability from a treatment process and appears unwarranted. More importantly, the assumption of 3 mg/l DIN equates to an assumption that 3 mg/l of effluent TN is organic. This is inconsistent with the available data, which indicates less than 2 mg/l of effluent nitrogen is organic in effluent from BNR systems (Sattayatewa et al., 2010; range of

[46] The relationship is set forth in EPA's Technical Support Document for Water Quality Based Toxics Control (EPA, 1991) as follows:

Average Monthly Limit (AML) = LTA * $\exp[2.326\sigma_n - 0.5\sigma_n^2]$; where
n = number of samples per month;
$\sigma_n^2 = \ln[(CV^2/n) + 1]$; CV = coefficient of variation
2.326 = z-value for 99th percentile probability basis

average effluent organic N from four BNR plants was 0.7 to 1.3 mg/l). Using more appropriate assumptions of a 0.2 coefficient of variation (EPA, 2008b at 2-58, Table 2-1) and an effluent organic nitrogen concentration of 1.1 (the average of the four plants sampled in Sattayatewa et al., 2010) mg/l would result in DIN concentrations of approximately 6 mg/l, or double the Coalition's estimate. See also RIDEM (2005), equating a TN limit of 8 mg/l with DIN concentration of 6 mg/l for purposes of permit limits in the Narragansett Bay watershed.

Finally, the Coalition ignores the contribution of dissolved organic nitrogen (DON) from the tributaries. Once in the estuary DON can convert to the more readily available DIN, therefore the analysis underestimates the total DIN contribution from the tributaries. For the reasons explained in Response #27, EPA believes that it is necessary to regulate total nitrogen as opposed to DIN.

Comment #29: EPA's beliefs that transparency is controlling eelgrass growth in Great Bay and that increased nitrogen is the cause of reduced transparency are misplaced (as also recently clarified by Professor Short). For nitrogen to affect transparency, it must cause increased and excessive chlorophyll-a levels. (*See* EPA Fact Sheet @ 14.) The historical data evaluations presented for Great Bay confirm that average algal growth increases have been slight and therefore could not have been the underlying cause of eelgrass decline occurring throughout the system. The PREP Environmental Indicators Report - 2009 shows that from 1993-2000 chlorophyll-a levels did not increase and averaged about 2.5 ug/l. (*See* 2009 PREP Report, Figure NUT3-5.) This was also confirmed by time series analysis of the data. (*See* Ex. 8). Therefore, algal growth induced transparency decreased and could not have played any role in eelgrass declines during this period, as EPA has assumed. This same PREP Report figure shows that algal levels increased by about 1 ug/l from 2001-2008. These are very low levels of primary productivity and minor changes in average system productivity that produced trivial changes in light penetration. Such algal growth in the Bay was demonstrated by Morrison to be a minor component affecting transparency. (*See* 2009 DES Report @ 61; Ex. 9.) EPA's peer review also noted that the Great Bay did not exhibit substantial algal growth and that, therefore, limited transparency benefits could be obtained by attempting to reduce algal growth in the Bay.

The various references to the 2003 and 2006 PREP reports cited by EPA confirm that, even though nitrogen levels have "increased by 59% in the past 25 years, the negative effects of excessive nitrogen, such as algal blooms and low dissolved oxygen levels, are not evident." (Fact Sheet @ 18.) Thus, the ability of nitrogen to affect transparency through algal growth in this system, at this time, is not very significant. It is not apparent how EPA could conclude that a limit of technology approach for nitrogen is necessary to restore eelgrass populations by improving transparency, given these regulatory findings and the relevant sampling data. HydroQual's analysis of transparency impact (Ex. 10), dated January, 2011, confirms that attaining the proposed TN standard will only change ambient transparency by about 5% and cannot possibly ensure that the intended level of transparency (assuming it was needed to protect eelgrass growth) will be achieved in the Bay. Thus, the proposed TN criteria for ensuring that transparency goals will be met is neither necessary nor appropriate.

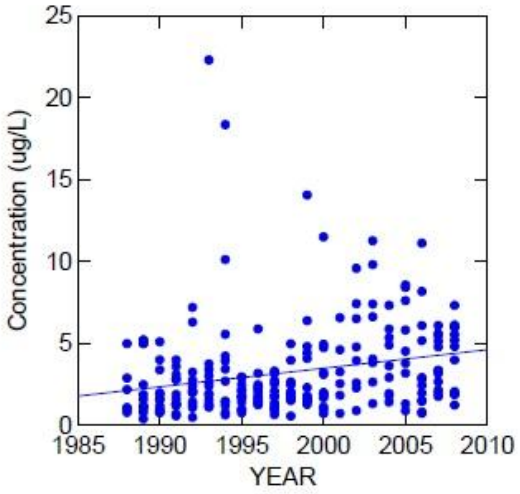
Regarding DO in the tidal rivers, it should be noted that the more recent assessments indicate that low DO conditions occurred less frequently from 2005-2008 than occurred earlier in the

decade. (*See* 2009 PREP Estuaries Report NUT 5-1 to 5-5.) Thus, the DO data demonstrate that there is not a direct connection between low DO and TN levels, as the *higher* TN levels and loadings have produced the *better* DO conditions. Clearly, EPA's misplaced generalizations regarding trend data and the influence of TN on transparency and DO conditions in the estuary do not provide a scientifically defensible basis for imposing stringent TN limitations in the Newmarket permit as the "cure" for the alleged transparency and DO impairments.

Response #29: Changes in chlorophyll-a concentrations are only one factor in water column transparency. EPA's chief concern is the quantity of light that reaches eelgrass. Ambient light that reaches eelgrass is reduced by a variety of factors, including changes in water column transparency, the proliferation of macroalgae that overgrows the bottom and eelgrass and epiphytes on the leaves of eelgrass shoots.

EPA disagrees with the Coalition's contention, based on selective use of data, that chlorophyll-a concentrations in Great Bay did not increase between 1993 and 2000. The average annual concentrations shown in Exhibit 8 masks the trend that is apparent when the full dataset is considered. The PREP 2009 Environmental Indicators Report Figure NUT3-1, reproduced below, shows a clear increasing trend between 1988 and 2008, with very obvious peaks in maximum chlorophyll-a in 1993 and 1994, just prior to the documented onset of eelgrass decline in 1996. (PREP, 2009b) The commenter's assertion that algal growth could not have been the cause of eelgrass decline is therefore incorrect.

Figure NUT3-1: Long-term trends for chlorophyll-a concentrations measured monthly at Adams Point in Great Bay



EPA notes that the same figure the commenter cites as showing that algal levels increased by only 1 ug/l from 2001 to 2008 (a box and whisker plot) also shows that the 75th percentile concentrations increase by over 3 ug/l, or more than double, in the same period. Indeed, this is consistent with the commenter's own Exhibit 8, which shows annual averages ranging from approximately 2.4 to 6 ug/l in 2001 to 2008, compared to annual averages consistently below 2 ug/l prior to 2001. However, EPA notes that more recent data do not indicate a statistically significant increasing trend in chlorophyll-a through 2011 in Great Bay proper (PREP, 2012), in

contrast with the analysis based on data through 2008 (PREP, 2009b). This is consistent with the strong impact of macroalgae on eelgrass in Great Bay proper.

Thus, while chlorophyll-a levels in Great Bay proper are what are considered as moderately elevated (90th percentile of 7.52 and maximum of 24.66, see Table 6A of *2009 NHDES Great Bay Nutrient Report*), it is clearly a contributing factor to the decline of eelgrass in Great Bay proper and a much larger factor in the Lamprey River where the measured 90 percentile for chlorophyll-a was 12.40 ug/l and the maximum was 145.45 ug/l (see Table 6A, *2009 NHDES Great Bay Nutrient Report*). As indicated previously, phytoplankton- driven light attenuation was one of several factors considered in the NHDES analysis establishing proposed numeric thresholds. Macroalgae proliferation, epiphyte growth (Short, 2011; Mathieson, 2012), the toxic effect of nitrogen on eelgrass, protective levels in the literature, and protective levels established for other estuaries were all taken into account. This weight-of-evidence approach provides an enhanced basis for interpreting the narrative nutrient criterion and was a significant factor in EPA's determination that the proposed numeric thresholds are reasonable and protective. The goal of these ambient water quality thresholds is to improve transparency, control macroalgae and epiphytes, and minimize the potential for a direct toxic effect that might prevent the recovery of eelgrass. See also Background and Response # 24.

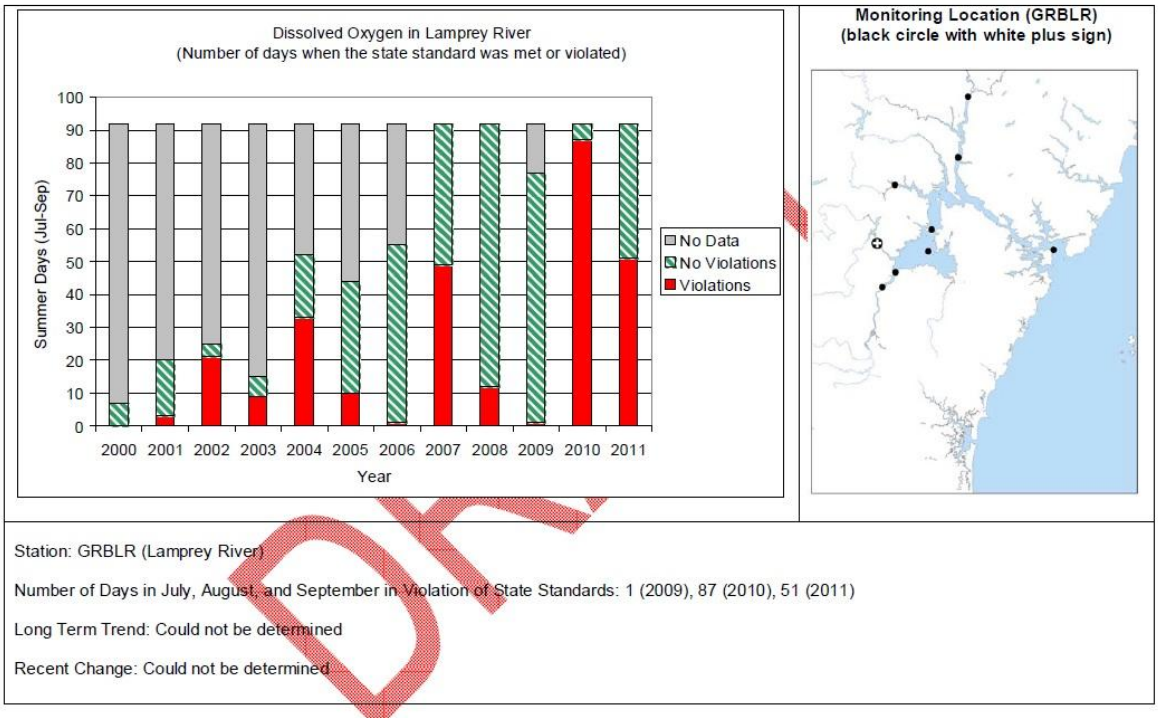
EPA also disagrees that the ability of nitrogen reduction to affect transparency is not significant. EPA finds persuasive NHDES' analysis that nitrogen controls will have a significant effect on transparency through the impact on algal growth and the particulate organic carbon component of turbidity. (NHDES, 2009 at 66). The analysis in HydroQual's Criteria Memorandum (Ex 10) to the comment is methodologically flawed, as described in Response #24, and therefore fails to show that the proposed TN standard will not meet transparency goals.

The commenter's citation of the Fact Sheet omits the references to the PREP *2009 State of the Estuaries Report*, which documents that the negative effects of excessive nitrogen, warned of repeatedly in the prior reports, have in fact become evident. The full discussion of the 2003, 2006 and 2009 *State of the Estuaries Reports* in the Fact Sheet demonstrates the continued deterioration of environmental indicators in the Great Bay estuary, consistent with predictions and warnings made regarding the expected result of increasing nitrogen concentrations. Far from indicating that the ability of nitrogen to affect transparency is "not very significant at this time," as suggested in the comment, the 2009 PREP report specifically states, "The negative effects of the increasing nutrient loads are evident. Water clarity has declined as shown by increasing concentrations of suspended solids and chlorophyll-a." (PREP, 2009a at 4).

As discussed in Response 24, EPA finds no merit in HydroQual's analysis of transparency impact (Ex 10). The effect of chlorophyll-a and particulate organic matter on transparency is far greater than that suggested by a mere weight ratio due to the lower density and higher surface to volume ratio of organic matter, and HydroQual's analysis therefore substantially understates the effect of these parameters on transparency. See Response #1. EPA further notes that the "5% change in transparency" figure is nowhere stated in the HydroQual Criteria Memorandum.

With respect to DO trends, EPA disagrees that the figures in the PREP 2009 *Environmental Indicators Report* reveal a decreasing trend inconsistent with the connection between TN and

low DO. Data for the earlier years are in many cases based on an incomplete record, and the percentage of time that dissolved oxygen is violated is influenced by a number of factors, including weather patterns. (For example, it would be expected that the wet years experienced in the 2005 - 2008 time frame would affect the frequency of dissolved oxygen violations.) The more complete dataset, published in draft form by PREP in July 2012 and including 2010 and 2011 data, reveals that both 2010 and 2011 had higher percentages of days with dissolved oxygen violations than any other year since 2000 in the Lamprey River. (PREP, 2012*t*, Figure NUT5-2 at 5-9 (reproduced below). In EPA's opinion, the key point is that there continue to be dissolved oxygen violations. NHDES's most current analyses relative to dissolved oxygen impairments in the Lamprey has resulted in the continued listing of the Lamprey River as impaired for dissolved oxygen (see NHDES, 2012c



Comment #30: Conclusions regarding the increase of system wide TN loadings in the past 5 years (2002 versus 2008) are misleading and inappropriate. (*See* Fact Sheet @ 19.) First, the change in TN level is due to an evaluation comparing loads between drought years and extreme wet weather years as noted in the 2009 PREP report. (*See* Ex. 26, Change in Rainfall Patterns.) This change in rainfall fully accounts for the difference in loading and does not indicate a system subject to runaway growth inducing higher TN levels. Data on WWTP flows indicate that municipal loadings have been relatively constant for the past 15 years. (Ex. 11, Trend Analysis of Municipal Flows During Dry Weather Years.) Thus, the change in conditions is not due to significant increases in point source contributions but rather to changes in precipitation and land use practices. This indicates that only a moderate reduction in point source contribution is necessary to ensure reduced inorganic Great Bay Municipal Coalition Comments on Proposed Newmarket Permit Page 15 nitrogen levels to the Bay to reflect mid-to-late-1990s conditions when eelgrass health was excellent. Likewise, EPA's conclusion that point sources account for over 30% of the TN loadings to the Bay is misplaced. (EPA Public Hearing Observation.) DES

recalculated the point source load inputs, accounting for system hydrodynamics. The point source contribution of TN is currently about 16%. (*See* Ex. 1, MOA attachment Table II.) Given this small percentage of TN loading, forcing communities to "limits of technology" would not result in any meaningful changes, in comparison to less restrictive limitations (e.g., 8 mg/l TN). As EPA's load reduction analysis was premised on a belief that point source loads were a far greater percentage of TN loads, the analysis must be reconsidered. An 8 mg/l TN limit would produce approximately a 70% reduction in current point source TIN levels and result in water quality reflecting acceptable mid-to-late 1990s conditions for this parameter when the system was considered "healthy." Load analyses based on TIN yield a completely different picture that confirms the Fact Sheet impacts analysis is completely in error. During the critical macroalgae growth period, point sources in the western end of the Bay (Exeter, Newmarket and Durham) dominate the DIN loading to the estuary. (*See* Ex. 25.) This data and analysis confirms that a lesser level of point source control will produce far greater benefits than estimated by DES or EPA because they both evaluated the wrong form of nitrogen. As noted earlier, setting seasonal limits equal to 8 mg/l will more than achieve the mid-1990 loading threshold. Due to these basic evaluation errors the proposed permit needs to be withdrawn and reconsidered.

Response #30: EPA disagrees with the characterization of trends in TN loads. While EPA acknowledges that much of the difference between 2002 and 2008 loads was due to increased rainfall, this is part of natural variability in weather patterns, which do have a significant effect on nitrogen loadings and responses, and that is why the NHDES analyses supporting the proposed nitrogen thresholds are based on evaluations of long-term data sets. Also as indicated in the Fact Sheet (page 12) there has been a long term increase in Great Bay concentrations of dissolved inorganic nitrogen, a major component of total nitrogen, of 44 percent in the past 28 years. The *NHDES Nitrogen Loading Reduction Report* clearly indicates that moderate reductions in point source contributions will not be sufficient to ensure attainment of the narrative nutrient criteria. There is no basis for the claim that simply restoring nitrogen levels to mid-to late 1990s conditions will be sufficient to achieve standards. As mentioned, the loss of eelgrass and proliferation of macroalgae and epiphytes often lags behind the tipping point in an estuary as measured by nitrogen concentrations (Bricker et al., 2007).

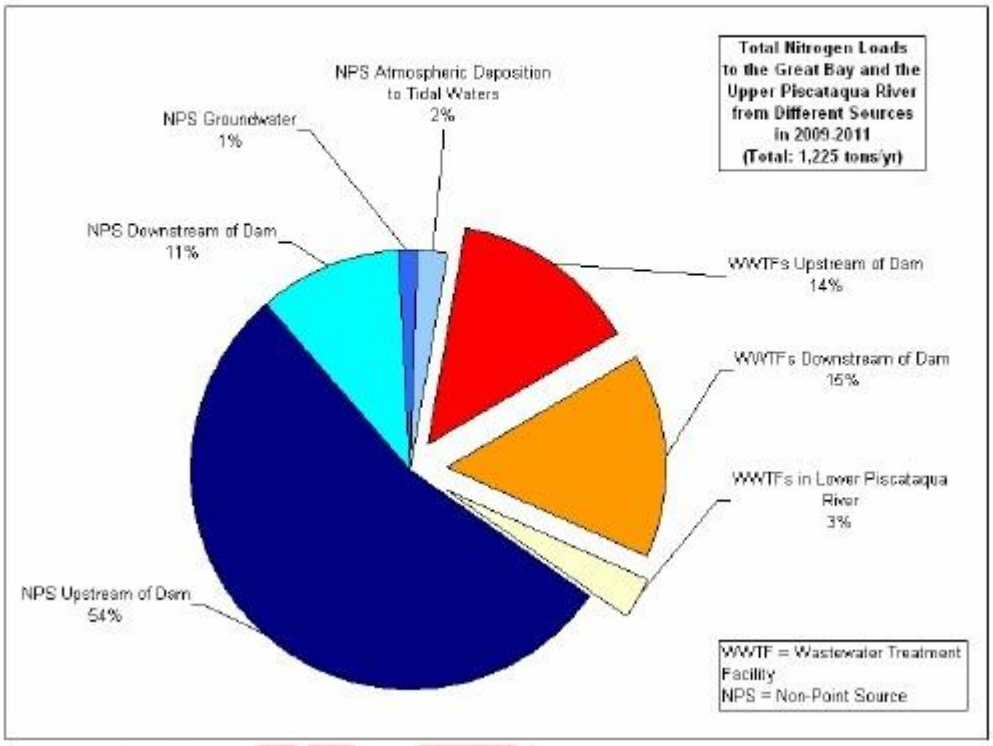
Exhibit 11 does not show municipal loads, only discharge flows from selected Great Bay POTWs during dry weather. There are little data available to indicate whether there has been an increase in nitrogen POTW loadings as these facilities were not reporting nitrogen concentrations or loads under their past permits. Rochester is a clear example of this where nitrogen discharge concentration levels have increased over time resulting in an increase in nitrogen discharge loadings independent of any flow increase. Quarterly monitoring provided by Rochester indicates that for 2001 – 2006 total nitrogen discharge levels ranged from 13 -18 mg/l and for 2007 – 2011 total nitrogen discharge levels ranged from 20 – 35 mg/l. Moreover, even if the recent increase in loads were primarily attributable to nonpoint sources, the fact is that total loadings exceed acceptable loadings and the point sources contribute significantly to these exceedances. Additionally, since permitted flows exceed actual flows, the potential for increased point source discharge loadings in the future is significant and needs to be addressed.

The estimate that 30% of the total loading of nitrogen is from point sources is an estimate based on the entire estuary, which was included in the *2009 State of the Estuaries Report*. The actual

reported number is 31%. (PREP, 2009a at 12). EPA notes that the most recent calculations for 2009 to 2011 indicate that point sources account for 32% of the nitrogen load to the Great Bay and Upper Piscataqua River. (PREP, 2012, Figure NUT1-5 (reproduced below).

Figure NUT1-5: Nitrogen loads to the Great Bay Estuary from different sources in 2009-2011

(A) Total Nitrogen



It is unclear what the basis is for the commenter's claim that NHDES "recalculated" point source loads for the Table in the MOA. In fact, the MOA Table specifically references the "draft Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed dated December 2010," and the figures in the Table appear to be the same loads reported in Table 7 through 9 of Appendix A of that report, averaged to obtain an 2003-2008 average value. While unexplained in the comment, the citation of a 16% point source contribution appears to be based on the figure for Great Bay proper, as opposed to the calculation based on the total load to all the study subwatersheds that was calculated by NHDES and cited by EPA. For the Lamprey River, the point source load was 15% of the total load between 2003 and 2008. (Id. at Tables 7-9; MOA Table II).

Increases in nonpoint sources are a major contributor to the impairments in Great Bay and are likely outpacing point source increases. However, the analyses documented in the Fact Sheet clearly indicate that nonpoint source reductions, in addition to minimizing point source loadings, will be necessary in order to restore Great Bay.

Comment #31: EPA's assertion that the greatest loss in eelgrass has occurred in the upper portion of the estuary where TN levels are highest is incorrect. (*See* Fact Sheet @ 19.) This statement was intended to confirm that reducing TN levels would lead to improved eelgrass populations. Data from the Piscataqua River developed by Prof. Fred Short (an eelgrass expert for Great Bay), show that eelgrass losses are equally high where lower TN levels occur and water quality is otherwise excellent. (*See* Figure HAB12-1, PREP 2009 Report; Ex. 5, HydroQual, Figure 12). Figure 6 presented in the Fact Sheet also documents that EPA's position is in error, showing 100% eelgrass loss in the upper and lower Piscataqua River where the transparency is excellent and TN concentrations meet the 0.3 mg/l TN objective assumed applicable in this action. The cause of this dramatic eelgrass decline is unknown. The undisputable fact that eelgrass declined in areas with both elevated and low TN concentrations means that it cannot be presumed that lowering TN levels will result in eelgrass restoration in the tidal rivers or the Bay. (*Compare* EPA Fact Sheet Figures 6/7 with Figure 5.) Likewise, as discussed earlier, lower DO occurs in the tidal rivers, but the occurrence of such conditions is not a function of chlorophyll-a or TN levels, even though the highest TN levels occur in these areas. It should be noted that virtually EVERY water quality pollutant indicator is higher in the tributaries than in the Bay or Piscataqua River where greater dilution exists. This coincidence does not prove that a particular pollutant caused the impairment of concern and is little more than generalized speculation. The Lamprey River, with the lowest chlorophyll-a levels, has the *poorest* DO compliance due to system hydrodynamics. (*See* Ex. 12; Pennock (2005).) Thus, EPA's broad brush analysis asserting TN and chlorophyll-a are the causes of all system impairments is simply not scientifically defensible and is demonstrably incorrect.

Response #31: EPA's assertion that the greatest loss in eelgrass has occurred in the upper portion of the estuary is correct. Eelgrass in the tidal rivers, the most uppermost parts of the estuary, has disappeared. The Lower Piscataqua River has limited available water quality data on which to base an assertion that TN concentrations meet the TN objective. Due to the greater depths in the Piscataqua River, small changes in water clarity can lead to large meadow losses. The Lower Piscataqua is also a poor location for evaluating the relationship between nitrogen concentrations and eelgrass health due to the significant dredging and shipping that occurs in this area as well as the presence of large mooring fields that overlap with the eelgrass habitat (NHDES, 2009b at 15). Thus, other factors may well be contributing additional stress on eelgrass populations in the lower Piscataqua River.

Water quality in the Upper Piscataqua River is not "excellent," contrary to the comment's assertions, in that both the total nitrogen concentrations and light attenuation exceed acceptable levels. (NHDES, 2009a, Tables 2 and 8). The data in these tables are consistent with improving water quality at more downstream locations, with eelgrass loss explained by increasing light attenuation. The only inconsistency regarding eelgrass and light attenuation (i.e., where eelgrass has disappeared despite a light attenuation coefficient that appears adequate to support eelgrass) is in the Lower Piscataqua, where, as previously explained, there are relatively little data and potentially additional stressors.

With respect to DO, the data demonstrate the relationship between DO and TN and chlorophyll-a as discussed in Response #25. The conceptual model linking TN and chlorophyll-a with DO is well-established based on decades of estuarine research and does not constitute "generalized

speculation." See also Response #25. While DO in the Lamprey River has been identified as requiring further analysis of the effect of stratification, the Lamprey River has some of the highest concentrations of chlorophyll-a. (NHDES, 2009a, Table 6).

Comment #32: Data on chlorophyll-a levels and secchi depth, not originally considered by DES when issuing the 2009 draft numeric criteria document, confirm that transparency did not materially change in Great Bay during the period of eelgrass reduction and that chlorophyll-a increases are not associated with eelgrass decline. (*See* Ex. 8.) These data confirm that transparency was not a causative agent in the eelgrass decline of the 1990s and that, in fact, transparency appears better today than during the mid-1990s. Moreover, the data further support the conclusion that transparency (as measured by secchi depth) is not materially impacted by the chlorophyll-a level in this system, as Morrison had also determined. Comparing EPA's Figure 5 – Gradient of Light Attenuation with Figure 4 – Gradient of Chlorophyll-a confirms that median transparency has little to do with algal growth; therefore, controlling TN levels to control algal growth will have no material impact on water column transparency. The data cited by the Region in support of the permit action show that TN control will not achieve its intended purpose. The Upper Piscataqua has a lower transparency level than Great Bay, but also lower chlorophyll-a levels, verifying that other factors are controlling transparency in this system. In fact, the difference in median chlorophyll-a in all of these areas is negligible (1-3 ug/l). This difference in chlorophyll-a could not physically account for the wide range of light attenuation occurring in the various areas (0.5-2.3 Kd m^{-1}). Thus, the Region's assumption that reducing TN will produce significant improvement in water column transparency is not supported by the information presented in the Fact Sheet.

Finally, the DES analyses relied upon by EPA provide no demonstration that eelgrass losses in the Bay are, in fact, correlated to reduced transparency. If they were, eelgrass losses from the deeper Bay waters would be the most prevalent – they are not. (*See* Ex. 13, Figure 5, presentation of Fred Short, Impediments to Eelgrass Restoration.) Recently, Professor Fred Short has acknowledged that the large tidal fluctuation in Great Bay allows the eelgrass to receive sufficient light and that, therefore, transparency is not likely a controlling factor in this area. (*See* Exs. 21 and 22 – MOA Meeting minutes.) In contrast to the transparency theory of eelgrass loss, higher losses appear to have occurred in shallower environments where the most light is available, and eelgrass are healthiest in the deeper waters. (*See* Figure HAB2-2, 2009 PREP Report.) This could evidence that macroalgae or shoreline development are adversely impacting eelgrass populations. Therefore, mandating TN reduction because of an assumed connection between eelgrass loss and transparency was in error.

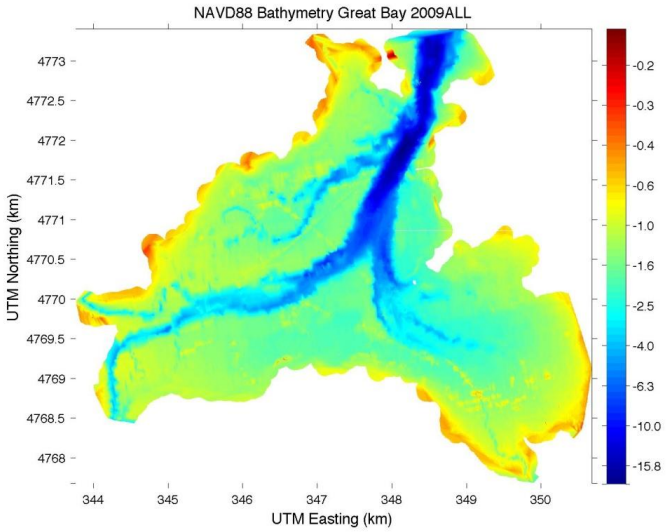
In conclusion, throughout the late 1990s as eelgrass declined, chlorophyll-a levels remained constant, even though data confirm that TIN levels increased by 40%. These data confirm that chlorophyll-a growth in the system is not significantly responding to increase inorganic nitrogen levels (the component of nitrogen that supports plant growth). Likewise, data from the tidal rivers do not show any significant relationship between algal levels and minimum DO occurrence. The assumption that nitrogen levels and excessive phytoplankton growth in the system is causing widespread impairment is simply not justified based on the available data. As noted earlier, the focus needs to be on macroalgae using an adaptive management approach.

Response #32: Secchi disc depth is a relative measure of water clarity. The secchi disc data cited by the Coalition was collected with limited quality control by volunteers sampling in one location (off a dock at Adams Point), which may not be representative of where eelgrass declines occurred in Great Bay proper. Due to questions of data reliability and representativeness, the secchi disc data was not used by NHDES in its analyses. EPA agrees with NHDES's decision to exclude this source of data from its analysis.

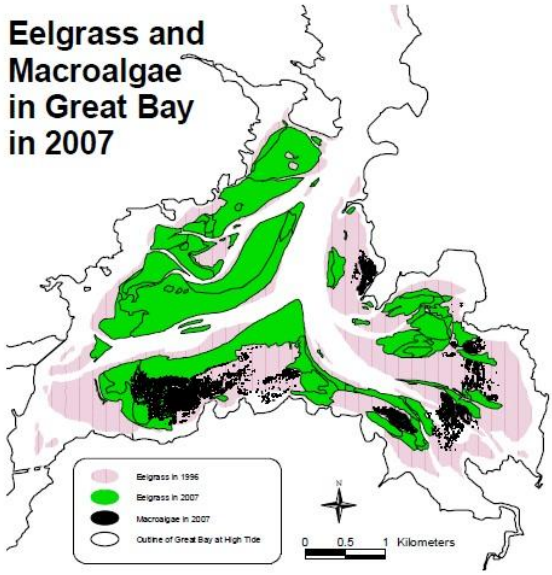
The Coalition incorrectly characterizes the figures in the Fact Sheet. Figure 5 in the Fact Sheet shows that light attenuation in Great Bay proper is reduced relative to better flushed portions of the estuary and Figure 4 indicates that there have been significant declines over time in eelgrass biomass in Great Bay proper. Macroalgae, epiphytes, and organic biomass resulting from excessive nitrogen concentrations are part of the overall accumulation of organic matter in the estuarine system that has a detrimental effect on the light levels that are critical for eelgrass health. It may be that the commenter intended to reference Figure 3 of the Fact Sheet, rather than Figure 4. In that case it is unclear why the commenter believes the comparison of these figures "confirms" that chlorophyll-a has little impact on transparency. These figures indicate identical patterns across the estuary as to both the magnitude and variability of chlorophyll-a concentrations and light attenuation, entirely consistent with the other data demonstrating a relationship between chlorophyll-a and transparency. See also Response #24.

While chlorophyll-a levels have increased only moderately in Great Bay proper, macroalgae and epiphytes have increased significantly and this response is indicative of elevated nitrogen concentrations. As indicated in other responses, macroalgae and epiphytes are a greater concern in Great Bay proper than water column algae (phytoplankton) as opposed to the tidal tributaries where the reverse is true. (Mathieson, 2012).

It is unclear how the commenter interprets Figure HAB2-2 of PREP (2009b) as indicating that "higher losses appear to have occurred in shallower environments where the most light is available and eelgrass are healthiest in the deeper waters." Figure HAB2-2 shows neither the bathymetry of Great Bay nor prior eelgrass conditions and therefore is ill-suited for assessing loss of eelgrass in relation to depth. Comparison of a bathymetry map with the eelgrass loss map in the NHDES numeric nutrient criteria does not support the commenter's assertion. Eelgrass losses appear to be less severe in the -1.0 to -1.6m depth range (green on the bathymetry; see area west of main channel) as compared to the areas closer to the -2.5 m depth range (blue on the bathymetry; see area east of main channel and south of channel split), although with losses in shallower areas where macroalgae has proliferated and/or close to the main tributary nitrogen sources. EPA therefore finds no merit in the comment's conclusory assertions concerning the relationship between depth and eelgrass losses. EPA agrees that macroalgae and shoreline conditions may also impact eelgrass decline, but notes that this does not disprove the established relationship between eelgrass and transparency.



Source: UNH, Center for Coastal and Ocean Mapping, http://ccom.unh.edu/theme/coastal-processes



Source: *Numeric Nutrient Criteria for the Great Bay Estuary* (NHDES, 2009a). More recent data show the same pattern (PREP, 2012, Figure HAB2-3).

Phytoplankton levels (chlorophyll-a) are particularly high in the tributary rivers and the relationship between algae levels and dissolved oxygen in the tributary rivers has been addressed in Response #25. While there is little difference in median chlorophyll-a levels between Great Bay proper and the Upper Piscataqua River, the maximum chlorophyll-a levels in the Upper Piscataqua River (78 ug/l) are three times higher than the maximum levels in Great Bay proper. Maximum concentrations are a better indicator of algae blooms than median values due to the intermittent nature of algae blooms and the infrequency of sampling.

See Responses # 7b, 24 and 26 with respect to macroalgae. See Responses #3 and 53 with respect to adaptive management.

Comment #33: The underlying technical basis for the nutrient criteria applied in the permit is a "stressor response" analysis completed by DES in 2009. That analysis plotted total nitrogen concentrations from various places in the estuary system versus light extinction and concluded that a specific ambient nitrogen concentration was necessary to attain a Kd of 0.75/m in the Great Bay and its tributaries. (*See* Ex. 14.) The method used to derive the DO-based TN objectives was derived similarly. The proposed criteria derivation method employed by DES and relied upon by EPA to set ambient total nitrogen water quality standards is not scientifically defensible and was not based on accepted scientific methodologies. DES plotted areas with radically different physical and chemical conditions and presumed that the level of TN occurring in the different areas was the only parameter controlling changes in DO, transparency, or algal growth. (*See* Ex. 15.) It is not scientifically defensible to plot data from such different areas on a single graph and conclude that the dependent pollutant caused the system response when other major physical and chemical factors are known to affect the result and have not been considered in the analysis. Given EPA's existing guidance on this issue and the 2009 SAB report on appropriate stressor-response analyses (discussed in greater detail below), it would be a violation of EPA's science integrity policy to continue to rely on this information in issuing the permit.

Response #33: The stressor-response component of the NHDES analysis is an accepted scientific methodology. (EPA, 2010). The basis for the Coalition's statement that the different areas of the estuary are "radically different" is not clear. In EPA's opinion, NHDES properly considered at the full data set that had been collected throughout the Great Bay Estuary. There is no reason to believe that the general physiology of eelgrass and ecosystem responses to elevated nitrogen would vary within the estuary. Certainly, the hydrologic conditions vary within the estuary and the NHDES analysis encompasses a range of hydrologic conditions. This range unquestionably is one of the factors that leads to the variability in the data. Despite this variability, a significant correlation still exists. See also Response #34.

Additionally, more recent analyses conducted by NHDES documented the relationship between light attenuation and increasing nitrogen concentrations in the Great Bay Estuary, even when evaluating areas of the estuary separately. The same relationship is evident between total nitrogen and algae growth (see NHDES, 2012a).

Comment #34: The USEPA Science Advisory Board has indicated that the type of "cause and effect" relationships developed by DES in 2009 cannot be presumed from such simplified analyses and that other factors that co-vary and may otherwise explain the change in the measured response variable must be assessed. (*See* "Review of Empirical Approaches to Nutrient Criteria Derivation," April 28, 2010.) The SAB has also cautioned that only data taken from similar habitats should be used for stressor-response analyses. EPA's Fact Sheet likewise noted that "estuarine nutrient dynamics are complex, and are influenced by flushing time, freshwater inflow and stratification among other factors." (Fact Sheet @ 14.) None of these factors or changing conditions were considered by DES in the evaluation of the system response to nutrient inputs. Dilution alone can explain the majority of the relationship between TN and all of the parameters plotted that were claimed to be caused by changes in TN. (*See* Ex. 16.) Moreover, HydroQual confirmed that, for transparency, turbidity co-varied with nitrogen levels and also

explained the change in transparency throughout the Great Bay system. (*See* Ex. 17.) Nitrogen does not relate directly to "turbidity" that is caused by a number of physical processes unrelated to the ambient nutrient concentration. Other parameters such as TSS, salinity, dissolved organic matter, color, SOD, phosphorus, and a host of other parameters also co-vary with TN and DO levels. (*See, e.g.*, Exs. 18 and 19.) Unless these factors are considered and it is confirmed that TN caused excessive plant growth, which in turn controlled the endpoint of concern (low DO or decreased transparency), there is no basis to conclude that TN was the cause of the changes occurring in DO or transparency throughout the system. This is a seriously flawed analysis, as the basic physical and chemical parameters influencing the pollutant levels and resultant water quality were not addressed in the DES assessment. This fundamentally flawed assessment methodology cannot be relied upon to demonstrate that TN reduction is necessary to protect the Bay or that the particular ambient TN level selected by DES will be sufficient to restore use impairments of concern.

Response #34: The Coalition's paraphrasing of the SAB position on cause and effect omits a highly material part of the SAB analysis. The SAB Report states: "the final [Guidance] document should emphasize that statistical associations may not be biologically relevant and do not prove cause and effect. However, when properly determined, statistical associations can be very useful in supporting a cause and effect argument as part of a weight-of-evidence approach to criteria development." (SAB, 2010 t 23). NHDES' weight of evidence approach is consistent with this advice.

The comment is incorrect in stating that the factors and changing conditions identified in the comment were not considered by NHDES. Flushing time, freshwater inflow, and stratification effects are all reflected in the extensive data set utilized to develop the *NHDES Great Bay Nutrient Report*. Flushing time and freshwater inflow are related to dilution, which the comment correctly notes is directly related to TN concentrations. This is consistent with the TN/salinity relationships shown in Exhibit 16.[47] This is not some confounding factor that was disregarded by NHDES, but rather a relationship inherent in the use of TN concentrations for the criteria analysis. TN concentrations are a direct function of TN load and the dilution in the receiving water, with dilution increasing and concentration decreasing as one moves further from the tidal river sources. This was explicitly recognized in the *NHDES Great Bay Nutrient Report*: "In the Great Bay Estuary, nitrogen concentrations are highest in the tidal tributaries and are progressively diluted by ocean water down to the mouth of the estuary." (NHDES, 2009a at 17). This is in contrast to analyses where criteria are set in terms of nitrogen load; in those cases flushing time and dilution effects are not reflected in the criteria parameter and must be accounted for independently. See Howarth (2010) for a general discussion of use of concentration- and load-based criteria analyses. The relationship between the concentration-based criteria and total nitrogen loads in Great Bay Estuary is explored at length in the *NHDES Nitrogen Loading Reduction Report*. The Report utilizes a model that is based on freshwater inflow and ocean water flushing volumes. Stratification as well is specifically accounted for in the NHDES criteria document; where it is significant, it is noted and accounted for in the analyses, e.g. Lamprey River.

[47] EPA does not, by referencing this exhibit, accept the accuracy of the data therein. EPA notes that Exhibit 16 contains no references to the source of the data or any particulars (time frame, averaging period, etc.) that would allow assessment of the accuracy of the data or relationship.

While dilution affects the total nitrogen concentration at a given point in the estuary, increased responses are associated with increased concentration levels. The mechanistic effect of nitrogen on response variables is thoroughly documented in the scientific literature and in the *NHDES Great Bay Nutrient Report*. Knowing the mechanistic effects of nitrogen, the Great Bay Estuary is an ideal system for evaluating changes in impacts associated with changes in total nitrogen concentrations. The fact that dilution has an effect on nitrogen levels, which is well documented in the Fact Sheet and supporting literature, in no way undermines the conclusions related to the measured responses to elevated nitrogen levels. Further, NHDES has demonstrated that the relationship between TN and both phytoplankton bloom and light attenuation can be seen even if areas of the estuary with differing salinities are considered separately. (NHDES 2012a at 11, 13).

The other assertions in the comment are similarly unsupported. The regression between TN and turbidity shown in Exhibit 17 was not authored by HydroQual, as stated in the comment, but was directly copied from the *NHDES Great Bay Nutrient Report* at Figure 37, with only the color coding for tributary, intermediate and coastal stations added. Obviously NHDES did in fact consider the covariance of these parameters. Despite the comment's conclusory assertion to the contrary, nitrogen concentrations have a causal relationship with turbidity through the particulate organic carbon component of turbidity. (NHDES, 2009a at 63-66). While the commenter disagrees with the extent of that contribution, EPA finds no merit in that analysis by the commenter's consultant due to its flawed methodology, as discussed in Response #24. Similarly, Exhibits 18 and 19 do not support the comment's position. Exhibit 18 is simply a copy of Exhibit 16, showing that total nitrogen concentrations are a function of dilution. This is entirely expected as discussed above. Exhibit 19[48] shows that CDOM often, but not consistently, varies with salinity at the Great Bay buoy. As CDOM derives directly from loading from the tidal rivers a relationship between CDOM and dilution would be unsurprising. The role of CDOM in transparency was likewise fully considered in the NHDES analysis, which determined that it represented 27% of light attenuation. As further discussed by NHDES:

> CDOM is important to attenuation in the Great Bay Estuary but is not controllable and does not appear to be related to primary production in the estuary. This parameter is largely based on delivery of dissolved organic carbon from the decomposition of plants and organic soils in the watershed (Keith et al., 2002), which occurs over long time periods. However, CDOM should still be correlated with nitrogen concentrations because of the nitrogen bound up in organic matter. (NHDES, 2009a at 63).

The comment's assertion that "the basic physical and chemical parameters influencing the pollutant levels and resultant water quality were not addressed in the DES assessment" thus simply mischaracterizes the record.

Finally, the Coalition's comments pertain to an estuary-wide analysis. The subject of this permitting action is Newmarket's discharge into the Lamprey River. Predictably, the discharge of high levels of nitrogen has resulted in elevated levels of chlorophyll-a and supersaturated levels of DO which is a clear indicator of cultural eutrophication (see Lamprey River Dissolved

[48] Again, EPA does not, by referencing this exhibit, accept the accuracy of the data therein. As with Exhibit 16/18, we note that Exhibit 19 contains no references to the source of the data or any particulars (time frame, averaging period, etc) that would allow assessment of the accuracy of the data or relationship.

Oxygen Study, 2004). Additionally, the high algae concentrations in the Lamprey River are likely contributing to the periodic depressed oxygen levels as a result of respiration and the biological decay of algae that has settled to the bottom of the river.

In addition, eelgrass has been excluded from its historical range in the Lamprey for years. EPA's permitting decision does not rest solely on the desire to protect eelgrass in Great Bay proper. Protecting eelgrass in Great Bay proper is an important consideration, but that is in addition to EPA's concerns about the immediate receiving water, the Lamprey River.

Comment #35: The TN/transparency relationship developed for the Bay does not apply to the tidal rivers, as EPA has assumed. The factors controlling transparency in the Bay, Piscataqua River, and mouth of the estuary are dramatically different than those controlling transparency in the tidal rivers or near their mouths in the Bay. The Lamprey River and other tidal rivers are heavily influenced by the color of the waters entering the system. (*See* Ex. 19.) These areas have naturally low transparency due to color leaching out of wetland and other areas into the system. Turbulence due to tidal exchange also causes high turbidity in these systems, as demonstrated by the DES turbidity data contained in Ex. 17. Consequently, transparency is naturally low in the Squamscott and Lamprey Rivers and cannot be increased simply by regulating TN to control chlorophyll '*a*' growth. (*See* Exs. 20 and 23.) Because the conditions producing poor water quality are natural, these conditions do not constitute a violation of the state's narrative water quality standards, and a TN-based transparency standard to protect eelgrass growth is not germane to this area. In summary, the typically low transparency of the Lamprey River has virtually nothing to do with nutrient levels or algal growth. This is a natural condition that cannot be changed. Therefore, EPA's presumption that TN control will produce improved transparency levels in the Lamprey River sufficient to allow eelgrass growth is unfounded. This permit action should be withdrawn since the central scientific and legal premises of the action are in error.

Response #35: EPA disagrees that "the central scientific and legal premises of the action" are in error; to the contrary, the commenter has pointed to a factor that militates in favor of imposing necessary nitrogen controls. While transparency is naturally lower in many tributary rivers, including the Lamprey River, than in Great Bay proper, there is no evidence or reason to believe that natural transparency has decreased over time. If anything, the natural color would be expected to be lower now than when eelgrass was present, due to the loss of wetlands resulting from the development of the watershed. What has clearly changed is nitrogen levels and algae growth in the Lamprey River, which clearly makes the naturally low transparency worse. The existence of naturally low transparency would be expected to make these systems highly sensitive to incremental decreases in transparency caused by nitrogen loads.
Increasing turbidity levels resulting from the loss of eelgrass is well documented in the literature as well as clearly demonstrated in Great Bay. It is unclear how the Coalition believes Exhibit 17 supports the assertion that high turbidity is due to tidal exchange. That exhibit shows a large range in turbidity among the tidal rivers, and no information at all about relative tidal exchange turbulence (while showing a very strong correlation between turbidity and total nitrogen concentrations that seems to contradict the comment).

Exhibits 20 and 23, while containing no references or citations to the source or nature of the data in the charts, appear to contain data for Kd and chlorophyll-a from the Squamscott and Lamprey Rivers. These charts contain no information indicating that the documented low transparency is

"natural" as claimed by the commenter. Exhibit 20 contains an additional chart that appears to be an attempt to compare light attenuation and chlorophyll-a data in the tidal rivers to the calculated direct component of light attenuation attributable to chlorophyll-a using the regression equation from Morrison (2008). Assuming the data therein is accurate, EPA notes that the existence of low transparency conditions in the tidal rivers from factors other than chlorophyll-a is widely recognized. NHDES has shown that light attenuation and total nitrogen have a statistically significant relationship in the Great Bay estuary and that light attenuation is more strongly correlated with plant/organic matter in the water column than with any other factor (NHDES, 2012a). TN is indirectly related to components of turbidity other than chlorophyll-a concentration, including organic matter in the water column (including detritus from macroalgae and phytoplankton) and increased sediment suspension from loss of eelgrass. Even where TN control alone is not sufficient to control transparency sufficiently to allow eelgrass growth, TN control is a necessary factor to allow eelgrass growth to occur, even while other factors effecting water quality in the tidal rivers will also need to be addressed. EPA also notes that the Lamprey River and Squamscott River do experience periods of extremely high chlorophyll-a concentrations in which algal growth would be expected to contribute substantially to light attenuation under the Morrison (2008) analysis. For example, data collected by HydroQual on August 12, 2012, showed a median chlorophyll-a concentration in the Squamscott River of 95 ug/l. Using the Morrison relationship this would be expected to result in a chlorophyll-a derived component of light attenuation of 1.8 m^{-1} compared to measured median Kd of 2.7.[49] In the Lamprey River, chlorophyll-a levels as high as 145 ug/l have been measured.

Comment #36: EPA's reliance on studies from other states or EPA manuals (*see* Fact Sheet @ 26-27) to assert that specific nitrogen-related impairments are present in Great Bay is misplaced. The available data from the underlying studies indicate that the system was not suffering adverse impacts from excessive algal growth or reduced transparency due to excessive algal growth. Moreover, there is no indication that application of such results from Massachusetts or Delaware was intended to apply to the highly dynamic tidal river and bay systems present here. Absent some demonstration that the physical settings and water quality conditions are the same (i.e., critical factors influencing plant growth in any system), there is no technical basis to conclude that these other state standards have any relevance to Great Bay. It should be noted further that 40 C.F.R. § 122.44(d) does not allow the presumptive application of "out of state" standards as a basis for interpreting a narrative criteria. Thus, the applicable federal regulation is being misapplied.

Finally, the focus on eelgrass loss in the tidal rivers is completely arbitrary, given that it is admitted no one knows why the eelgrass loss occurred over 40 years ago and that the State of New Hampshire has determined that the primary ecologic concern in the tidal rivers is DO. (*See* Fact Sheet @ 17.) Neither DES nor PREP has ever attempted to claim that reduced nitrogen levels would restore eelgrass in these areas. The analysis was focused on an alleged relationship between transparency and TN in the Bay, not miles up the tidal rivers. Therefore, EPA's assertion that "[s]ince eelgrass was present in the Lamprey River from the Lower Narrows down to Great Bay, the applicable total nitrogen criteria to ensure its recovery is 0.30 mg/l" is simply unsupported speculation. (*See* Fact Sheet @ 30.) Other DES-funded studies (e.g., 2006 Great

[49] EPA notes that concentrations in the Squamscott River are well outside the concentrations in the Morrison analysis so that the precise relationship established in Morrison (2008) may not hold.

Bay Estuary Restoration Compendium) confirm that it is not reasonable to presume that reducing TN levels will result in eelgrass restoration in the Lamprey River, and Ex. 23 indicates that natural transparency is insufficient to support eelgrass growth. Given that major eelgrass losses are also occurring even in high quality waters, EPA's decision to stringently control TN inputs is not supported by the relevant data for the estuary.

Pursuant to 122.44(d), EPA is to follow the state's narrative criteria approach where such information is available. That approach does not support applying the Bay eelgrass protection targets in the tidal rivers, assuming the criteria were not fundamentally flawed, as explained earlier. Consequently, EPA's proposed permitting approach for Newmarket should be withdrawn because there is no credible scientific data showing that decades-old eelgrass losses in the Lamprey River have anything to do with changes in TN levels. To the opposite, EPA's own fact sheet recognized that the cause (and therefore the remedy) of such losses is currently "unknown." Therefore, any regulatory requirement at this point is pure speculation, and, consequently, the proposed related effluent limits are arbitrary and capricious.[11]

[11] It should be noted that, out of concern for the health of the Bay, the Coalition has agreed that several facilities should be designed to achieve an 8 mg/l TN limit. This agreement, however, is not premised on a conclusion that TN has been adequately confirmed to be the cause of eelgrass loss.

Response #36: EPA compared the results of what other analyses have produced for nitrogen thresholds or criteria with the values generated by NHDES. These analyses, though they employed different approaches, generated nitrogen thresholds that fall within a very narrow concentration range. This fact gave EPA greater confidence in the appropriateness of the value generated by NHDES.

There is no prohibition in section 122.44(d) on considering out-of state standards for interpreting narrative criteria as "relevant information." Contrary to the claim, out of state standards were not applied as a "presumptive" standard for the New Hampshire narrative criteria. They were, however, used by NHDES and EPA as part of a weight-of-evidence evaluation of appropriate numeric criteria for Great Bay. Such an approach is consistent with EPA guidance and regulations and was cited in the peer review process for the proposed numeric thresholds as one of the strong points of the criteria development. The biology/physiology of eelgrass does not vary from state to state. In addition, how the plant reacts to excess nitrogen and lowering of light levels is consistent across state boundaries. (See Short, et al., 1993). See also Response #7d.

The Coalition includes no evidence in its comment that the eelgrass loss occurred 40 years ago. It is not known when the eelgrass was lost. The reason the Lamprey River was not identified as suitable habitat for eelgrass restoration in the 2006 Great Bay Estuary Restoration Compendium was due to its current degraded water quality, not any naturally occurring condition. The prior existence of eelgrass in the Lamprey River was cited in the nutrient criteria document and was part of the analysis linking transparency and TN. (NHDES, 2009 at 56-60) (analysis of assessment zones including Lamprey River for relationship between measured Kd and predicted eelgrass depths); *id.* at 67 (Figure 39 regression of Kd v. TN, including Lamprey River stations). Controlling nitrogen in the Lamprey River to a level consistent with the proposed numeric thresholds is necessary in order to control the excessive algae growth that has caused a decline in transparency levels relative to natural levels and will restore the conditions under which eelgrass

previously thrived. Exhibit 23 does not include any evidence that the low transparency is natural. See also Response #35. The possibility that other factors may also require action for successful recovery of eelgrass does not obviate the need for limits on nitrogen loads. Eelgrass cannot be restored to locations where it previously existed in the Lamprey River without substantial reductions in nitrogen. Current water quality conditions are in violation of the water quality standards relative to the designated uses and related numeric and narrative criteria, because they do not support the restoration of eelgrass.

NHDES has developed proposed numeric thresholds for the Lamprey River including thresholds for the protection of eelgrass habitat. Dissolved oxygen is not the sole ecological concern in the Squamscott River (see also Responses #7c - 7d, 24 and 25 relative to impairments in the Lamprey River).

Comment #37: The proposed permit applies the proposed criteria for eelgrass protection in the tidal rivers at a 7/Q/10 low flow. (*See* Fact Sheet @ 28-29.) The chosen water quality criteria are not based on short-term or near field impact considerations. Consequently, this is a misapplication of the draft DES TN criteria from several perspectives. First, the impact of concern – "transparency" – is a long-term effect. The data used by DES to derive the 0.3 mg/l TN criteria was based on multi-year average ambient conditions. It is therefore inappropriate to assert that compliance with that objective must be maintained under a rare 7/Q/10 flow condition. Second, the impact on transparency, if it did exist, has nothing to do with the dilution available in the current Newmarket mixing zone. There is not sufficient time for the Town's effluent quality to alter algal growth at this point of discharge. Assuming the 0.3 mg/l TN objective was properly derived and necessary to ensure use protection, this objective would be applied under some type of growing season average tidal dilution flow condition, relevant to the time period when algal growth could significantly influence water column transparency.

Response #37: The nitrogen limit in the permit has not been calculated using the applicable critical flow condition in New Hampshire WQSs. The calculations in the Fact Sheet were included for illustrative purposes, to show the relative contribution of the POTW under critical conditions. EPA agrees that the thresholds in the *Great Bay Nutrient Report* were derived using a long-term data set, and that the proposed numeric thresholds are based on a five-year period. Specifically, the TN and light attenuation thresholds for the protection of eelgrass are based on median values over a five year period. There is, however, no requirement that a permit limit be based on the same period used to determine attainment of the ambient water quality criteria. Determining the appropriate averaging period for nutrient limits requires balancing between several considerations. As noted by the commenter, these include a consideration of the period for which attainment of the ambient water quality criteria is assessed, but also include regulatory requirements governing the expression of permit limits for POTWs, and relevant guidance; attainment of water quality standards; and compliance assessment.

First, federal regulations at 40 C.F.R. § 122.45(d)(2) require that "[f]or continuous discharges all permit limitations, standards, and prohibitions, including those necessary to achieve water quality standards shall unless impracticable be stated as…[a]verage weekly and average monthly discharge limitations for POTWs." There is no absolute bar to nutrient limits based on averaging periods longer than monthly average and weekly average, but such a determination must be made on a case-by-case basis. It stands to reason that the averaging periods should be as short as

practicable, given the requirement of the underlying regulation for monthly and weekly average limits. In the case of Chesapeake Bay, EPA specifically considered whether it would be impracticable under 40 C.F.R. § 122.45(d) to express nutrient limits as weekly or monthly averages for Bay dischargers. EPA found that these averaging periods were impracticable for Chesapeake Bay due to the characteristics of nutrient loading and its effect on water quality. *See* March 3, 2004 Memorandum from James Hanlon, Director of the Office of Wastewater Management, entitled, "Annual Permit Limits For Nitrogen and Phosphorus Permits Designed to Protect Chesapeake Bay and its Tidal Tributaries From Excess Nutrient Loading Under the National Pollutant Discharge Elimination System." In EPA's judgment, several factors cited in this memorandum are applicable to Great Bay (e.g., complex nutrient dynamics and delay between nutrient discharge and effects; attainment of the criteria is dependent on long-term average loadings rather than short term maximum loadings), justifying a departure from the default averaging periods for purposes of 40 C.F.R. § 122.45(d). See also Response # 9 (finding a monthly average to be impracticable in the context of LOT).

To inform its decision regarding the appropriate averaging period, EPA first looked to the *NHDES Nitrogen Loading Reduction Report* to determine what averaging period was used by NHDES in its analysis of the point and nonpoint source load reductions necessary to address water quality impairments in Great Bay. Appendix C of this report analyzes watershed nitrogen load for different permitting scenarios for wastewater treatment facilities. For this analysis, NHDES looked at treatment plants within a watershed and assumed the plants to be discharging at design flow and ran scenarios with the plant effluent concentrations set at 3, 5, or 8 mg/l total nitrogen. With the estimated loads from the treatment plants estimated, NHDES then calculated the necessary nonpoint load reductions necessary to achieve instream total nitrogen thresholds. All of these calculations are based on two-year timeframes, indicating that the 3, 5 or 8 mg/l total nitrogen effluent concentrations and the associated loads are relatively long term (2 year) values.

As discussed elsewhere [see Response #3], the permit's nitrogen limit of 3.0 mg/l was intended to maximize point source reductions into the Lamprey River; it was not by itself designed to result in attainment of the threshold that EPA has determined will attain and maintain applicable water quality criteria and fully protect designated uses, but to do so in conjunction with nonpoint source reductions. In adopting this permitting framework, EPA is cognizant that maximizing point source reductions will decrease the magnitude of required nonpoint source reductions, which are more difficult and unpredictable to achieve, and counsels in favor of a shorter averaging period. However, EPA also did want to include a limit that would be attainable by existing technology, and so did not make the averaging period too short. See Response #9 and 39.

Another practical consideration is making the averaging period short enough that compliance can be assessed regularly during the term of the permit. For example, compliance with a five year average could not be definitively determined until the end of the permit term, making the permit ineffective in ensuring attainment of standards.

Based on these considerations, EPA has changed the averaging period for the nitrogen limit to a seasonal rolling average, an averaging period corresponding with the growing season, consistent with commenter's view. Such a limit will not allow large variability in effluent quality (although admittedly greater than a monthly average limit), thus ensuring large POTW reductions, will be achievable by existing technology, and is sufficiently short that compliance can be assessed in no

more than one year following the permit effective date (shorter if the limits go into effect before April 1), and can be continually assessed thereafter.[50]

Comment #38: The proposed permit requires that the facility optimize TN reduction during the nongrowing season (November – March), despite recognizing that "these months are not the most critical period for phytoplankton and macroalgae growth." (Fact Sheet @ 11.) There is no technical or regulatory justification for this requirement; therefore, it should not be included in the permit. As noted earlier, EPA must demonstrate that a water quality-based effluent limitation is necessary to achieve water quality standard compliance. The permit record provides no such demonstration and concedes that it is not demonstrated to be necessary. Therefore, this provision is not legally or technically supported.

Response #38: As indicated in the Fact Sheet, the *NHDES Nitrogen Loading Reduction Report* is based on a year round rather than seasonal analysis, which reflects how the proposed numeric thresholds were developed. Algae blooms in the Great Bay system occur in the late winter/early spring as well as in the summer period. Data on dissolved inorganic nitrogen clearly indicates that uptake by biomass starts accelerating in March (see NHDES 2009a). However, EPA and NHDES do not believe that it is necessary to apply the limits year round since November - March is not when the most severe algae blooms occur and also not when the system response is most sensitive to nutrient enrichment. EPA and NHDES are imposing the condition requiring the Permittee to optimize nitrogen removal during the wintertime in order to keep the annual discharge load low, thereby reducing the potential for accumulation of nitrogen in the system, which may become available for uptake in the future. Such a requirement is also consistent with the standard permit conditions related to the operation of treatment facilities. In combination, the numeric limitations and the optimization requirements are as stringent as necessary to ensure compliance with applicable New Hampshire water quality standards, including its narrative water quality criterion for nutrients, in accordance with Section 301(b)(1)(C) of the CWA.

Comment #39: The permit should not contain a monthly maximum effluent limit since it has not been demonstrated that this restrictive permit averaging period is necessary to ensure WQS compliance. Assuming it is proper to rely on the state's draft, unadopted criteria in setting permit limits, those criteria are based on long-term (multi-year) median conditions. Therefore, at a

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[50] EPA also reviewed a September 20, 1996, letter sent by James Prendergast, Acting Director of EPA Permit Division to Gary Stenhouse, City Manager of the City of Rochester, which addressed various questions regarding the use of seasonal limits in permits. There, EPA concluded that seasonal limits are acceptable on a case-by-case basis, subject to the statutory and regulatory requirements that they achieve water quality standards and are consistent with any TMDL developed for the receiving water. Under New Hampshire WQSs, the flow used to calculate permit limits for discharges into tidal waters shall be the "low flow condition equivalent to the conditions that result in a dilution that is exceeded 99% of the time." Env-Wq 1705.02(c). In some cases, accordingly, application of nutrient criteria at critical low flow is appropriate. However, in this case, as explained in the *2009 Great Bay Nutrient Report*, the threshold analyses related to eutrophication concern a number of relatively long-term effects (e.g. eelgrass loss) driven by long-term changes in pollutant concentrations resulting from point and nonpoint sources of nitrogen. Therefore, even though not calculated using a low flow dilution factor, the permit limit will be protective of water quality standards under low flow as well as average conditions, consistent with the long-term basis for the site-specific analyses in the *Great Bay Nutrient Report*.

minimum, limitations necessary to comply with such limits should be established as long-term averages, as EPA has done in similar situations. For instance, nutrient limits were applied to derive annual average requirements with EPA's approval in Chesapeake Bay and Long Island Sound. If EPA now insists that monthly averages must be set, EPA must account for the difference between the standard and permit averaging periods when setting the limits. Finally, the use of concentration-based limits, which assume the facility is discharging at design flow, produces unnecessarily restrictive permit limits. Under lower flow conditions and existing effluent discharge rates, the allowable effluent quality may range up to 6 mg/l and still meet loading targets equal to 3 mg/l at the design flow of 0.85 MGD. To ensure that only necessary permit limitations are established, flow tiered concentration limits should be established to properly implement whatever load limits are set to achieve narrative criteria compliance.

Response #39: Please see Response #37 above.

The nitrogen effluent limit of 3.0 mg/l accomplishes the goal of maximizing point source reductions to attain (in combination with additional nonpoint source reductions) the narrative nutrient criterion and does so within the capabilities of current technology. In adopting this permitting framework, the Region is cognizant that maximizing point source reductions will decrease the magnitude of required nonpoint source reductions, which are more difficult and unpredictable to achieve.

Federal regulations require that "[f]or continuous discharges all permit limitations, standards, and prohibitions, including those necessary to achieve water quality standards shall unless impracticable be stated as…[a]verage weekly and average monthly discharge limitations for POTWs." 40 C.F.R. § 122.45(d)(2). While review of nitrogen reduction results achieved by other facilities indicates that TN concentrations of 3.0 mg/l are achievable in New Hampshire, EPA agrees with information provided by the Town of Newmarket that the available information on effluent variability indicates that 3.0 may not be practicably or consistently achievable as a monthly average limit. A seasonal (April - October) rolling average TN limit of 3.0 mg/l accomplishes the goal of maximizing point source reductions while allowing for a reasonable amount of effluent variability. The rolling average limit ensures that the best possible result is achieved each month in order to ensure that the seasonal average limit is not exceeded. Accordingly, the final permit contains a seasonal rolling average limit for TN. As mentioned above, EPA has previously found that longer-term permit limits may be appropriate for nutrients consistent with EPA's regulations (Hanlon, 2004)[51] To the extent that the comment is

[51] As noted in the Hanlon memorandum, the Chesapeake Bay approach to annual limits is not to be applied reflexively, but only after a careful consideration of site-specific factors:

> "Additionally, it is important to note that the nutrient dynamics of the Bay may not be unique. The establishment of an annual limit with a similar finding of "impracticability" pursuant to 40 C.F.R. § 122.45(d) may be appropriate for the implementation of nutrient criteria in other watersheds when: attainment of the criteria is dependent on long-term average loadings rather than short-term maximum loadings; the circumstances match those outlined in this memo for Chesapeake Bay and its tidal tributaries; annua1imits are technically supportable with robust data and modeling as they are in the Chesapeake Bay context; and appropriate safeguards to protect all other applicable water quality standards are employed."

EPA has made a practicability finding as a basis for imposing a seasonal rolling average for the nitrogen, as explained elsewhere in this Response to Comments.

suggesting an even longer averaging period for the permit limit, EPA does not accept that suggestion as it would be (1) difficult to implement effectively, as a multi-year period would be required before compliance could be assessed; and (2) inconsistent with the goal of maximizing point source reduction.

EPA also finds no merit in the suggestion that it eliminate the concentration limit in favor of a tiered limit based on design flow loads. EPA's approach is in accord with federal regulations and New Hampshire WQSs. Under 40 C.F.R. § 122.45(f), permit limitations are required to have "limitations, standards and prohibitions expressed in terms of mass except [] [w]hen the applicable standards and limitations are expressed in terms or other units of measurement." The applicable New Hampshire narrative water quality standard for nutrients requires that Class B waters "shall contain no phosphorus or nitrogen in such *concentrations* that would impair any existing or designated uses, unless naturally occurring," NH Env-Wq 1703-14(b) (emphasis added). EPA also notes that NHDES Great Bay Nutrient Report expresses thresholds in terms of receiving water concentrations. The approaches outlined by the Coalition would not be consistent with the goal of maximizing point source reductions. Imposing concentration rather than mass limits will assure that effluent nitrogen concentrations are maintained at consistently low levels even below design flows.

As explained elsewhere in this Response to Comments, EPA has used the *NHDES Great Bay Nutrient Report* as a relevant source of site-specific technical information in establishing effluent limits in an individual permit; it has not considered the proposed numeric thresholds to be binding.

Comment #40: The permit should include a long term schedule of compliance as allowed by New Hampshire state law. (*See* RSA 485-A:13 (2011).) Given the uncertainties and high costs associated with the proposed limits, a 20-year schedule of compliance is requested. The first 10 years will be used to construct and monitor the effects of reducing TN levels to 8 mg/l. The next five years will be used to evaluate whether a more restrictive TN reduction is necessary to promote reduced macroalgae growth. If found necessary, the remaining five years will be used to construct facilities necessary to meet a 3 mg/l TN limitation.

Response #40: Although there is a provision authorizing compliance schedules in the New Hampshire statutory section governing NHDES water discharge permits ("Such permits may contain, in the case of sources not in compliance with such effluent limitations at the time the permit is issued, compliance schedules, including interim requirements necessary or desirable in order to fulfill the purposes or requirements of this chapter…"), compliance schedules for water quality-based effluent limitations have not been clearly authorized under New Hampshire's water quality standards, as approved by EPA. This interpretation is consistent with EPA and NHDES's long-standing practice in New Hampshire, under which compliance issues are addressed through enforcement mechanisms, such as administrative orders. EPA therefore does not consider them appropriate for inclusion in NPDES permits issued in New Hampshire.

The implementation schedule established by EPA will take into account affordability concerns using, for example, EPA's guidance *Interim Economic Guidance for Water Quality Standards*.

Accurate cost estimates cannot be made until facilities planning and design work is completed. The implementation schedule can be modified, as appropriate, based on the results of the planning and design work. The impact of wastewater related costs on the average sewer fee will be based on actual water use and not a theoretical water use value. A phased implementation schedule will be allowed, to the extent appropriate, to address documented affordability concerns.

COMMENTS FROM THE CONSERVATION LAW FOUNDATION

Comment #41: Congress established the Clean Water Act "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251(a). The Act reflects Congressional recognition that "no one has the right to pollute." *Weyerhaeuser Co. v. Costle*, 590 F.2d 1011, 1043 (D.C. Cir. 1978) (quoting SENATE REPORT NO. 92-414 1972 U.S.C.C.A.N. 3668, 3709 (1971)). In crafting the Act, Congress resolved that "[t]he use of any river, lake, stream or ocean as a waste treatment system is unacceptable." *Id*. at 3674. The Act's ambitious water quality goals reflect Congress's intent to remedy water quality problems by forcing development of pollution control technology and practices:

> it is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985;
>
> it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983. . . .

33 U.S.C. §1251(a)(1)(2).

States must establish minimum "water quality standards" sufficient to carry out the overall purpose of the Act. 33 U.S.C. § 1313; 40 C.F.R. § 131.2. These standards define a state's water quality goals by "designating the use or uses to be made of the water and by setting criteria necessary to protect those uses." 40 C.F.R. § 131.2. The standards thus serve "dual purposes." *Id.* § 130.3. First, they require each state to set forth specifically-tailored water quality benchmarks for all the waters within its boundaries. *Id.* Those waterway-specific benchmarks then provide the "regulatory basis for establishment of water quality-based treatment controls" in Clean Water Act permits that require pollutant removal levels above and beyond the EPA-established, nationwide technology-based effluent limitations. *Id.*; *see, e.g., Arkansas v. Oklahoma*, 503 U.S. 91, 101 (1992) (observing that water quality standards supplement technology-based effluent limitations "so that numerous point sources, despite individual compliance with effluent limitations, may be further regulated to prevent water quality from falling below acceptable levels.") (internal citation and quotations omitted). Each state must periodically identify and prioritize the waters within its boundaries that do not meet the state's minimum water quality standards and any specific numeric criteria set by the standards. 33 U.S.C. § 1313(d)(1)(A). The list of these waters that fail to attain water quality standards, frequently referred to as "impaired" waters, is known as the 303(d) list—a reference to the section of the CWA that requires its creation.

NPDES permits thus work synergistically with water quality standards to achieve the Act's goals, including the ultimate no-discharge goal. *Waterkeeper Alliance, Inc. v. United States E.P.A.*, 399 F.3d 486, 491 (2d Cir. 2005) (recognizing that EPA and states "advance[] the Act's objectives – including the ambitious goal that water pollution be not only reduced, but eliminated, … through the use of N.P.D.E.S. permits that, while authorizing some water pollution, place important restrictions on the quality and character of that licit pollution."). In addition to the EPA-established technology-based effluent limitations (TBELs), *see* 33 U.S.C. §1311(b)(1)(A),(B), and when necessary to restore and protect water quality, NPDES permits must include "any more stringent limitation…necessary to meet water quality standards." *Id.* §1311(b)(1)(C); 40 C.F.R. § 122.44(d). These additional limitations are known as water-quality based effluent limitations (WQBELs). Consistent with the CWA's goal of restoring water quality, EPA must establish WQBELs at levels that are "necessary to achieve water quality standards." 40 CFR § 122.44(d)(1).[1] *See also id.* § 122.4(d) ("No permit may be issued…when the imposition of conditions cannot ensure compliance with applicable water quality requirements of all affected states."). These provisions establish the regulatory basis for requiring WQBELs in NPDES permits.

The key question in the WQBEL analysis is "whether a given point source discharge 'causes, has the reasonable potential to cause, or contributes to' an exceedance of the narrative or numeric criteria for various pollutants set forth in state water quality standards." *In re Keene*, 2008 WL 782613 at 3. (quoting 40 C.F.R. § 122.44(d)(1)(ii)). CWA regulations expressly set forth the required elements of this analysis—often referred to as the "reasonable potential analysis":

> When determining whether a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above a narrative or numeric criteria within a [s]tate water quality standard, the permitting authority shall use procedures [that] account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, and where appropriate, the dilution of the effluent in the receiving water.

Id. When this analysis demonstrates that the permit applicant's proposed discharge would have the reasonable potential to cause or contribute to a violation of water quality standards, the permitting authority must calculate WQBELs for the relevant pollutants. *Id.*[2] EPA guidance makes clear that "[a]t a minimum, the permit writer must make this determination at each permit reissuance and must develop WQBELs as necessary to control the discharge of pollutants." *Id.*

Importantly, and as recently affirmed by the U.S. EPA's Environmental Appeals Board (EAB), the imposition of WQBELs in an NPDES permit must not be based on a determination that the discharge will, as a matter of certainty, cause the violation of water quality standards. To the contrary:

> The requirement to impose a permit limit is not only premised on a finding that the pollutant discharges "are" at a level that "causes" violation of the applicable water quality standards, but the requirement is also triggered by a finding that the facility's pollutant discharges "may" be at a level that "contributes" to or has the "reasonable potential" to cause a violation. 40 CFR § 122.44(d)(1)(i). The juxtaposed contrasts between "are" and

> "may," and between "cause" and both "contribute" and "reasonable potential," indicate that the Region is not limited . . . to acting only where there is certainty of an existing causal link between a specific discharge and a particular violation of water quality standards. Instead, the regulation requires water quality-based effluent limits even when there is some degree of uncertainty regarding both the precise pollutant discharge levels and the potential causal effects of those discharges, so long as the record is sufficient to establish that there is a "reasonable potential" for that discharge to cause or contribute to a violation of water quality standards.[FN29][3] Agency guidance and the Board's decisions have also stated that the reasonable potential analysis must be based on the "worst-case" effluent conditions. *In re Washington Aqueduct Water Supply Syst.*, 11 E.A.D. 565, 584 (EAB 2004); *accord Am. Iron & Steel Inst. V. EPA*, 115 F.3d 979, 1001 (D.C. Cir. 1997) (discussing EPA's policy that the reasonable potential analysis be based on the worst case scenario). The regulations, thus, require a precautionary approach when determining whether the permit must contain a water quality-based effluent limit for a particular pollutant.

In Re: Upper Blackstone Water Pollution Abatement Dist., 2010 WL 2363514 (EAB) at 13 (rejecting argument that a complete assessment and development of a mathematical model precisely predicting fate and transport of nitrogen throughout the Narragansett Bay system was necessary for EPA to have sufficient scientific basis for finding that WWTF's nitrogen discharges contribute to, or have the reasonable potential to cause, water quality impairments). Moreover, "scientific uncertainty is not a basis for delay in issuing an NPDES permit" and establishing necessary WQBELs. *Id.* at 16.

[1] EPA must do so without regard to issues of cost or technological feasibility. *In re Westborough and Westborough Treatment Plant Board*, 10 E.A.D. 297, 312 (E.A.B. 2002) (collecting cases); *Defenders of Wildlife v. Browner*, 191 F.3d 1159, 1163 (9th Cir. 1999) (EPA also "is under a specific obligation to require that level of effluent control which is needed to implement existing water quality standards without regard to the limits of practicability") (internal quotations and citations omitted); *United States Steel Corp. v. Train*, 556 F.2d 822, 838 (7th Cir. 1977)). For example, municipal operators of the Westborough, MA sewage treatment plant appealed their NPDES permit, arguing that the limits EPA established in the permit for "Chronic-No Observed Effect Concentration" (C-NOEC) " 'may not be attainable through any known technology reasonably applied to' POTWs, or would only be attainable at an unreasonable cost." *In re Westborough*, 10 E.A.D. at 312. The EPA's Environmental Appeals Board rejected this challenge to the permit limit, stating that "[w]ith regard to technical or economic feasibility arguments, we have consistently held that cost and technological considerations are not permitted under the CWA to be considered by the permit-writer when setting water quality-based effluent limits." *Id. See also In re City of Attleboro, MA Wastewater Treatment Plant*, NPDES Appeal No. 08-08, slip op. at 46-47 (E.A.B. Sept. 15, 2009), 14 E.A.D.__ (collecting cases and stating that "[t]he Board has often emphasized that the legal standard is that cost and technological considerations are not factors in setting water quality-based effluent limits. Rather, section 301(b)(1)(C) of the CWA requires unequivocal compliance with applicable water quality standards, and does not recognize an exception for cost or technological feasibility.").

[2] *See also* U.S. EPA, "NPDES Permit Writers' Manual" (available at http://www.epa.gov/npdes/pubs/chapt_06.pdf) at 99 ("In deciding whether or not WQBELs are needed to protect water quality, a permit writer must determine whether the discharge causes, has the reasonable potential to cause, or contributes to an excursion of numeric or narrative water quality criteria.").

[3] Footnote 29 in the EAB's decision states: "'Reasonable potential' requires some degree of certainty greater than a mere possibility, but it leaves to the permit writer's scientific and technical judgment how much certainty is necessary."

Response #41: The comments are noted for the record.

Comment #42: The Lamprey River, which flows into Great Bay, is an important part of the larger Great Bay estuarine ecosystem. In the past several years, conditions in the Great Bay estuary have been the subject of significant additional study demonstrating that the estuary has experienced significant increases in nitrogen levels and troubling signs of degradation, including but not limited to the substantial loss of eelgrass – the cornerstone of the estuary's ecosystem – and other signs of eutrophication, such as the increased presence of macroalgae. Such additional studies include the following:

• **Numeric Nutrient Criteria for the Great Bay Estuary.** In June 2009, the N.H. Department of Environmental Services (NHDES) published its final numeric nutrient criteria for the Great Bay estuary, establishing two sets of numeric nitrogen criteria – one to protect eelgrass, the other to address dissolved oxygen. NHDES, Numeric Nutrient Criteria for the Great Bay Estuary (June 2009).[4] The criteria were the result of a four-year-long process, during which NHDES consulted with a nutrient criteria advisory group comprised of numerous researchers (including from EPA and the UNH Jackson Estuarine Laboratory), and during which NHDES solicited, received and responded to comments. The criteria also were subjected to independent peer review by Robert W. Howarth of Cornell University and Walter R. Boynton of the University of Maryland. *See* Correspondence from Stephen S. Perkins, EPA to Harry T. Stewart, NHDES (June 29, 2010), appended as **Attachment 1**.

• **Great Bay estuary impairment studies and Section 303(d) listings**. In August 2009, NHDES published and submitted to EPA its Amendment to the New Hampshire 2008 Section 303(d) List Related to Nitrogen and Eelgrass in the Great Bay Estuary (Aug. 13, 2009). The Amendment was the culmination of a comprehensive process in which NHDES (1) published a draft methodology report, dated June 20, 2008, for which NHDES solicited comments, and which was the subject of discussion among researchers and other stakeholders;[5] (2) published a final document outlining its methodology and assessment results related to eelgrass and nitrogen in the Great Bay estuary, for purposes of determining compliance with water quality standards,[6] and (3) applied its peer-reviewed numeric nitrogen criteria. As set forth in NHDES's 2009 Amendment to the New Hampshire 303(d) List, waters throughout the Great Bay estuary were identified as impaired relative to nitrogen and/or eelgrass loss, including but not limited to the Lamprey River, Great Bay and Little Bay. Such impairment listings are set forth in NHDES's 2010 Section 303(d), including but not limited to impairments to Aquatic Life uses in the Lamprey River pertaining to, *inter alia*, total nitrogen, estuarine bioassessments (i.e., eelgrass), chlorophyll-a, and dissolved oxygen, and in Great Bay and Little Bay pertaining to, *inter alia*, total nitrogen, estuarine bioassessments (i.e., eelgrass), and light attenuation. *See* NHDES, Final 2010 List of Threatened or Impaired Waters That Require A TMDL. In addition to these impairments relative to Aquatic Life uses, the Lamprey River's Primary-Contact-Recreation use is impaired as a result of chlorophyll-a and total nitrogen. *Id.*

• ***State of the Estuaries* report, 2009.** In 2009, the Piscataqua Region Estuaries Partnership (PREP) published its most recent *State of the Estuaries* report.[7] The report documents a continuation of the troubling trends outlined in previous *State of the Estuaries* reports. Specifically, it shows that of the twelve indicators tracked in the estuary, only *one* (land conservation) demonstrated a positive trend. All other trends were either negative or cautionary. Importantly, trends for nitrogen in Great Bay, and for eelgrass, were found to be *negative*. With respect to nitrogen, the report noted that the total nitrogen load to the Great Bay estuary increased by 42 percent in the prior five years, and that dissolved inorganic nitrogen concentrations in Great Bay had increased by 44 percent in the prior 28 years. Regarding eelgrass, it reported eelgrass declines of 37 percent in Great Bay between 1990 and 2008, and that eelgrass has completely disappeared from the tidal rivers, Little Bay and the Piscataqua River. The report classifies dissolved oxygen as having a *cautionary* trend, and notes that violations of dissolved-oxygen water quality standards have been consistently observed at stations located in the tidal tributaries.

• ***Nitrogen Loading Analyses*.** In December 2010, NHDES published its draft Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed.[8] The analysis, which was predated by a stakeholder review draft for which NHDES sought and obtained comments,[9] included the development by NHDES of models "to determine existing nitrogen loads and nitrogen loading thresholds for the subestuaries to comply with the numeric nutrient criteria," as well as an evaluation of different permitting scenarios for wastewater treatment facilities on nitrogen loads, and projected costs of wastewater facility upgrades. The analysis demonstrated, *inter alia*, that nitrogen loads to the Great Bay, Little Bay and the Upper Piscataqua River need to be reduced by 30 to 45 percent to attain the numeric nutrient criteria, that both wastewater treatment facilities and non-point sources will need to reduce nitrogen loads to attain the numeric nutrient criteria, and that while wastewater treatment facility upgrades to remove nitrogen will be costly, the average cost per pound of nitrogen removed from the estuary due to wastewater facility upgrades is lower than for non-point source controls.[10]

• ***Lamprey River Studies.*** In recent years, the New Hampshire Water Resources Research Center at the University of New Hampshire has studied nitrogen pollution in the Lamprey River, assessing the various forms of nitrogen found in the river, as well as nitrogen attenuation. *See* Daley, Michelle L, *et al.*, Nitrogen Assessment for the Lamprey River Watershed (Sept. 7, 2010), appended hereto as **Attachment 2**; *Nitrogen Research in the Lamprey River Watershed and the Great Bay Estuarine Ecosystem*, Powerpoint Presentation of Michelle L. Daley at Southeast Watershed Alliance Science Symposium (May 10, 2011), appended as **Attachment 3**. This work documents that, *inter alia*, nitrogen retention in the Lamprey River watershed is declining as nitrogen inputs increase, indicating that the watershed or portions thereof may be reaching saturation.

[4] It is CLF's understanding that NHDES's Numeric Nitrogen Criteria for the Great Bay Estuary (June 2009) are already part of the administrative record. In addition, CLF submitted this document as Attachment 1 to its August 8, 2011 comments on the draft NPDES permit for the Town of Exeter's WWTF.

[5] NHDES, Methodology and Assessment Results related to Eelgrass and Nitrogen in the Great Bay Estuary for Compliance with Water Quality Standards for the New Hampshire 2008 Section 303(d) List (June 20, 2008) (marked "Draft – For Review and Comment").

[6] NHDES, Methodology and Assessment Results related to Eelgrass and Nitrogen in the Great Bay Estuary for Compliance with Water Quality Standards for the New Hampshire 2008 Section 303(d) List (Aug. 11, 2008). CLF submitted this document to EPA as Attachment 4 to its August 8, 2011 comments on the draft NPDES permit for the Town of Exeter's WWTF.

[7] It is CLF's understanding that the 2009 *State of the Estuaries* report is part of EPA's administrative record. CLF submitted a copy of this document as Attachment 7 to its August 8, 2011 comments on the draft NPDES permit for the Town of Exeter's WWTF.

[8] It is CLF's understanding that this document is part of EPA's administrative record. CLF submitted a copy of this document as Attachment 8 to its August 8, 2011 comments on the draft NPDES permit for the Town of Exeter's WWTF.

[9] NHDES, Preliminary Watershed Nitrogen Loading Thresholds for Watersheds Draining to the Great Bay Estuary (Oct. 30, 2009) (marked "Stakeholder Review Draft").

[10] To reiterate, cost cannot be considered as part of EPA's permitting determination. *See supra* note 1.

Response #42: The comments are noted for the record. The cited reports are part of the administrative record. EPA concurs that the facts and studies cited above collectively provide strong evidence of nitrogen impairment in the receiving waters and point to the need for nitrogen controls on the Facility. EPA also notes that the neither EPA nor the State consider the NHDES *Great Bay Nutrient Report* to be water quality criteria under Section 303 of the Act. New Hampshire does not, however, have "final numeric nutrient criteria," only a narrative nutrient water quality criterion. NHDES has finalized its site-specific nutrient analysis for the Great Bay Estuaries designed to translate the State's narrative nutrient criterion. The thresholds yielded by that study are no longer draft or preliminary.

Comment #43:

A. The Clean Water Act mandates a WQBEL for total nitrogen at the limit of technology, coupled with stormwater and non-point source nitrogen reductions

CLF strongly supports the WQBEL of 3 mg/l effluent limit for total nitrogen (considered to be the limit of technology) set forth in the draft NPDES permit. As discussed in Part II of these comments, the Lamprey River has numerous Aquatic Life use impairments (loss of eelgrass, elevated chlorophyll-a concentrations, depressed dissolved oxygen, elevated total nitrogen) as well as impairment of Primary Contact Recreation uses (chlorophyll-a, total nitrogen). Because the Lamprey River flows into Great Bay (which in turn is connected to Little Bay and the Piscataqua River), its nitrogen loads, including those from the Newmarket WWTF, are causing or contributing to the violation of water quality standards downstream, such as well documented losses of eelgrass. As set forth in Part I of these comments, the Newmarket WWTF, which is a significant source of nitrogen pollution in the Lamprey River, as a matter of law *cannot* cause or contribute to these or other violations of water quality standards.

To achieve water quality standards, significant reductions in nitrogen loading to the tidal tributaries (including the Lamprey River) and the bays (Great Bay and Little Bay) will be required. For example, according to NHDES' draft nitrogen loading analysis, nitrogen loads need to be reduced by 98.7 tons per year (41 percent) to protect eelgrass in the Lamprey River.[11] NHDES, Draft Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed (Dec. 2010) at 13. Imposing effluent limits of 3 mg/l total nitrogen for the Newmarket WWTF, which contributes 88 percent of the 34.7 tons per year of nitrogen load from WWTFs in the Lamprey River watershed, will result in a significant reduction in WWTF nitrogen load, but will still require significant non- point source nitrogen load reductions to achieve water quality standards sufficient to address eelgrass. *Id.*

The need to achieve these significant load reductions is highly relevant in two ways. First, it is dispositive evidence that to comply with the Clean Water Act (*i.e.*, to ensure that discharges from the Newmarket WWTF do not cause or contribute to water quality standards violations), EPA *must* impose an effluent limit that is the limit of technology. Again, CLF strongly supports the 3 mg/l total nitrogen limit set forth in the draft permit (although we question whether applying this limit in the April 1 – October 31 timeframe is sufficient). Any less stringent standard will violate the Clean Water Act.

Second, because the limit of technology will not be enough, on its own, to achieve water quality standards, reductions in loads from stormwater and non-point sources will be necessary. EPA's Fact Sheet recognizes this need, outlining various steps that must be taken to reduce stormwater and non-point source contributions. EPA, Fact Sheet at 29-31. We urge EPA to specifically incorporate these requirements into the body of the permit as required offsets that will be necessary to attain water quality standards.

11 According to NHDES' analysis, preventing low dissolved oxygen in the Lamprey River and protecting eelgrass in the subestuary requires nitrogen load reductions of 12.8 tons per year and 98.7 tons per year, respectively. NHDES, Draft Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed (Dec. 2010) at 13. CLF agrees with EPA that the 41 percent (98.7 tons per year) load reduction is necessary, as it protects *all* designated uses. *See* Fact Sheet at 29.

Response #43: Please see Response #38 above relative to the seasonal limit for nitrogen. While algae blooms can occur prior to April, they are not expected to be of a frequency and magnitude that would result in standards violations due to less than optimal growing conditions. EPA will revisit its position on the growing season in future permitting cycles if subsequent monitoring indicates that algae blooms in the November - March are of greater concern.

The nonpoint source loading analysis and implementation plan needs to be completed in order to determine how the necessary nonpoint source controls can be most efficiently achieved, including how much of the necessary reductions will be allocated to each community. Until this work is completed a specific allocation for Newmarket cannot be determined. EPA has determined that it not therefore appropriate to frame the permit in terms of a WQBEL plus offsets. Rather, to account for the possibility that NHDES and the Town will not pursue a framework to reduce nonpoint source nitrogen loads, EPA has opted for a WQBEL plus reopener structure for the permit, such that the limit is expressly linked to nonpoint source efforts. EPA has added language to the permit indicating that the 3.0 mg/l limit is predicated on taking specific actions to pursue a nonpoint source reduction framework over the course of the permit

term, including a nonpoint source analysis, an analysis of the costs for controlling these sources, an implementation plan, and a monitoring plan for tracking results. EPA has also added language indicating that in the event the activities described above are not carried out according to the terms of the permit, EPA will reopen the permit and incorporate any more stringent total nitrogen limit required to assure compliance with applicable water quality standards.

For clarification, and as discussed in response to a comment by the Coalition, the Clean Water Act does not mandate that EPA include a "Limit of Technology" for nitrogen; water quality-based limits must be established irrespective of technological feasibility. The *NHDES Nitrogen Loading Reduction Report* (2010) modeled a limit of 3.0 mg/l for this facility (among other limits) and showed that a limit of 3.0 mg/l would require less nonpoint source reduction compared to higher effluent limits. EPA selected 3.0 mg/l as a water quality-based limit that, in conjunction with nitrogen reductions from nonpoint sources, which DES has committed to pursue, is as stringent as necessary to meet applicable water quality standards. These factors together led to the imposition of 3.0 mg/l, not solely the mere fact this level of pollutant control was the commonly accepted limit of technology. *See Reaffirmation of Nitrogen Effluent Limitation of 3 mg/l* above.

Comment #44:

> **B. Contrary to arguments from certain sewered communities, EPA's proposed nitrogen limits are based on sound analysis and can and must proceed without further delay**

A coalition of five Seacoast-area sewered communities (led by the City of Portsmouth – which still operates its Peirce Island WWTF with only primary treatment – and including the Town of Newmarket) has engaged in a concerted strategy to delay NPDES permitting for the Exeter and Newmarket WWTFs and other facilities, claiming NHDES's longstanding work on the issue of nitrogen pollution and eutrophication in the Great Bay estuary is somehow flawed and that further study is necessary. It is important to note as a threshold matter that this coalition, from which the Town of Durham recently withdrew, does not represent the views of all sewered communities with WWTFs discharging into or otherwise affecting the estuary. To the contrary, for example, the Town of Newington, a sewered community that discharges into the Piscataqua River, has specifically acknowledged the nitrogen-related challenges facing the Great Bay estuary and that "[t]he bay is a priceless natural and economic resource that has provided immeasurable value to our community over the course of four centuries." Correspondence from Chairs of Newington Board of Selectmen and Conservation Commission to Administrator Spalding, EPA (June 9, 2011), appended as **Attachment 4**. The Town of Newington has specifically urged EPA "to move decisively, and in a comprehensive fashion, to reduce the volume of all sources of nitrogen that contribute to the impairment of water quality in the estuary." *Id.* It has further stated:

> We assume that our wastewater plant will be subjected to the same standard as Exeter's. With that in mind, we urge you to demonstrate respect for Newington taxpayers by implementing a standard that will achieve the desired results. Were the EPA to implement half-measures, our municipal funds would be expended in vain.

> Alternately, were the EPA to delay implementation, it would ultimately drive up the cost of solving the problem and continue the degradation of the environment. That result would not be in the best interest of local taxpayers.
>
> We have no doubt that building wastewater infrastructure to a more rigorous standard will be expensive. Yet failure to do so would ultimately cost us a great deal more. For that reason, the Town of Newington stands ready to upgrade our wastewater plant to meet whatever standard for nitrogen reduction the scientific community concludes is necessary to heal the estuary.

Id. More recently, in comments submitted at EPA's public hearing on the draft Newmarket NPDES permit, the Town of Newington wrote:

> The Town of Newington currently has plans underway to upgrade our wastewater treatment plan to meet the proposed nitrogen standard of 3 milligrams per liter. Concurrently, we are undertaking an aggressive program to reduce non-point sources.
>
> Obviously, our efforts would be for naught unless other communities in the watershed were to take comparable measures.
>
> **Accordingly, the Town of Newington urges the EPA to move quickly and decisively, and in a comprehensive fashion, to reduce the volume of all sources of nitrogen that contribute to the impairment of water quality in the estuary.**
>
> We support the proposed 3-milligram standard. We have no doubt that building wastewater infrastructure to a more rigorous standard will be expensive. Yet failure to do so would ultimately cost us a great deal more.

Correspondence from Town of Newington to Curt Spalding, EPA Region I Administrator (Nov. 30, 2011), appended hereto as **Attachment 5** (bold emphasis in original).

The objections of the municipal coalition are without merit. As discussed in Part II, above, NHDES – with the assistance and input of many others – has engaged in comprehensive study and analysis of the nitrogen, eelgrass loss and dissolved oxygen problems in the estuary. This open and comprehensive process has led to additional impairment listings for waters throughout the estuary (including the Lamprey River, Great Bay and Little Bay), to the development of numeric nitrogen criteria for purposes of translating narrative water quality standards, and to assessments of nitrogen loads. At the eleventh hour, following the conclusion of years of work and analysis, the municipal coalition submitted to NHDES a January 10, 2011 "Technical Memorandum" prepared by HydroQual Environmental Engineers & Scientists ("HydroQual") for the coalition's consultant, John Hall, leveling a number of criticisms at NHDES and its analysis. *See* **Attachment 6**. NHDES replied to the HydroQual memorandum in detail, noting numerous significant flaws in HydroQual's criticisms, including its exclusion of substantial relevant data. A copy of NHDES's written response is appended at **Attachment 7**.[12]

Contrary to the municipal coalition's claims, there is a sound scientific basis for the nitrogen limit set forth in the draft permit. This has been confirmed by NHDES itself in response to

criticisms raised by the municipal coalition, and by the expert peer review conducted by Robert W. Howarth and Walter R. Boynton. It is further confirmed by Drs. Ivan Valiela and Erin Kinney of Woods Hole Environmental Associates, who have reviewed NHDES's numeric criteria and other related analyses. Correspondence from Ivan Valiela, Ph.D. and Erin Kinney, Ph.D, Woods Hole Environmental Associates, to Tom Irwin, CLF (July 28, 2011), appended as **Attachment 10**. Drs. Valiela and Kinney, who have a wealth of expertise in estuarine matters (Dr. Valiela, for example, has been studying the effects of nitrogen loading on estuarine systems for 41 years),[13] found the eelgrass effects of nitrogen concentrations and loads in Great Bay to be consistent with effects observed elsewhere. *Id.* With specific regard to light attenuation and the municipal coalition's claim that natural non-nitrogen-related conditions preclude the growth of eelgrass, it is important and highly relevant to note, as EPA's Fact Sheet does, that eelgrass historically grew in the Lamprey River subestuary.[14] EPA, Fact Sheet at 30. The municipal coalition's contention that there is no causal link between nitrogen-related water clarity problems and eelgrass declines also flies in the face of well documented losses of eelgrass – starting from the "deep-edge" of eelgrass beds and moving over time into shallower waters – in Little Bay and the Piscataqua River, where eelgrass now no longer exists.[15] The municipal coalition's recent argument that eelgrass loss in Great Bay-proper does not appear to be a result of excessive epiphyte growth and is the result solely of macroalgae growth also is without merit. According to Dr. Fred Short of the University of New Hampshire's Jackson Estuarine Laboratory, while epiphyte growth in Great Bay is not excessive, there is nonetheless an epiphyte problem in Great Bay, as the epiphytes present there are a species that forms a furry coating on eelgrass leaves, causing them to capture sediments in a way that both reduces photosynthesis and weighs-down the plants to their detriment.[16]

Any claims that dissolved oxygen trends in the Lamprey River are associated with hydrodynamics, as opposed to the eutrophic effects of nitrogen, also are without merit. *See* Drs. Valiela's and Kinney's report (Attachment 10) at page 8, rejecting this argument raised by the coalition with respect to the Squamscott River and noting that dissolved oxygen trends are strongly correlated with diurnal patterns – linked to primary production and nitrogen – as opposed to hydrodynamics.

Drs. Valiela and Kinney further note in conclusion:

> The Great Bay estuary appears to be a system transitioning from threatened eelgrass habitat into habitats dominated by other kinds of estuarine producers (macroalgae), and the transition seems closely linked to increases in land-derived nitrogen loads. There can always be more study, to more fully understand every factor contributing to the health of the estuary, but we believe that the evidence for the need to decrease the land-derived nitrogen load is overwhelming. No amount of hydrodynamic modeling or larger data sets will change the fact that the amount of nitrogen entering the Great Bay estuary is increasing and there must be substantial nitrogen reductions if the eelgrass habitats, and all of the ecosystems services that they provide, are to survive. The solution to the eutrophication of the Great Bay estuary is going to require control of wastewater nitrogen – a significant and controllable source of nitrogen. The plan to deal with the problem also will need to include a combination of point and non-point nitrogen sources, and future changes in land use (NHDES 2010). The conclusions of NHDES regarding Numeric

> Nutrient Criteria of the Great Bay estuary are supported by studies in other New England estuaries and can provide a sound basis for permitting decisions . . . .

Id. at 9-10.

In resisting EPA's regulatory efforts to address nitrogen pollution from wastewater treatment facilities, including but not limited to the Newmarket WWTF, the municipal coalition also has asserted that EPA is incorrectly focused on total nitrogen and, instead, should focus on dissolved inorganic nitrogen (DIN). This argument is without merit. According to University of New Hampshire Research Scientist and New Hampshire Water Resources Research Center Associate Director Michelle L. Daley, who has been engaged in extensive study of nitrogen loading in the Lamprey River (including both the *forms* of nitrogen contributing to those loads, and nitrogen attenuation within the Lamprey River hydrological system), DIN should be the focus of management efforts aimed at reducing non-point sources of nitrogen given that DIN clearly responds to the human footprint in the watershed.[17] Dissolved organic nitrogen (DON) in streams throughout the Lamprey watershed draining sub-basins with a range of human activity, but containing no major point sources of nitrogen, does not respond to the level of the human footprint and therefore, according to Ms. Daley, non-point DON is not manageable.[18] According to Ms. Daley, regulating total nitrogen (TN) in Great Bay is appropriate as all forms of nitrogen can impair aquatic health (sediments and DON can block light and both DIN and DON can fuel eutrophication), and regulating TN from point sources such as Newmarket's WWTF is entirely appropriate since TN from WWTFs can effectively be managed with current technology.[19] Ms. Daley also notes that organic nitrogen from sewage effluent has greater bioavailability than DON from wetlands or other natural sources (Seitzinger et al., Bioavailability of DON from natural and anthropogenic sources to estuarine plankton, Limnol. Oceanogr., 47(2), 2002, 353-366), and that regulating total nitrogen contributions from point sources such as Newmarket's WWTF is also important because a significant portion of the non-point nitrogen load cannot be managed (i.e., reduced) since it does not respond or relate to the human footprint in the landscape.[20] Ms. Daley is of the opinion that it is important to invest in WWTF improvements to achieve total nitrogen load reductions, and that failing to move forward with the reductions that can be achieved with technology at point sources such as the Newmarket WWTF will make the problem of nitrogen pollution in the Great Bay estuary extremely difficult to solve.[21]

Even separate and apart from the numeric criteria established by NHDES, there can be no question that the Lamprey River and downstream water bodies such as Great Bay and Little Bay violate state water quality standards.[22] The municipal coalition has failed to in any way establish that any effluent limit less stringent than 3 mg/l will meet the Clean Water Act's requirement that the Newmarket WWTF's discharge not cause or contribute to the violation of water quality standards.

The municipal coalition's argument for the need for greater scientific certainty – in addition to lacking merit – as a matter of law cannot preclude or delay EPA from proceeding with the prompt finalization of its proposed permit with the 3 mg/l effluent limit. As the EPA's Environmental Appeals Board recently explained: "scientific uncertainty is not a basis for delay in issuing an NPDES permit. The Board has specifically held that '[i]n the face of unavoidable scientific uncertainty, the Region is authorized, if not required, to exercise reasonable discretion and judgment.'" *In Re: Upper Blackstone Water Pollution Abatement Dist.*, 2010 WL 2363514

(May 28, 2010) at 16 (*quoting In Re: Dominion Energy Brayton Point, LLC*, 13 E.A.D. 407, 426 (EAB 2007). Indeed, the call for further study upon further study would amount to delays that would greatly undermine the ability of the Clean Water Act to achieve its objectives. *See id.* ("[M]ore than three decades ago, the D.C. Circuit aptly described the CWA's balance when confronted with a difficult situation and the obligation to eliminate water quality impairments: '* * * EPA may issue permits with conditions designed to reduce the level of effluent discharges to acceptable levels. This may well mean opting for a gross reduction in pollutant discharge rather than the fine-tuning suggested by numerical limitations. *But this ambitious statute is not hospitable to the concept that the appropriate response to a difficult pollution problem is not to try at all.*") (*quoting Natural Resources Defense Council, Inc.*, 568 F.2d 1369, 1380 (D.C. Cir. 1977) (emphasis added by EAB).

In challenging an effluent limit at the limit of technology, members of the municipal coalition have raised issues regarding cost and feasibility. As discussed above (*see* note 1, *supra*), EPA as a matter of law cannot consider cost and technological feasibility when writing an NPDES permit. Nonetheless, even if, assuming *arguendo*, these factors were legally relevant, there is ample evidence that achieving the total nitrogen limit set forth in the draft permit is feasible.[23]

12 In what can only be characterized as a response to the ongoing, intense pressures of the municipal coalition, NHDES entered a memorandum of agreement with five municipalities (Portsmouth, Exeter, Dover, Rochester and Newmarket) contemplating further study. In written responses to two letters criticizing the memorandum of agreement (a May 19, 2011 letter from the Town of Newington, and a May 25, 2011 letter from CLF, Great Bay Trout Unlimited and the N.H. Coastal Protection Partnership), NHDES Commissioner Burack responded that NHDES stands by its nutrient criteria, and that any further study conducted pursuant to the memorandum of agreement will not cause delay in EPA's process for issuing a final permit for the Exeter WWTF. *See* Correspondence from NHDES Commissioner Burack to Town of Newington Chairs of Board of Selectmen and Conservation Commissioner (June 8, 2011), appended as **Attachment 8** ("The Department of Environmental Services (DES) is in complete agreement that the situation in Great Bay requires prompt attention and that nitrogen reductions will be needed from all sources, including municipal wastewater treatment facilities. DES further agrees that nitrogen discharge limits ought to be set in such a way as to improve the overall ecological health of the estuary. DES has already taken steps to address the problems of low dissolved oxygen and eelgrass loss by proposing Nutrient Criteria for the estuary. *These criteria are the result of comprehensive analyses by DES scientists, which have been peer reviewed. DES stands by those criteria*.") (emphasis added); Correspondence from NHDES Commissioner Burack to CLF, Great Bay Trout Unlimited and N.H. Coastal Protection Partnership (June 8, 2011), appended as **Attachment 9** ("The situation in Great Bay requires prompt attention, and nitrogen reductions will be needed from all sources, including municipal wastewater treatment facilities, in order to improve the overall ecological health of the estuary. DES has clearly articulated the problems of low dissolved oxygen and eelgrass loss in the proposed Nutrient Criteria for the estuary. *DES stands by those criteria.*") (emphasis added).

13 Drs. Valiela's and Kinney's *curriculum vitae* are included within Attachment 10.

14 *See, e.g.*, Drs. Valiela's and Kinney's report (**Attachment 10**) at pages 6 - 7, noting with respect to the Squamscott River that it "has a history of eelgrass growing as far upstream as Chapman's Landing as recently as 1960. This suggests that transparency of the water column was adequate for eelgrass growth. We have no reason to assume that natural color, organic or inorganic dissolved matter in the Squamscott River have changed since that time. However there is evidence nitrogen inputs have increased."

15 Personal communications between Tom Irwin, CLF, and Dr. Fred Short, UNH Jackson Estuarine Laboratory (Nov. 10, 2011, Dec. 15, 2011). A copy of Dr. Short's *curriculum vitae* is appended hereto as **Attachment 11**.

16 *Id.*

[17] Personal communications between Tom Irwin, CLF, and Michelle Daley, UNH (Nov. 30, 2011 and Dec. 13, 2011). A copy of Ms. Daley's *curriculum vitae* is appended hereto as **Attachment 12**.

[18] *Id.*

[19] *Id.*

[20] *Id.*

[21] *Id. See also* "Sewer Plants in Great Bay Face Tougher Clean Water Standards," N.H. Public Radio (May 20, 2011) (http://info.nhpr.org/sewer-plants-great-bay-face-tougher-clean-water-standards), appended as **Attachment 13**.

[22] *See e.g.*, Env-Wq 1703.01(b), 1703.14(b),(c), and 1703.19(a), (b).

[23] *See* EPA, *Municipal Nutrient Removal Technologies Reference Document: Volume 1 – Technical Report*, EPA 832-R-08-006 (Sept. 2008) at 3-1 to 3-15, 3-46 to 3-48 (in assessing one year of data for WWTF technologies in operation at various WWTFs, finding that all four WWTFs with stringent TN discharge limits satisfied their permit limits and "performed efficiently and reliably."); Water Environment Research Foundation, *Nutrient Management Volume II: Removal Technology, Performance, and Reliability*, NUTR1R06k1 (assessing performance reliability of WWTFs having low TN effluent limits and revealing that several WWTFs consistently met 3 mg/l TN effluent limit over a three year period and that not once did the rolling 30-day average TN effluent concentration for three WWTFs exceed 3 mg/l TN during the three year period). In addition to the above, a recent WWTF upgrade in Hagerstown, Maryland (operational as of January 2011), is using continuous backwash upflow media (CBUM) technology to achieve impressive results. Adding CBUM technology downstream of biological nitrogen removal, the WWTF – with a capacity of 10.5 million gallons per day (MGD) and a peak design of 32 MGD – achieved average TN effluent concentrations of 2.65 mg/l in April, 1.56 mg/l in May, 1.69 mg/l in June, and 1.44 mg/l in the first half of July. Personal Communication between Michael Racine, CLF, and Donnie Barton, Hagerstown, MD Utilities Dept. (July 19 and 28, 2011). The Hagerstown CBUM upgrade cost a total of $12 -13 million for engineering and construction (equating, on a per MGD basis, to an annual cost of approximately $60-65,000 over twenty years). Hagerstown employed the use of 70 Dynasand CBUM filters with a footprint approximately 115' x 42' in size. *Id.* Costs of other technologies suggest that cost concerns are overblown. For example, the Western Branch WWTF in Maryland has met its 3 mg/l monthly average permit limit with upgrades having an annual cost (including operation, maintenance, and capital costs annualized at 6 percent over 20 years, but excluding costs associated with land) of $5,635,000 for a 30 MGD facility (amounting to a per MGD annual cost of approximately $188,000). EPA, *Municipal Nutrient Removal Technologies Reference Document: Volume 1 – Technical Report*, *supra*.

Response #44: The comments are noted for the record. In particular, the letter from Drs Valiela and Kinney includes their assessment of water quality information in Great Bay and the proposed numeric thresholds. EPA notes their concurrence with the thresholds, and also notes their comparison of DIN concentrations in Great Bay and the Squamscott River Bay to other water bodies, shown in Table 1 of their letter, and their comparison of nitrogen loads to Great Bay upstream of Adams Point and to the Squamscott River to other waterbodies, shown in Table 2 of their letter. Table 1 generally lends additional weight to evidence provided by NHDES that relates nitrogen concentration to seagrass, and Table 2 represents a supplemental line of evidence relating nitrogen load to seagrass, which also supports the NHDES's proposed numeric thresholds. (Valiela et al., 2011).

Comment #45: With the caveat that requirements relative to reducing stormwater and non-point source inputs also must be a condition of the permit, we strongly support EPA's proposed limit for total nitrogen, which is both supported by scientific study and analysis and which is necessary to comply with the Clean Water Act.

Response #45: Please see Response #43 above.

COMMENTS RECEIVED FROM WILLIAM H. McDOWELL AND MICHELLE L. DALEY

Comment #46: We have seen data on the dissolved oxygen (DO) impairment in the tidal Lamprey and the significant eelgrass loss in Great Bay and its tidal tributaries. We agree with NH Dept. of Environmental Services (NH DES) and EPA that nitrogen loading to the bay must be reduced to improve water quality and restore aquatic health. Numerous estuaries around the world have experienced eutrophication and contain dead zones due to increases in human activity and nitrogen loading to the estuary (Diaz and Rosenberg 2008). In estuaries, all forms of nitrogen can impair aquatic health. Particulate N (PN) and dissolved organic nitrogen (DON) can block light and both dissolved inorganic nitrogen (DIN) and DON can fuel eutrophication. Therefore, we agree that setting total nitrogen (TN) standards for Great Bay is entirely appropriate and necessary.

Reports by NH DES document that the current N Load is to the Great Bay system is 1405 tons/yr and 27% of the load is from point sources, 73% is from non-point sources (Trowbridge 2010). Because non-point sources are the biggest contribution to the TN load, several municipalities and other stakeholders have questioned why "WWTFs need to bear the brunt of the load reduction and the corresponding financial burden when they are not the biggest part of the problem". Assessing what fraction of the non-point source nitrogen is potentially manageable would be useful in the Great Bay watershed where much of the watershed is only moderately impacted by human activity and some non-point nitrogen exists from natural sources. Because the point sources of nitrogen are directly from human sources, we can consider all point sources to be manageable. Comparing the total point source nitrogen to the potentially manageable non-point source nitrogen would better emphasize which sources are important to target for reduction. We will illustrate this approach using data from the Lamprey watershed.

The NH Water Resources Research Center has studied the freshwater portion of the Lamprey River for 12 years and we have paid particular attention to the change in nitrogen concentrations over time and the variation in nitrogen concentrations in sub-basins of the watershed that drain a range of land uses and land cover types. Since there is only one minor WWTF in the freshwater portion of the Lamprey River, data that we have collected are useful in assessing non-point sources of nitrogen in the watershed. Our data show that non-point DIN clearly responds to human activity in the watershed (Daley et al. 2010) and is therefore potentially manageable. However, DON in sub-basins with no significant WWTF input does not respond to the level of the human footprint and therefore, non-point DON is not manageable. Instead, DON is controlled mainly by the amount of wetlands in the sub-basin (Daley et al. 2010).

Based on weekly and storm event stream samples collected from the Lamprey River at the Packers Falls gaging station in Durham, NH (LMP73; 5 river kilometers upstream from the head of tide) from 2000-2009, we can estimate the fraction of non-point N in the Lamprey that is potentially manageable. The discharge-weighted mean TN concentration at LMP73 was 0.40 mg N/L. Particulate N, DON and DIN were 0.07, 0.21 and 0.12 mg N/L respectively. We have no data on the spatial variability of PN and how it relates to human activity, but PN concentration

and load does increase with increasing stream flow. Particulate N at LMP73 is the lowest PN concentration among all the tidal tributary data collected at the 8 head of tide NH DES stations; therefore, we conclude that reductions in non-point PN in the Lamprey are not likely. In our most pristine site in Pawtuckaway State Park, DIN is 0.03 mg/L and we conclude that DIN cannot be reduced below this level. Based on these thresholds, the maximum reduction in nonpoint TN at LMP73 is 0.09 mg/L or 23% of TN (PN and DON not manageable and remain unchanged; DIN reduced from 0.12 to 0.03 mg/L). This maximum 23% percent reduction in non-point TN assumes that ALL of the human influence is removed and the watershed condition is returned to a completely undeveloped state. Based on the Trowbridge 2010 report, if WWTF permits are established at 3 mg/L at design flow, non-point nitrogen in the Lamprey watershed would need to be reduced by 13% to protect DO levels in the tidal Lamprey and restore eelgrass downstream in Great Bay.

If we apply the percent PN, DON and DIN of TN (17, 53 and 30% respectively) at LMP73 to the total non-point load to the tidal Lamprey as reported by Trowbridge (204.1 tons/yr; 2010), we estimate that a 59% reduction in potentially manageable non-point N (Table 1) would be necessary at a WWTF permit of 3 mg/L. Given the diffuse nature of non-point sources, more than a 50% reduction in potentially manageable non-point nitrogen is unlikely and available technology should be used to maximize reduction of point sources of nitrogen necessary to restore aquatic health in Great Bay. Reduction of point sources is especially important during the summer months when water temperatures are warmer making DO impairments more likely, eelgrass is the most sensitive to nitrogen loading and non-point source nitrogen inputs are at their lowest due to low stream flow.

Even though we are supportive of using available technology to reduce point source contributions of nitrogen, we do have a few concerns. One concern is that the draft permit limits the TN concentration in the effluent and the corresponding load at design flow. We are told by municipal coalition members that most WWTFs do not operate at or near design flow and thus we urge EPA to focus enforcement efforts on the TN load allowed. If enforcement is based on the WWTF TN load, slightly higher concentrations in the effluent may be allowed when discharges are well below design flow. For example in Newmarket, if the WWTF operated at or below 0.5 MGD instead of the 0.85 MGD allowed, an effluent concentration of 5 mg/L would keep the TN load at or below the 21 lbs/day limit established in the permit. Because there are significant financial and carbon (footprint) costs associated with reducing TN from 5 mg/L to 3 mg/L in WWTF effluent, we urge EPA and Newmarket to consider other approaches to reducing point source TN load, particularly in the summer months. Perhaps treating the effluent to 5 mg N/L and land-applying effluent during the summer months on golf courses or upslope vegetated areas would achieve the desired N reduction needed at a reduced cost when compared to discharging 3 mg/L effluent directly to the tidal Lamprey. Or perhaps there is a way to generate biofuel from the effluent to help offset treatment costs. We recognize that one unintended consequence of establishing WWTF permits at the limit of technology is that the associated increased water and sewer rates could promote sprawl in unsewered areas and innovative approaches must be considered to reduce this undesired outcome.

In summary, we applaud the efforts of EPA and NH DES to protect the health of Great Bay which is a vital part of our local economy and heritage. Given that a significant portion of the

non-point TN load in the Lamprey is not manageable, significant reductions in point sources of nitrogen are needed to restore DO levels in the tidal river and protect eelgrass in Great Bay. Innovative approaches to managing point sources should be considered to help offset some of the financial costs associated with WWTF upgrades and efforts must also be made to reduce nonpoint sources.

Table 1. Current nitrogen loads to the tidal Lamprey River, the potentially manageable fraction of point and non-point nitrogen sources and N reductions needed to protect DO levels in the tidal Lamprey and eelgrass downstream in Great Bay. Trowbridge 2010 data in **bold**, our data in *italic*.

	Current Load (tons/yr)	% Potentially Manageable	Potentially Manageable Load (tons/yr)	Targeted N Load (tons/yr) to Protect DO in Tidal Lamprey and Eelgrass Downstream with 3 mg/l WWTF permit	N Load (tons/yr) Reduction Needed with3 mg/l WWTF Permit	% Reduction of Manageable N needed
Point sources	**34.7**	*100%*	*34.7*	**5.2**	**29.5**	*85%*
Non-point Sources	**204.1**	*23%*	*45.9*	**177.2**	**27**	*59%*
Total Load	**238.9**		*80.6*	**182.4**	**56.5**	

Response #46: Establishing NPDES permit effluent limitations based on design flow is consistent with NPDES regulations. *See* 40 C.F.R. § 122.45(b). While Newmarket could approach its design discharge flow during the life of this permit, maintaining a discharge flow less than the design flow simply means that fewer nonpoint source reductions will be necessary in order to achieve standards. If the Permittee proposes to reduce its discharge flow to the Lamprey River through alternative wastewater disposal or reuse methods, EPA would consider modifying the permit to incorporate a total nitrogen limit that is as stringent as necessary to ensures attainment of water quality standards at the new discharge design flow. In making a decision on whether to grant a modification, EPA would evaluate this option against the alternative of increasing design flow to allow the tie in of septic systems to the POTW in order to achieve a net reduction of nitrogen to the watershed

As the commenter notes, achieving the necessary nonpoint source reductions will be challenging. Given the uncertainty with how much nonpoint source nitrogen can be reduced, it would be inappropriate to relax the point source limit. It is EPA's expectation, as documented in the Fact

Sheet, that a comprehensive watershed-wide nonpoint source reduction effort will be developed and implemented as necessary to attain the nitrogen thresholds consistent with the narrative water quality criteria. This approach will necessarily need to also address potential nitrogen increases in the watershed that could result from future development, including the potential for increased point source regulation to push development to unsewered areas. If the nonpoint source reductions are not pursued by NHDES and the Permittee, EPA will have to lower the point source limits in order to be consistent with the Clean Water Act and its implementing regulations.

While the carbon footprint is a concern, the Permittee has the ability to address this issue through making energy efficiency, nutrient recovery, and alternative energy production an integral part of the treatment facility upgrades.

COMMENTS RECEIVED FROM FREDERICK T. SHORT, PH.D.

Comment #47: I support the draft EPA permit including setting a monthly average total nitrogen concentration limit of 3.0 mg/L in discharge waters and a monthly average total nitrogen mass limit of 21 lb/day for the months of April through October.

The Lamprey River itself, Great Bay, and the estuary overall, need this limit if estuarine water quality and health are to be improved to support historic eelgrass distributions.

As you know, I am a research scientist and professor at the University of New Hampshire with nearly 40 years of work studying seagrasses and 28 years of research specifically on eelgrass in Great Bay. I have seen the deterioration of Great Bay over the long term and I understand the functioning and dynamics of the ecosystem. My work includes studies of eelgrass distribution with annual mapping of eelgrass throughout the estuary, studies of nitrogen effects, and comparison of the Great Bay Estuary to other locations along the east coast of the U.S. My work has been published in many scientific journals, all of which are peer reviewed in detail by internationally known scientists who work in the fields of seagrass research and estuarine ecology.

Eelgrass, as you are aware, is a crucial habitat and water filter in estuarine systems. It provides a nursery shelter area for young fish and shellfish and is part of the food web. The New Hampshire Department of Environmental Services' choice of eelgrass health as an indicator of estuarine conditions is well-founded. We have seen, time and again, that when eelgrass diminishes in an estuary, the system is on its way down – e.g., Chesapeake Bay, Waquoit Bay in Massachusetts, and Long Island Sound.

Here is what I know about eelgrass in the Lamprey River and Great Bay Estuary: it is declining, has been lost from Little Bay and the central Piscataqua River, and now has less than half its historical biomass in Great Bay itself. In the Lamprey River, as will all the river tributaries to the Great Bay Estuary, eelgrass is completely lost upstream of the mouth. For the Lamprey River specifically, the historic eelgrass distribution (see attached) is based on an eelgrass map from a 1948 UNH Master's Degree thesis. There was eelgrass extending well up the Lamprey historically, but now there is no eelgrass in the Lamprey River. Of the many times I have been in

the Lamprey in the past decade, the water clarity has been poor. Overall, in the Great Bay Estuary in the last six years particularly, I have seen the rapid decline of eelgrass in Little Bay and the Piscataqua River and the loss of water clarity in the Bay itself, in addition to an increase in nuisance seaweeds both large and small. *Ulva* sp. and *Gracilaria* sp., both considered eutrophication indicator seaweeds, have proliferated in Great Bay, often within the eelgrass beds, sometimes smothering the eelgrass.

Over the years I have examined the factors that may be contributing to eelgrass success and failure. My analysis of eelgrass tissue changes using the Nutrient Pollution Indicator (NPI, Lee et al. 2004) clearly showed an increase in nitrogen exposure in the late 1990s and early 2000s, indicating elevated concentrations of nitrogen entering the estuary (CICEET). Plain and simple, there is too much nitrogen entering the estuary. Although a large part of this nitrogen is non-point source, the greatest point source of nitrogen is the many wastewater treatment facilities in the Great Bay Estuary watershed. While I believe that all sources of nitrogen to the estuary must be reduced, the reduction of the point source inputs from wastewater facilities like that in Newmarket must be greatly reduced. To that end, the identification of 3.0 mg/L as a target concentration will have substantial impact on improving the Lamprey River and the Bay.

Questioning the science is the oldest stalling trick in the book. Unfortunately, the Lamprey and the estuary cannot afford to be stalled – water quality continues to degrade and the resources of the estuary are diminished season by season.

We must act soon to reverse nitrogen trends or we will be restoring the rivers and open waters of the Great Bay Estuary's watershed at great expense for decades to come, and with less than fully assured success. The EPA is right in attempting to reverse the nitrogen trends in New Hampshire's valuable Great Bay Estuary now, and the proposed nitrogen limit to the Newmarket Wastewater Treatment Plant effluent is a good first step.

Response #47: EPA notes these comments for the record.

JOINT COMMENTS RECEIVED FROM THE CONSERVATION LAW FOUNDATION, CONSERVATION NEW HAMPSHIRE, ENVIRONMENT NEW HAMPSHIRE, GREAT BAY TROUT UNLIMITED, N.H. AUDUBON, AND NEW HAMPSHIRE COASTAL PROTECTION PARTNERSHIP

Comment #48: We, the undersigned organizations, write to support the Environmental Protection Agency's (EPA) draft NPDES permit for the Town of Newmarket, New Hampshire's wastewater treatment facility (WWTF). In particular, we commend the EPA for proposing significant, much-needed reductions in total nitrogen pollution from the Newmarket WWTF, which discharges into the Lamprey River, part of the Great Bay estuary.

Regrettably, the Great Bay estuary is in decline. Every three years, the Piscataqua Region Estuary Partnership (PREP), formerly the NH Estuaries Program, publishes a *State of the Estuaries* report tracking specific indicators of estuarine health in the Great Bay and Hampton/Seabrook estuaries. One need go no further than these recent reports, and their

increasingly negative findings, to find a troubling reality – the health of the Great Bay estuary is on a downward trajectory.

In PREP's most recent *State of the Estuaries* report, published in 2009, it was found that out of the twelve primary indicators tracked by PREP, *eleven* show negative or cautionary trends. Included among the four negative trends documented in the 2009 report are: increasing nitrogen concentrations in Great Bay; and the loss of eelgrass – the cornerstone of the Great Bay ecosystem – in Great Bay, and the complete disappearance of eelgrass in other areas of the system. Importantly, the interpretations of indicators in this report were reviewed by PREP's Technical Advisory Committee and other experts, and therefore represent the scientific consensus regarding conditions in the region's estuaries. Thus, scientific consensus as of 2009 is that the health of the Great Bay estuary is in decline.

Consistent with findings in the 2009 *State of the Estuaries* report, the Department of Environmental Services and EPA have designated waters throughout the Great Bay estuary as violating water quality standards as a result of elevated nitrogen concentrations, eelgrass loss, and low dissolved oxygen. The Lamprey River has been designated as being impaired for aquatic life use as a result of nitrogen pollution, with the complete disappearance of eelgrass, and with elevated chlorophyll-a and low dissolved oxygen. Immediately downstream, Great Bay has been listed as impaired for aquatic life use as a result of nitrogen pollution and with significant eelgrass declines.

The Clean Water Act makes clear that permitted discharges *shall not* cause or contribute to the violation of water quality standards. This is the touchstone that must guide EPA in its permitting decision. In light of the conditions in the estuary and the documented need to reduce nitrogen loads in the Lamprey River watershed by 41 percent, and in light of the detailed scientific assessment conducted by the Department of Environmental Services (a process that took more than three years and that included input from a Technical Advisory Committee and outside experts), discharges of total nitrogen from the Newmarket WWTF must, as a matter of law, be reduced to the fullest extent and, as acknowledged in EPA's Fact Sheet, must be supplemented with measures to reduce nitrogen pollution from stormwater and non-point sources.[1]

We strongly support the draft permit's important provisions addressing nitrogen pollution, and we commend EPA for taking this essential step toward restoring the estuary's health. We urge EPA to promptly proceed to finalization of this permit, and to work with the Town of Newmarket to develop an implementation schedule that is both feasible and protective of the estuary. The Lamprey River, Great Bay, and the estuary as a whole are natural treasures that are vital not only for their natural resource values, but for the role they play in the economy and the culture of the Seacoast region. We urge you to proceed promptly and without delay, and we thank you for your efforts to protect this remarkable resource.

1 EPA Fact Sheet for Draft NPDES Permit for Newmarket WWTF at 29-30.

Response #48: EPA notes the comments for the record.

<u>COMMENTS RECEIVED FROM THE NATURE CONSERVANCY</u>

Comment #49: We are encouraged by the constructive dialogue and the transparent public process that is underway in communities such as Newmarket to balance their economic and community growth with the long-term health and vitality of the Great Bay Estuary- one of the state's most unique, important and threatened ecosystems.

Science informs us - and the direct observations of those who live, work and recreate here confirm - that the Lamprey River, and the Great Bay Estuary into which it flows, are in decline. Although there are several contributing factors, it is clear that increased nitrogen pollution stemming in part from inadequate treatment of wastewater is a principal cause. Nitrogen loading is causing more severe algae blooms, lower levels of life-supporting oxygen, and fewer acres of eelgrass meadows in the estuary. The decline of eelgrass is especially troubling as it is one of the key foundations for the estuary - providing essential habitat for fish, feeding areas for migrating birds, reduces shoreline erosion and serves as a water filter in the estuary.

The Nature Conservancy strongly supports the draft NPDES permit because it will significantly reduce the nitrogen discharges from Newmarket's wastewater facility into the Lamprey River. There is consensus that serious attention is needed now in order to reduce pollution and improve water quality. The Lamprey has been designated as impaired for aquatic life as a result of nitrogen pollution directly affecting the health of Great Bay.

Updating the wastewater treatment facility and cleaning up the community's discharge is a critically important step in cleaning up the natural system upon which our communities depend. The Nature Conservancy is not only supporting these essential infrastructure improvements, we're also taking direct action to protect the long term health of the estuary through land protection, restoration initiatives, and constructive dialogue.

Since 1994, the Conservancy along with the Great Bay Resource Protection Partnership (GBRPP) has permanently protected over 5,800 acres of land surrounding the Bay, that, if developed, would have added to the regions nitrogen problem. In addition, the Conservancy is working with UNH's Jackson Lab to restore oyster reefs in the estuary, with more than four acres restored over the past three years. The Nature Conservancy will continue this important work within the estuary to protect habitats and water quality, but we know it is going to take all these approaches - land protection, restoration, improvements to wastewater facilities, and stormwater management- and many more to restore the health of the Bay.

The Nature Conservancy has a long and enduring connection with the town of Newmarket. The town is home to the Conservancy's Great Bay office, our Lubberland Creek Preserve, and portions of the Cy and Bobbie Sweet Trail. Community members and town officials have consistently demonstrated strong support for conservation initiatives, and have partnered with the Conservancy on many occasions to advance and sustain the town's character and natural environment. We are committed to working with communities such as Newmarket, non-profit organizations, policy makers and the EPA to find solutions that improve the health of Great Bay for the benefit of nature and people

In closing, we wish to reiterate our strong support for the draft NPDES permit for the Newmarket wastewater treatment facility. We look forward to the finalization of the permit and encourage the EPA and the town to develop an implementation schedule that establishes clear and measurable limits on nitrogen, meets the requirements of the Clean Water Act, and is feasible for the town while protecting the health of the Estuary.

Response #49: EPA concurs and notes the comments for the record.

COMMENTS RECEIVED FROM THE TOWN OF NEWINGTON

Comment #50: The Town of Newington currently has plans underway to upgrade our wastewater treatment plant to meet the proposed nitrogen standard of 3 milligrams per liter. Concurrently, we are undertaking an aggressive program to reduce non-point sources.

Obviously, our efforts would be for naught unless other communities in the watershed were to take comparable measures.

Accordingly, the Town Newington urges the EPA to move quickly and decisively, and in a comprehensive fashion, to reduce the volume of all sources of nitrogen that contribute to the impairment of water quality in the estuary.

We support the proposed 3-milligram standard. We have no doubt that building wastewater infrastructure to a more rigorous standard will be expensive. Yet failure to do so would ultimately cost us a great deal more.

Response #50: EPA notes the comments for the record.

COMMENTS RECEIVED FROM THE LAMPREY RIVER WATERSHED ASSOCIATION

Comment #51: The Lamprey River Watershed Association (LRWA) has been an advocate of water conservation and clean water for over three decades. The Lamprey River, Great Bay, and the estuary as a whole are natural treasures that are vital not only for their natural resource values, but for the role they play in the economy and the culture of the Lamprey Watershed and the Seacoast regions.

The LRWA supports the draft permit's provisions addressing nitrogen pollution. We recognize that EPA must, by law, take this essential step toward restoring the estuary's health, as the New Hampshire Department of Environmental Services (NHDES) and EPA have designated waters throughout the Great Bay estuary as violating water quality standards as a result of elevated nitrogen concentrations, eelgrass loss, and low dissolved oxygen.

It is well understood that the elevated nitrogen levels in the estuary are due to both Non-Point Sources (NPS) as well as the Waste Water Treatment Facilities (WWTF) identified by NHDES and EPA. Both sources must be addressed if water quality is to be improved and health restored

to Great Bay. The LRWA is committed to working with communities to identify and remediate practices resulting in NPS pollution.

In summary, the LRWA supports the Town of Newmarket working with the EPA towards a WWTF discharge of 3 mg/l or less. This improvement, of course, will come at a cost that the Town of Newmarket may find difficult to manage. We therefore urge the EPA and the State of NH's Congressional Delegation to look for ways to help the Town of Newmarket make these improvements in a timely fashion and at a reasonable cost.

Response #51: EPA notes the comments for the record.

THE FOLLOWING COMMENTS WERE RECEIVED AT THE PUBLIC HEARING FOR THE DRAFT PERMIT HELD ON NOVEMBER 30, 2011 AT THE NEWMARKET TOWN HALL

COMMENTS FROM SEAN GREIG

Comment #52: Good evening. My name is Sean Grieg. I am the water and sewer superintendent for the Town of Newmarket. I will be giving the first part of the presentation and then, Dave Mercier from Underwood Engineers will be doing the second half of the presentation.

First, I'd like to give you a little bit of background information about the Town of Newmarket wastewater. In 1969, the primary plant was built and in 1985, it was upgraded to secondary treatment. The current trickling filter plant has no ability to remove total nitrogen or nitrogen at all. Our current flow is at 570,000 gallons a day. We are permitted for 850,000 gallons a day.

As part of the MOA, memorandum of agreement, we did a treatment process screening workshop. We looked at 20 different technologies and from that, we evaluated three technologies in detail. A four stage Bardenpho process was chosen as the most cost effective process to meet Newmarket's current and future needs.

Also, to try and refine the costs a little bit better, we did a 20 year build out study and conducted borings. From that, we established our costs. Our cost to meet the eight milligram per liter limit is 12 and a half million dollars in today's dollars, 2011, with an additional increase projected in operating costs and maintenance of $230,000 a year. To get to the three milligram per liter total nitrogen limit, it would cost us approximately $16,000,000 for the 850,000 gallons in today's dollars and an annual operation and maintenance projected cost increase of $265,000 per year. We also feel that the three milligrams per liter limit may be not attainable in the colder weather near spring.

How does that affect our users? It affects us a lot. The rate calculations below are based on the New Hampshire DES's assumed residential household water usage of 12,000 cubic feet of water per year usage. Our current user rate is $6.20 per hundred. Plus, we have a $6.00 per quarter system charge. This equates to a bill of $768 per year.

At an eight milligram per liter total nitrogen, the user rate will need to increase by $8.30 per 100 cubic feet, to $14.50 per hundred cubic feet. So, including the system charge, it comes to $1764 per year. At a three milligram per liter total nitrogen plant, we will need to increase our rate by $10.40 per 100 cubic feet to $16.60 per 100 cubic feet. Including the system charge, the rate will increase to $2016 per year. This does not include any inflation and this includes just the plant itself to get to those levels. This also does not incorporate any other requirements in the permit or any work done to the collection system.

We have some areas of agreement. We agree that Great Bay is impaired and that the causes are many and complex. Nitrogen does need to be reduced to some degree. This is under review as part of the MOA with New Hampshire DES. We share a common goal to have a healthy Great Bay. It's very important to us.

Newmarket is committed to working collaboratively with regulators and other communities to develop an adaptive management solution to meet a healthy bay. The Town requests a total nitrogen permit limit of eight milligrams per liter as a seasonal average. This will reduce the Newmarket wastewater treatment total nitrogen discharge by 80 percent and it will reduce the total inorganic nitrogen by 88 percent. This is well below the mid-1990s levels.

This limit will also allow us to eliminate some non point source septic systems in the future if we need to. The Town also will work with surrounding communities to support water quality and habitat monitoring, Great Bay restoration projects, and non point source nitrogen reduction.

Response #52: EPA appreciates the comment, notes it for the record, and commends the Town for having moved forward with facilities planning to explore nitrogen removal options. The Town should be aware that Section 301 of the CWA and its implementing regulations obligate EPA to establish water quality-based effluent limits that are as stringent as necessary to attain and maintain applicable water quality standards, including narrative criteria, and to develop those limitations irrespective of cost or technological feasibility. While cost is not taken into account as a consideration when *establishing* water quality-based effluent limitations, it can be a factor when *implementing* limits (i.e., though reasonable schedules of compliance in administrative enforcement orders).[52] Newmarket should pursue cost and/or affordability concerns over complying with the permit limit in this context. Affordability thresholds are established in EPA's *Interim Economic Guidance for Water Quality Standards*. When conducting cost analyses in the future, EPA recommends that the Town utilize actual as opposed to design water use values and, in addition, that it provide the basis for projected sewer rate increase calculations. The user charge estimate in the comment are based on a hypothetical yearly water use of 12,000 cubic feet per capita, which in EPA's experience is much greater than actual water use, and thus represent an inflated sewer use charge.

EPA appreciates the Town's acknowledgement that Great Bay waters are impaired and that some level of nitrogen control is needed.

[52] It also plays a role in other regulatory actions (i.e., use attainability analyses, variances from water quality standards, etc.) not applicable to this permit issuance proceeding.

Please see Response # __ relative to adaptive management and Response # __ relative to scientific uncertainty.

COMMENTS FROM DAVE MERCIER

Comment #53: I'm going to start my presentation with a question and also end with a question.

Is the impairment in Great Bay a point source problem that can be solved with only a point source solution?

We need to look at the data that's available to us. From data that has been collected and presented, we know that only 27 percent of the total nitrogen going to Great Bay is from point sources or treatment plant discharges. The other 73 percent comes from non point sources. We also know that there are 43 New Hampshire communities that contribute total nitrogen to the Great Bay watershed. Only 15 of those have treatment plants.

We know that EPA is using eelgrass data as the indicator organism for the health of the bay and it's been cited that eelgrass has been declining since 1996. So, the question that should be asked is what has changed since 1996.

This chart presents the same eelgrass data that EPA is working with represented by the green bars on the chart. When we look at this data from '96 to 2009, we don't see a continuous downward trend in eelgrass. What we see is two distinct periods, an earlier period, from '96 to 2001 where the eelgrass was fairly stable at levels of about 2300 acres in the bay on average and then a period from 2002 to 2009, where there's certainly a decrease with an average coverage of only about 1700 acres. John Hall is going to speak to you in a minute and he'll tell you why we believe that decrease happened.

Right now, what I want to focus on is what didn't change during that time period. And the thing that didn't change is the discharge from the Newmarket facility. The red bars at the bottom of the screen represent the annual average discharge flow from the facility. You can see that, over those 14 years, the discharge was essentially flat line.

Then the question is, what has changed. This is a list of factors we know have changed in the bay. First, we know from census data that, between 1990 and 2010, within those 43 communities, there has been an average population increase of 17 percent.

We know that there has been an increase in individual septic tank discharges. We know that rainfall has increased over that time period. Again, John will hit on that point.

There has been an increase in impervious surfaces due to development, an increase in the use of fertilizers, an increase in stream encroachment. There has been an increase in invasive species growth that has been competing with the eelgrass.

What should be jumping out to everyone is that none of these changes are point source related.

And, if you look at recent presentations that UNH has made and the Conservation Law Foundation has made, they agree, urban sprawl is the problem, not point source discharge increases.

So, what problems do we have with the current Draft Permit? First and foremost is that the limit that has been handed out is three milligrams per liter total nitrogen as a monthly average. Three milligrams per liter is the lowest limit they can give. It's the best you can expect to achieve with the best available technology under optimal conditions. We're not sure that three can even be consistently met. We do know that, in Connecticut, to our south, they struggle to meet levels with consistency that are that low.

Our concern is that, if EPA goes straight to a three milligram per liter level of technology with this permit, it's going to handcuff the Newmarket treatment facility's ability to take in additional septic loadings into the future.

What this is going to do is force a moratorium on that treatment plant. People will not be able to connect within the collection system. The growth is going to have to occur outside of the collection system with more private septics and more urban sprawl.

We also think this will push growth to the non sewered communities, because they will have no restrictions. What has come out of all of this is that new legislation is needed at the State level to involve all the total nitrogen contributing communities. This problem can't be solved by the sewered communities alone.

Bottom line is, EPA's moving too fast? There is limited funding available to approach this. We need to make sure that it is spent as wisely as possible. Adaptive management is a must. We need to attack point sources, non point sources. We need to perform restoration in the bay. And all the while, we need to monitor the health of the bay to try to resolve uncertainties in the science that exists and to try to make sure that we are getting the best bang for the buck we are spending.

In all of this, we need to remember that discharge permits are looked at again once every five years. We owe it to ourselves to look at the Newmarket permit again in five years, again in 10 years, after an adaptive management plan has been put into place. And it is then and only then that we should consider going to the limited technology.

After listening to what Sean and I have said, there's five conclusions you can come to.

The first is that the Draft Permit that is currently proposed forces all available dollars to be spent on one source of nitrogen and all of the cost to be borne by the communities that have treatment plants.

The second is that Great Bay needs a multi pronged approach. We need to deal with both point source and non point source nitrogen.

The third is that an adaptive management plan will allow us to make good decisions based on sound science as we are moving forward.

The fourth is that all communities in the Great Bay watershed should be contributing and participating in the solution.

And the fifth is that upgrading to meet a total nitrogen of eight milligrams per liter is what is appropriate at this time.

I'm going to leave you with a parting graphic. The yellow bars on this graph represent the total nitrogen discharge from the Newmarket treatment facility under different conditions. The first bar on the far left represents what they're currently discharging in terms of pounds per day today. And you can see that number is about 107 pounds.

If the Newmarket treatment facility were to upgrade to meet a new limit of eight milligrams per liter, at start up, the discharge would be down at the level of 24 pounds per day, which represents an 80 percent reduction in load.

The third, to the far right, represents what Newmarket would be putting out at start up if they upgraded to meet a three milligrams per liter limit, if we truly could consistently meet that limit.

And the question I want to leave you with is this, does it really make sense to spend an additional 3 and a half million dollars, plus additional annual O&M, to achieve that small amount of reduction in light of the fact that the science that these limits are being acted upon is questionable, and also, that none of this addresses non point sources that are out there?

Response #53: Many of the issues or themes touched on in this statement are also addressed in the response to written comments. For example, a fuller explanation of why EPA opted to impose a limit now, after accounting for the state of the scientific record and the mix of point and nonpoint sources of nitrogen pollution, is set forth in *Reaffirmation of Nitrogen Effluent Limitation of 3 mg/l* above.

While wastewater treatment facilities account for 30% of the total nitrogen discharged to the Great Bay Estuary, they represent a significantly higher percentage of the dissolved inorganic nitrogen load. Approximately 70% of the total nitrogen discharged from point sources in Great Bay consists of dissolved inorganic nitrogen while only approximately 30% of the total nitrogen from nonpoint sources (ambient rivers monitoring data) consists of dissolved inorganic nitrogen. Consequently, point sources constitute approximately 50% of the dissolved inorganic nitrogen load on an annual basis. During the critical season for algae growth, the point source contribution is even more significant given the reduced rate of nonpoint source contributions during this period.

The dissolved inorganic nitrogen component of total nitrogen is the preferential form of nitrogen for algae growth and therefore is the highest priority for reductions as part of a comprehensive approach to reducing total nitrogen levels as necessary to comply with water quality standards. While nonpoint source nitrogen reductions will also be necessary, some of these nonpoint source loadings represent natural background loadings. Of the loadings caused by development in the

watershed, achieving meaningful controls will be challenging and will likely cost more per pound of nitrogen removed than point source controls (see *NHDES Nitrogen Loading Reduction Report* at 1). It is also important to note that a significant portion of the nonpoint source loadings originate from the same communities that have point source discharges.

The point source analysis presented only indicates that there has not been a significant increase in discharge flows. There are little data available to indicate whether or not there has been an increase in nitrogen loadings. Rochester is an example of a facility that has significantly increased nitrogen loadings even though discharge flows have not increased significantly. Regardless of whether point source loads have increased recently, total loadings exceed acceptable loadings and the point sources contribute significantly to these exceedances. Additionally, since permitted flows exceed actual flows, the potential for increased point source discharge loadings in the future is significant and needs to be addressed.

Where there is a reasonable potential for a discharge to cause or contribute to an exceedance of water quality standards, the Clean Water Act and implementing federal regulations governing the NPDES permitting process require EPA to establish a water quality-based limit as stringent as necessary to meet applicable water quality standards. Given that point source controls will not by themselves result in achievement of the designated uses due to the magnitude of the nonpoint source loading, EPA was confronted with a choice in how to frame the permit – to either impose a total nitrogen limit equal to the instream threshold that EPA determined would implement the narrative nutrient criterion and protect uses (which would be beyond the limits of conventional technology) and assuming little or no reduction from other sources, or to initially impose total nitrogen limits at the limits of conventional technology with an opportunity for the communities to pursue nonpoint source reductions within their respective boundaries. EPA opted for the latter—as stringent controls as necessary on point source WWTFs to address their significant impacts on immediate receiving waters combined with a commitment from NHDES to pursue a framework for addressing nonpoint sources—given that nonpoint sources account for a majority of the nitrogen loading afflicting Great Bay and tidal rivers, and without timely action, is expect to increase. See "*Reaffirmation of Nitrogen Limitation of 3 mg/l*" in Background above.

This choice was consistent with EPA policy to address the complex nutrient pollution problems confronting the Nation's waterways. See Memorandum from Nancy K. Stoner, "Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions," March 16, 2011 ("While EPA has a number of regulatory tools at its disposal, our resources can best be employed by catalyzing and supporting action by states that want to protect their waters from nitrogen and phosphorus pollution.").

It is EPA's expectation, as documented in the Fact Sheet, that a comprehensive watershed-wide nonpoint source reduction effort will be developed and implemented as necessary to attain the nitrogen thresholds consistent with the narrative nutrient water quality criterion. Such an approach necessarily needs to also address potential nitrogen increases in the watershed that could result from future development, including the potential for increased point source regulation to push development to unsewered areas. If the nonpoint source reductions are not pursued, EPA will have to lower the point source limits in order to be consistent with the Clean Water Act and its implementing regulations. EPA concurs that the State needs to take a

leadership role, including the possibility of new legislation, in addressing nonpoint sources of nitrogen from all communities in the watershed.

Providing treatment for septic system discharges will likely be necessary in order to accomplish the nonpoint source reductions required to achieve the receiving water nitrogen criteria. This can be accomplished by sewering to the centralized treatment facility or by providing individual on-site treatment or cluster treatment options. EPA expects the permittees in the Great Bay watershed to evaluate the most cost effective means for reducing septic system loads of nitrogen, including taking into account the effect of the various alternatives on future growth and development to ensure that short-term nitrogen reductions from septic systems are not undermined in the future by nitrogen increases associated with new development.

EPA does not believe that its action today will "force a moratorium" on growth or tying septic systems into the sewer. If actions to address nonpoint sources of nitrogen result in the need to expand current sewer service (i.e., tying in septic systems), EPA understands that the permit may need to be modified, in accordance with applicable requirements, including backsliding and antidegradation, to allow for the increased loading from the treatment facility. In EPA's view, an increase in nitrogen loading from the facility would be consistent with the goal of achieving water quality standards to the extent it represents a net reduction in nitrogen to the receiving water.

The issue of how affordability is addressed relative to point source controls is addressed in Response #53. Adaptive management may make sense relative to engaging watershed controls of nonpoint sources of nitrogen and can be pursued in the context of the implementation schedule for achieving the point source limit for nitrogen.

COMMENT FROM DEAN PESCHEL

Comment #54: Good evening. My name is Dean Peschel and I am here this evening representing the Great Bay Municipal Coalition. I represent Dover on that coalition.

What is the Great Bay Municipal Coalition? It is basically a group of five communities that came together in 2008 over a concern regarding the proposed DES nutrient criteria for the Great Bay estuary.

The Coalition, as you just heard, believes strongly that a holistic type of approach is important in solving this issue, which addresses not only point sources, but non point sources. And also, we believe that it should include bioremediation, which is basically replanting of oyster beds.

And the Coalition is currently operating under a memorandum of agreement that was reached in July of 2011 to resolve scientific issues and ultimately propose solutions.

Great Bay impairments are obvious. There has been a decline in eelgrass. The oyster populations in the bay have essentially been decimated and there has been an increase in undesirable macro algae and low dissolved oxygen in the tributary rivers.

The key findings in the MOA are there is uncertainty about the extent to which nitrogen is causing low DO and eelgrass impacts. And as a result of that, we believe that there is additional analysis of causative factors influencing eelgrass decline, macro algae, transparency and epiphytes needed.

We believe that there is a calibrated hydrodynamic model that would be very helpful in better understanding the fate and transport factors and reduce uncertainty overall.

We also believe that the adaptive management approach that was earlier mentioned is necessary to reduce the impairments. Adaptive management is an interesting process by which scientific research, monitoring and practical management is brought together. And it allows us to learn by doing.

We also believe that it is not appropriate at this time to rely on the current draft nutrient criteria until additional work is completed and that an action on the Exeter permit is not completed until the re-analysis of the Squampscott. Those are items under the MOA.

The proposed Coalition adaptive management plan has been recently submitted to DES and EPA and a number of other organizations for comment. And the Coalition strongly believes that this is a much more effective way to attack this problem. And we also believe that it will allow the coalition of communities who are currently facing these wastewater permit limits to engage the other communities within the watershed to better understand the issues and the fact that they too are a part of the solution.

The adaptive management plan that we have put forward includes a number of key points. One is that, we all be given an eight milligram per liter total nitrogen and that we actually implement wastewater treatment plant improvements within the first five years. Following that five years, we will then monitor water quality improvements and habitat improvements that we might be able to discern during that second five year period. At the end of that time, we will have a better idea of how much has it improved. And maybe the endpoint is nearer than we think it is.

But, this is the learn by doing. It will allow us to make improvements, see how good the improvements are, and then decide what further improvements are required, if any.

The Coalition is proposing to fund oyster restoration and we are proposing to fund a macro algae resource to get a better understanding of what exactly the nutrient limits should be for controlling macro algae.

The Coalition is ready to fund an eelgrass replanting program and also -- which is not on this particular list, but is part of the plan, we plan to invest money in a more comprehensive monitoring program so that we understand where things are now in a more comprehensive way than we actually do. And when we start to make these improvements, we will be able to see what benefits there are from the improvements.

We also are ready to work together to adopt storm water ordinances to reduce nitrogen run off. And in this way, it'll allow some of the larger communities, which we are, to go to some of the

smaller communities and begin to engage them in understanding that they are part of the issue and part of the solution as well.

The Coalition believes that, if we are given an eight for this period of time, that it's really an opportunity for the communities of the coalition to work together to bring everyone in the watershed to work on this issue. And if we fail to do that, then, the onus is on us. I think we all understand, we will be facing much more stringent limits if we fail.

Response #54: EPA again notes that the issues raised in this oral statement are addressed in the response to written comments above, including EPA's decision to opt for a nitrogen limit of 3 mg/l instead of an 8 mg/l, as proposed by the commenter, the role of scientific uncertainty on NPDES permitting processes, and matters pertaining to the MOA.

The proposed numeric thresholds were derived from stressor-response relationships observed in a comprehensive analysis of nine years worth of site-specific water quality data, and by reference to established nutrient response thresholds. Each data source utilized was chosen because of its relevance to a conceptual model for eutrophication in estuaries. Multiple lines of evidence were evaluated and a weight of evidence approach utilized to determine protective nitrogen thresholds. The weight of evidence approach minimizes the inherent uncertainty associated with establishing thresholds in order to make informed management decisions. This approach to developing protective thresholds is consistent with EPA guidance (see Using Stressor-response Relationships to Derive Numeric Nutrient Criteria, Office of Science and Technology, Office of Water, U.S. Environmental Protection Agency, Washington, EPA November 2010)

The desire for more study, including the development of a calibrated hydrodynamic model, is not sufficient reason to delay establishing limits necessary to address the well documented impairments in the Great Bay Estuary.

As discussed in Response #53, adaptive management can be pursued in the implementation schedule and may make sense if it results in constructive engagement relative to addressing nonpoint sources of nitrogen. Merely constructing treatment facilities to meet 8.0 mg/l of nitrogen and then monitoring to determine the results without any commitment to achieving significant nonpoint source nitrogen reductions does not constitute meaningful adaptive management and is not consistent with attaining water quality standards. Successful adaptive management will require a comprehensive monitoring program, and EPA welcomes the Coalition's intent to help fund such a monitoring program.

COMMENTS FROM JOHN HALL

Comment #55: My name is John Hall and I am the water quality consultant to the Great Bay Municipal Coalition.

One of the things that was included in the memorandum of agreement between the coalition and New Hampshire DES was a commitment to look closer at the science. If you're going to poke holes, if you will, in somebody else's effort, you need to be able to step up and provide the information that shows what you think the right things are to do.

There are a couple of key areas where the coalition committed to put out some considerable resources to get to the bottom of a few issues. One of them was to fund some fairly extensive sampling and analysis on the Squamscott River. Why the Squamscott? Exeter was one of the first permits that was going to be out the door and that seemed to be the river that probably had the most complex issues associated with algae and dissolved oxygen levels, which was a major concern of the DES.

Another very critical part was the collaborative effort to hold some additional meetings to review the underlying science on various key issues that were controlling what is the water quality that one needs to meet in the bay. Those meetings were held to review primarily the causes of eelgrass decline associated with transparency, macro algae and epiphytes. Epiphytes are the little things that can grow right on the eelgrass and then the sunlight can't get to the eelgrass. Think of it like when a vine climbs up a tree and shades out the tree and the tree dies, because the vine had covered it. The stalk still stands, the tree still stands, but it's dead. Epiphytes work the same way. We were looking at those key issues to see if there was a way to develop what we felt was a more defensible nutrient criterion standard for the bay and the tidal rivers.

What I'm going to do is give you a quick review of a little bit of background on the original standards development, which explains why we looked at some of the other slides. And then, what were some of the latest scientific findings and information that we believe we have come to which shed light on the proper solution for Great Bay.

The original focus of the State program was fairly straightforward. They thought that nutrient increases caused excessive plant growth in the bay and tidal rivers. And that excessive plant growth had certain secondary effects. The eelgrass were being affected because, when you grow too much algae in the water column, the light can't penetrate. The eelgrass are at the bottom and they get shaded out. They don't get enough light. They die.

The theory was that excessive nutrients were growing algae and that was shading out the eelgrass and that if you control the nitrogen, it would improve light penetration by reducing the amount of algae that's going in the water column. The State also believed that reducing total nitrogen would reduce algal growth in the tidal rivers and that, by reducing algal growth in the tidal rivers, you would also improve the dissolved oxygen occurring there.

We've had some back and forth. Preliminarily, it was our understanding that DES didn't agree that the transparency based standards for nitrogen that were applicable to the bay should apply in the tidal rivers. I think we're still trying to work through to get to the bottom of that one with them.

Here are the standards that were originally suggested by DES in a 2009 document. For DO, they said, the magic number you need to meet in the tidal rivers is 0.45 milligrams per liter and that applies as kind of a long term median in the tidal river.

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To protect eelgrass, these numbers were derived to come up with a certain amount of light penetration. It was chosen that a .3 milligram per liter number would be the target for total nitrogen, we believed in the bay to protect eelgrass.

Here is what we think, based on the analysis that we got to date, and the historical information, what the basic error is in the application of those standards in the Lamprey River in particular.

The Lamprey River, by the way, does have some low transparency. All of the tidal rivers have low transparency. The Lamprey River, however, does not really have very substantial algal growth. As in most of the tidal rivers, the low transparency in the river is caused by color and apparently turbidity in the water column. That's what the data shows. It does not show that it is related to chlorophyll-a.

With regard to eelgrass losses in the Lamprey, it is true, the Lamprey River used to have, we are informed, eelgrass growing at the mouth. Now, I am saying we are informed, because we have never seen this. It hasn't existed for 40 years. The PREP reports that discuss this said the losses occurred 40 years ago, but they are unknown. Well, they occurred 40 years ago. If they were known, you can hardly claim that nitrogen caused it when the nitrogen levels that were present 40 years ago had to be far lower than the nitrogen levels present in 1996 which were healthy for eelgrass in Great Bay. So, we don't know what caused that 40 years ago. I do, by the way, have a suspicion.

I had a group of clients many years ago that were textile industries. And it was mainly through the south where most of them are located. And I understand, in New England, at one point in time, you had a pretty healthy textile industry up here. The one thing I can tell you about textile plants is they put out massive color discharges. Whether or not they discharge directly, or they go to a sewer system. And I would be surprised if there weren't, at that point in time, you know, in the '40s, '50s and '60s, still textile mills and things like that up in this area. I would imagine your industrial base was better then. The color levels coming into the rivers had to be pretty high, because none of the textile facilities were controlling that at that time. I used to see it in the south. I used to see rivers turned red, green, black, all different shades, different days. And if you want to stop eelgrass from growing, put that much color in the water. That will stop them from growing properly.

The one thing that we do know though, and for sure, is the lower DO in the Lamprey, which that standard is intended to correct, was caused by hydrodynamics. Why do we know that? There was a UNH study done in 2005 which located the areas of low DO and concluded that there is a hydrodynamic anomaly occurring in certain segments of the river. It causes very low DO to appear in that area and it's not really related to algal growth. So, the idea that you would apply either the transparency numbers or the DO base numbers in the Lamprey to produce results is really not justified.

But now, let's look at the updated science, because this is really where the action is at, because it's also I think what the right solution is and where we need to go. This next series of slides were things we presented to the MOA review committee and the review group. It was a small group of UNH researchers, some other technical experts, including DES and EPA in one of the

meetings, and the discharge coalition members sat in. So, it was a group that convened in order to review what the science really looked like on a few of these areas that had been driving the water quality standards.

Well, this was the main analysis that was done to come up with the transparency criteria. What DES did was plotted the nitrogen level and the light data from the Squamscott, the Lamprey, the Oyster, Great Bay and the mouth of the ocean all in the same graph. The amount of light that is getting through the water column is called light attenuation. DES plotted them all on the same graph, drew a line through the data, and said this is the correct number. It's right here.

The problem with this is, it is a fundamentally flawed analysis. And when I say fundamentally, I mean fundamentally. You do not plot data from rivers, bays and the ocean on the same graph and claim that the only thing that is causing a change in a light attenuation is nitrogen.

As a matter fact, I will show you another slide in a few minutes that, the reason the light is so poor in these areas, in the Squamscott, it's got nothing to do with nitrogen. But, you are plotting the light data from the Squamscott and the nitrogen numbers from the Squamscott as if nitrogen caused that, when we know, in fact, it did not. So, what was never checked was that, in fact, the relationship between light and nitrogen actually applied at different locations. It was just assumed.

Well, the same type of issue got reviewed by EPA's science advisory board where they expressly said, you should not be doing these kind of analyses, because these analyses do not show cause and effect. In other words, you can plot a bunch of data on a graph and put a line through it. That does not mean the one value caused the other value to occur.

The science advisory board made a fairly clear statement, to be scientifically defensible, empirical methods, and that's what this is, it is an empirical method, you have to consider the influence of other variables. In other words, if you're going to plot the ocean, a bay and a river all on the same plot, you have to account for all of the different variables occurring at the different locations, or else, you have done a fundamentally flawed analysis because, what is affecting transparency in the ocean is not the same thing that can affect transparency in a river.

Now, statistical methods require careful consideration of confounding variables. What does that mean? That means, make sure, the thing that what you are plotting as causing the impact on transparency is actually the thing causing the impact on transparency. Prove it at each individual site before you try to just put it all in a graph and plot it out.

Okay, so, what would happen if you don't have that information? The nutrient criteria developed can be highly inaccurate and that was our feeling.

An example is the color data, just to give you an idea. And this is information presented to the MOA review group. High color happens at low salinity. So, as you get closer to the ocean or more saline, the color drops. When you get closer to freshwater, the color increases. Why? Because color is washing down every one of your rivers, little swampy areas, or things like that. And when you go and look in the tidal rivers, in the fresh water ends, they look like tea. They're

brown. And this doesn't even account for the turbidity or other things that go on there. So, we know that color is changing at the various locations.

Then, this is the data from the Squampscott River. That little light extension coefficient, that's the one that DES plotted against nitrogen. Well, if you're going to plot a light extinction coefficient against nitrogen, what you are really plotting against it is chlorophyll-a. You are assuming that nitrogen is growing algae and that the algae are then affecting this parameter.

So, we plotted the algal levels, the algal information for Squampscott River versus the light extinction. And actually, the light extinction seemed to be worse with the lower chlorophyll-a levels than they were at the higher chlorophyll-a levels. What does this tell you? Well, what we knew kind of going in once we looked at the color data. What's causing poor light transmission in the tidal rivers is not the chlorophyll-a. Therefore, this analysis never should've been done and therefore, needs to be withdrawn.

We did ask another interesting question. Everybody is assuming that the eelgrass are decreasing in Great Bay because of transparency. So, we asked an obvious question, does anybody have any data showing the transparency in Great Bay has dropped over the years? Because, if transparency caused the eelgrass to decrease, there should have been a drop in transparency.

Well, transparency is also measured by this little thing called a secchi disk. It's a little round thing. It is white with sometimes a black spot or a black X in the middle of it. You lower it down into the water until you can't see it. And at that point, you realize the light isn't going any further down. You take a measurement. How far did that lower before I couldn't see it.

So, at Adams point, we had measurements for a good number of years. Earlier years, we had about 15 measurements. Then, this later bunch of years, we only had eight measurements per year there, but, it's the only data that were available. It's all we could find. And basically, this showed that the secchi depth pretty much bounced around, but it's got no significant change over time. If anything, you know, in the most recent years it actually got better. Go figure. But, it pretty much stayed constant. So, this told us there is no good indication that transparency actually significantly changed in Great Bay.

Okay. So, we brought all this information to the MOA review committee. And this is what I call the key findings. The key findings are statements that are found in the meeting minutes for the review committee. And there were a number of fairly critical ones.

One, the eelgrass losses in Great Bay are not due to poor transparency. The eelgrass received sufficient light over the tidal cycle. And Fred Short was the expert at that meeting that gave us that indication. He is, to my knowledge, the main eelgrass expert in the area.

Art Mathieson, who was the macro algae expert indicated that macro algae growth had significantly increased in the past two decades. Hmm. Okay. Well, that's probably not that good. And his opinion was that it was adversely impacting the habitat and eelgrass populations. It's crowding them out. It's growing in the middle of the eelgrass. And it's basically -- I don't know, if any of you have ever seen kudzu growing on the side of a road in Tennessee where it

just starts climbing and going through things. You get one of these invasive species and they take the habitat over and drive out the other more desirable species. Art said he thinks it's a macro algae issue.

We asked then, okay, if it is a macro algae issue, how do we stop it. What do you do to reduce macro algae if that is what is causing the impairment.

And the indication was that, the macro algae likely increased due to increases in dissolved inorganic nitrogen. And that is a form of nitrogen. That is a subset of total nitrogen. It is not the same as total nitrogen. It is a subset. And it's usually ammonia and nitrate are the two main inorganic forms that really get plants growing. Farmers out in the midwest applying anhydrous ammonia to the fields to grow corn. That's why we have so much nitrogen going into the Gulf of Mexico.

And nitrate, that can come from wastewater plants and from septic systems in particular. The ammonia gets converted to nitrate. It goes into the groundwater. And then, it percolates into the system. Then, we asked the next logical question, because remember, that earlier slide I showed you where-- where DES had projected what were the necessary levels of nutrients that we needed to achieve.

So, we asked the question. All right. It's not transparency, and as I'll cover later, we don't think we have the DO issue just generally the way it was originally thought about the system. But, if it's not transparency impacting eelgrass, but it's macro algae, what's the level I've got to get to control it. The answer, we don't know with any certain day. Macro algae did not get a lot of research done over the last 10 years. Most of the research went to other biological indicators in the bay.

And therefore, they don't know with any certainty what you need to do. There seemed to be a consensus that, if we could get the DIN loads down to the mid '90s levels, because that's when -- the last time there was the greatest eelgrass population in the bay, that if we could reproduce that, okay, that -- maybe that will work to ensure that the macro algae are no longer the problem.

Okay. So, why are these findings critical? Well, we are at a Newmarket permit hearing. And the reason -- one of the reasons for standing here is to provide comments on the Newmarket permit. The Newmarket permit relied extensively on all of the earlier DES reports on what level of TN control, what level of total nitrogen in stream standard needed to be met. What was the cause of impairments, transparency, not macro algae.

It relied on all of that information to come up with why you need to go to three. And these last findings would say that is all misplaced. By the way, what's misplaced is the findings of what you need to do and what should be controlled, but not whether we really need to reduce the pollutants in the system. I mean, that's a finding that I think, in the end, one agrees.

Okay. So, what would be the issue? Regulate inorganic nitrogen, not total nitrogen. Focus on macro algae not transparency. Non point sources controls for DIN, by the way, they are different than for TN. That was a very critical point because, if we kept going down the total nitrogen

path, we might have spent money on a bunch of BMP's in the system that wouldn't have controlled the pollutant we're worrying about. You do different things for each, or you often do.

As stated earlier, the DIN increase is not due to point sources. However, we think, properly timed point source reductions can substantially restore the impacts that will occur. And I'll show it to you.

Yeah. Let me run first, Squampscott sampling, quick points. We did the Squampscott sampling in various sections of the river. The question that -- the assumption that DES had in their analysis of why control total nitrogen, the assumption was that, if I reduce chlorophyll-a, I'll get improved DO in the system.

These data do not show that. The data collected tend to show, here is chlorophyll-a. Here is DO. And I've got two of these slides and they've got a dozen of them. But, I'm just showing two as an example.

The DO goes up and then goes down. The chlorophyll-a goes up and then comes down. We actually got our worst DO's with our lowest chlorophyll-a's. And there's probably a reason for that. I think it is in oxygen demand in the system might be partly due to settling algae, by the way, which means there could be a benefit to reducing algae.

But, as a straight up, are algae associated with the low DO's? No. Low algae are associated with low DO's. And as a matter of fact, the next chart, this one is done by Newfields. Here is a big chlorophyll-a bump up right here, 20, 40, 60 chlorophyll-a.

By the way, these are high chlorophyll-a's. I mean, you generally don't want them that high in a tidal river. So, I'm not suggesting this is a good idea.

The only question is, was the underlying standard that the -- that DES had, was it the correct one.

Well, the DO's go up. And then, when the chlorophyll-a drops, the DO's go down. And that's a violation of the standard. That's 4 to 3.

So, the bottom line on the DO situation for the tidal rivers is, it's a little more complicated than what we thought. And I won't go through that one. That -- basically, the earlier data that we have from DES gave us that indication. We just didn't have such detailed data for the river to be able to confirm that.

Now, here is the interesting point. What do we do to control the system and can we get there to reduce the macro algae? The answer is, we think we can.

This is rainfall data in the system. What I want you to notice is, this is -- after 2000, it went --in the '90s, you had up and down, up and down, dry wet, dry wet kind of back and forth. In the middle to late 2000's, that is the wettest period in this hundred year record. It is ridiculously wet compared. It's a complete outlier from the rest of the system. Now, whether or not that will

continue, I have no idea. But, it is the single wettest period just compared to everything. The last record that we saw that was that wet was somewhere around 1900.

Okay. We then took some recent UNH data collected by Michelle Daly and said, what did this high rainfall do to nitrogen loads coming into the system. Remember, the nitrogen loads can feed the macro algae growth. Macro algae growth is increased. And what it showed was, the higher the rainfall, the inorganic nitrogen levels went up. Hmm. So, not only did we get more flow coming into the system, we got more flow at a higher concentration. Why would that happen?

You are driving the groundwater out of the system into the receiving waters. And this groundwater has a lot of septic tank and other long term accumulated pollutants in it.

Okay. That'll do it. Now, Art Mathieson told us to -- if you want to control macro algae, the period to focus on was the warmer weather period. So, we asked ourselves the question, what load do we have to control to get back to pre-1990 levels or mid-1990 levels?

And we looked at the flows occurring over the whole year and June, July, August, September, and we did some analyses of the inorganic nitrogen. And this is going to be a little shocking, I think, to a lot of people.

Well, these bars down here -- this is the flow, the average summer flow. And this is in the Exeter River. We did it for three rivers. Lamprey, Exeter and Oyster, the three main ones. We took the current -- we converted these flows, knowing the concentration of inorganic nitrogen, or assuming it was the same each year. There are assumptions built in. And said, how much non point source load do you see in the summer time.

And this is what you see in the Squampscott River. Notice, the last bunch of years, it got a little higher when it got wetter. But, by and large, it was lower.

Here is the current Exeter summer load. Low. If I looked at the total nitrogen loads, I might've gotten a completely different picture. I might've assumed that the non point source was still overwhelming the situation. It's not. In the high -- in the period where you've got high growth of macro algae, the point source has got the biggest load.

Let's look at the Lamprey. Now, the Lamprey's got more flow than the Squampscott, but -- and it's got a smaller discharge. The Exeter discharge is about four times the size of the Newmarket discharge. But, here is the Newmarket current load. It is still very many years, most of the load, more than half the load coming in the summer time when you grow macro algae.

Now, let's look at the Oyster. The same thing. We see it again. So, we did one analysis. And this is where we think -- this is where we think that and why we recommended adaptive management, we go to eight. We took each river and said, existing plant source, non point, non point, point. The greens are where the loads would go if we go to eight nitrogen. And we converted them inorganic, so, there is a conversion factor that gets involved and here's the story.

I excluded -- by the way, I asked Tom Gallagher to exclude 2006, 7, 8, and 9, because it was -- it was more than a hundred year wet period. And I thought it kind of skewed the analysis. So, I asked him to leave that out for now. Let's see what it looks like when you've got a more typical rainfall pattern in the time frame. And basically, you get a 40 percent load reduction of inorganic nitrogen to the system from the three main tributaries by going to eight. That load reduction is far below the historical mid 1990 levels, early 1990 loads. It's probably something in the early '80s, late '70s.

So, this level of reduction should produce the macro algae reduction we want. If it's inorganic nitrogen that is driving those macro algae, which is what Art Mathieson tells us. Okay. So, these are the basic conclusions. The two I'll point out, we think, the eight nitrogen will do it. Three nitrogen is clearly not required from the more detailed analysis that focuses on the time frame when you need the reductions and the form of pollutant that really has to be controlled.

We do think, focusing on future non point source reductions is also going to be needed. I mean, there is still a fair amount of it left. There. There is still a fair amount of non point source left.

Actually, non point source in the future becomes the biggest load. So, if you're going to make more progress, you'd need to work on them I would suppose. And monitoring should go -- future decisions.

So, in terms of the Newmarket permit, we would simply suggest that, with the updated information, we'd like to meet with the agency, with EPA and DES to discuss the adaptive management approach, to discuss the new information and why we think a DIN set of controls targeted at eight should pretty much do the job.

Now, I still would not want anybody to think that would mean, because it looks like the point sources can pretty much get the load down to where it needs to be for the summer time, that non point should do nothing. I think that would be a bad idea over the long term. I think you need to put in some controls to kind of stabilize and bring down those loads. And that will help the system.

So, that's our recommendations and we look forward to further discussions with both DES and EPA.

Response #55: Many the issues raised in this oral statement are addressed in EPA's responses to written comments above.

With respect to the DIN analysis which looks at loadings from the treatment plants (Exeter, Newmarket, and Durham) and the Exeter, Lamprey, and Oyster Rivers, EPA agrees that during the summer months (June through September) treatment plants account for the majority of the DIN loading to the system. However, for reasons explained in Response #27 EPA believes that it is necessary to regulate total nitrogen as opposed to DIN. Further, the Coalition predicates its conclusions from the DIN loading analysis on the control of macroalgae in the system which is incorrect. As explained in Responses #26 macroalgae is not the only concern within the system.

Algal blooms (particularly in the tidal tributaries), epiphytic growth, and direct toxic effects to eelgrass are also concerns within the Great Bay Estuary.

EPA also notes several errors in the Coalition's DIN analysis. First, the DIN loading target in the analysis appears to be to get DIN levels within the estuary to early or mid 1990 levels which seems to be based on the fact that the peak eelgrass coverage occurred in 1996. It is unclear why the Coalition makes this assumption since the impacts of elevated nitrogen levels are not immediate so there is no way to be assured that meeting early or mid 1990 levels of DIN is appropriate for recovery within the system. Secondly, the analysis presents estimated nitrogen loads from the Exeter, Lamprey, and Oyster River from 1990 – 2010; however in the final conclusions the Coalition ignores the non-point source loads from 2006 – 2009 because these were "more than a hundred year wet period". Ignoring these years is not appropriate because it underestimates the nitrogen contribution tributaries. Further, water quality standards are intended to be met under all conditions, not just under average rainfall years. EPA also notes that rainfall data presented by the Coalitions shows an increasing trend in the amount of rainfall. Finally, the Coalition ignores the contribution of dissolved organic nitrogen (DON) from the tributaries. Once in the estuary DON can convert to the more readily available DIN, therefore the analysis underestimates the total DIN contribution from the tributaries.

See Responses #15 and 16 regarding issues raised pertaining the MOA between the Coalition and the DES.

See Responses #18, #20, and #34 regarding issues raised pertaining to EPA's Science Advisory Board.

See Response #33 regarding issues pertaining to plotting data from river, bays and ocean on the same graph.

See Response #32 regarding issues pertaining to secchi disk data.

See Responses #7c and 24 regarding issues pertaining to algal information in the Squamscott River versus the light extinction.

See Responses # 7d and 25 regarding issues pertaining to dissolved oxygen levels in the Squamscott River.

COMMENTS FROM ADAM SCHROADTER

Comment #56: My name is Adam Schroadter. I am from here in Newmarket and I am a State Representative for this community. I have been following this stuff pretty closely since I was elected and even before that actually.

Some statements have been made about adaptive management and non point source concerns. Wastewater treatment plants are a relatively small fraction of the total cause of the problem.

I think it's obvious that, on the State level, there is a lot that we can do to help. Since I've gotten involved here on the State level, I haven't heard from anybody in the EPA about this at all. I certainly am here to help. On the Federal level, I have tried to at least contact Congressman Guinta and the Senators Ayotte and folks and, I would ask, in the future, please do contact me because I'm trying to help.

I have put in three bills about these problems, specifically, the non point sources and the adaptive management plan that I think can help in the conversation that we just talked about having with you guys in looking at that 8 versus 3 and reducing nitrogen through non point sources.

First, I put in a bill that should help incentivize oyster farming in Great Bay and aquaculture. Currently, the license issued by the Department of Fish and game for aquaculture is a one year permit. But, given the hundreds of thousands of dollars in total hours that these people -- the farmers have to put in and entrepreneurs into going in and doing this, and given the fact that it takes oysters at least three years to mature. I think, in extending that to at least seven years, we will be able to incentivize further aquaculture and the benefits that you've heard and know very well about oysters filtering out the pollutants in the bay.

The second one is something that you guys might be interested in even further and, that is reducing the total amount of quick release nitrogen fertilizer that is allowed to be sold in fertilizers sold in the state of Hampshire. It is modeled off of a bill that Maryland recently passed. You guys are probably familiar with the Chesapeake. Rather than dealing with asking how are we going to police fertilizer companies, landscaping companies, and individuals with their lawns, we go straight to the source of the sale and reduce the amount that is allowed to be included here, which would help out with run off problems that we just heard about as well.

Lastly, I also put in a bill based upon another bill that Maryland recently passed and referred to as the flush tax. It is a bill that requires an additional payment on people's sewer bills to help go into a dedicated fund to help replace dilapidated wastewater treatment plants and septic systems.

Here in New Hampshire, as it stands in the current bill, it would be a suggested donation or recommendation on people's taxes that they would put in a $25 donation per toilet per property to go toward contributing toward these problems that we are facing here in Great Bay.

With all three of these things, I have gotten extremely good feedback. Everybody understands in the State legislature the dire property tax situation we are looking at here in these communities. I've heard people say and seen statistics that show people in Newmarket might end up paying as much as twice their current property taxes here, the effects of which are people moving out and businesses closing down, devastating effects on our community.

The response in Concord has been, well, we'd like to take care of our problems on our own and try to solve these problems in ways with the non point sources as best we can. I do ask that you consider our discussion here and the idea of somewhat more lenient restriction here on the point source through the wastewater treatment plants.

Response #56: EPA appreciates the comment and notes it for the record. EPA has structured the permit to provide NHDES and the communities with both a framework to accommodate, and the time to pursue, the very types of nonpoint source-based initiatives described in this comment.

Please see Response #53 relative to the need for the 3.0 mg/l total nitrogen limit and relative to cost considerations. Please see also Response #55 relative to adaptive management.

COMMENTS FROM JOHN BENTLEY

Comment #57: I'm a Town Councilor here and I would hope that, with all of the scientific minds and Town Reps, State Reps and concerned citizens we have here tonight, we could roll up our sleeves and work together to meet halfway and come up with an open minded solution that is best for Newmarket.

We, the Town of Newmarket, have never crossed our arms and said we are not going to do anything. We couldn't do that and we wouldn't do that.

At one of the meetings, I got the feeling that the EPA said, it is pretty much our way or the highway. We were told we never lost a case. And then, when I probed on that, I was told the panel of judges that sits on it are EPA employees. That still sticks with me from that night at that meeting. We probably wouldn't lose our case if we had Newmarket residents voting on it.

I'd like to think that we could have an open forum and talk about this. There are 14,000,000 people in the United States unemployed and, here locally, we need a new school, new water tower, new water lines, and new wells. A limit of eight milligrams will double our rates and a limit of three milligrams will triple our rates. It's just a burden that we can't take on. It's just fiscally not able to be done.
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I asked at the last meeting about testing the river above the dam. The Lamprey River runs through many towns. I fly fish and I hunt on the river. I've stood in the river and seen cows and horses in the river. And they are certainly letting things into the river that are probably contributing to the nitrogen also.

I'd like to see some tests done upstream and not just below the dam, because I think there's nitrogen in it before it's even getting there. I know there is nitrogen. It's a matter of how much.

There are golf courses on the bay. There's beautiful homes from Durham, Newmarket on the bay. You see people out fertilizing their lawns and that's part of the run off that's going in there.

So, not all nitrogen is the same we were told. I'm certainly not an expert at all on it, but I think we still need to hold our breath, take a minute and look at some of these other sources because pretty much anyone above us is getting a free pass. They can continue to let their animals do what they want to do. They can continue to fertilize their lawns and their golf courses. And some of the users, the 15 communities that have treatment plans are going to pay the sole burden.

And we're not talking 10,000 taxpayers. We might be talking 3000 users out of the 10,000. So, you're not sharing the cost with everyone. You are sharing it only with the users.

Also, you know, EPA regulates VOC. I am from the paint industry and that didn't go from 250 to 350 to 450, it didn't go all in one jump. They slowly started with California and then the Delaware watershed and gradually changed the VOC levels a different way. I'm wondering why we can't again do the same thing here. Start at 8 milligram per liter and see what that looks likes. If it's true that it takes 80 percent of it, I think that could possibly be a good alternative.

We all care about the bay. I eat stripers and the blues out of the bay and lobster every year. And we want a clean bay. But, not at all costs and not when there seems to still be some other science out there and some other ways to do it.

I don't know why it has to be all or nothing. It certainly isn't the way other things have happened whether we are talking about the additives in gas, or back to the VOC paint issue. It wasn't all one big jump. It was gradual jumps.

I'm just hoping that everyone can stay open minded and hold our hands to all work together and come up with a solution that works for everybody.

Response #57: EPA appreciates the comment and notes it for the record.

Please see Response #53 relative to the need for the 3.0 mg/l total nitrogen limit and relative to cost considerations.

EPA has remained committed to considering all points of view and, where appropriate, has made changes to the permit based on public comment. The notion of meeting half way or the prospect of forestalling permit issuance to gather more data or conduct more studies is sometimes difficult to square with the mandates of the Clean Water Act as enacted by Congress. NPDES permits are for five-year terms, about which time the reissuance process begins. Under the Clean Water Act, EPA upon reissuance is obligated to include limitations as stringent as necessary to ensure compliance with applicable water quality standards. CWA § 301(b)(1)(C). Under federal regulations implementing the NPDES program, "No permit may be issued…[w]hen the imposition of conditions cannot ensure compliance with the applicable water quality requirements of all affected States." 40 C.F.R. § 122.4(d). In this case, the administrative record for the permit already accounts for the technical issues raised by the comments. EPA concurs that non-POTW sources contribute to the nitrogen-driven impairments in Great Bay. It is indeed undisputed that nonpoint sources represent the majority of the total nitrogen load to the Great Bay Estuary. For this reason, significant nonpoint source reductions will be necessary to achieve the applicable narrative nutrient water quality criterion. These reductions must occur in conjunction with, not in lieu of, nitrogen effluent limitations on POTWs, including some as low as 3 mg/l.

It is, in addition, there is already a significant amount of data documenting river levels of nitrogen. These data clearly indicate that nitrogen concentrations in the river upstream of point

source discharges are high. All of these data are available on the Piscataqua Region Estuary Partnership's web site.

Please see Response #54 relative to nonpoint source controls.

Please see Response #55 relative to the role of scientific uncertainty in decision making under the Clean Water Act and relative to the potential applicability of adaptive management.

COMMENTS FROM DAWN GENES

Comment #58: The Lamprey River Watershed Association has been an advocate of water conservation and clean water for over three decades. The Lamprey River, Great Bay and the estuary are natural treasures that are vital, not only for their natural resource values, but for the role they play in the economy and the culture of the Lamprey watershed and seacoast regions.

The Lamprey River Watershed Association supports the Draft Permit provisions addressing nitrogen pollution. We recognize that EPA must, by law, take this essential step toward restoring the estuary's health. As the New Hampshire Department of Environmental Services and EPA have designated waters throughout the Great Bay estuary as violating water quality standards as a result of elevated nitrogen concentrations, eelgrass loss and low dissolved oxygen.

It is well understood that the elevated nitrogen levels in the estuary are due both to non point sources as well as wastewater treatment facilities identified by NH DES and EPA. Both sources must be addressed if water quality is to be improved and health restored to Great Bay. The Lamprey River Watershed Association is committed to working with communities to identify and remediate practices resulting in non point source pollution.

In summary, the Lamprey River Watershed Association supports the Town of Newmarket working with the EPA towards a wastewater treatment facility discharge of three milligrams or less. This improvement, of course, will come at a cost that the Town of Newmarket may found difficult to manage. We therefore urge the EPA and the State of New Hampshire's Congressional delegation to look for ways to help the Town of Newmarket make these improvements in a timely fashion and at a reasonable cost.

Response #58: EPA appreciates the comment and notes it for the record.

COMMENTS FROM PHIL NAZZARO

Comment #59: This is our backyard, this is something that matters to us. I hope you don't take, in any way, the fact that there is some push back against the three total nitrogen as us saying that we don't care about what's going on. We care very, very deeply. This is a livelihood for some people around here and it's absolutely a great part of our community.

I'm not a scientist by trade, but, I do have some background in statistics. I think that there has been some very strong statistical evidence showing that, perhaps, the way the permit is written right now is not going to solve the problem going on in the bay.

I just ask, very sincerely, that, understanding you are the EPA and we're just the Town of Newmarket, that you take what we have to say here to heart, what the citizens have to say here to heart. Because I know Councilor Bentley and I believe Representative Schroadter actually alluded to the tough economic times right now. Things are especially hard right now in the Town of Newmarket. The numbers that the superintendent of the water system put up there, a shift in the numbers like that, could have devastating effects on real people and real families.

Response #59: Please see Response #53 relative to the need for the 3.0 mg/l total nitrogen limit and relative to cost considerations.

Please see Response #54 relative to role of nonpoint source reductions in achieving water quality standards in the Great Bay Estuary.

Please see Response #55 relative to the potential role of adaptive management.

COMMENTS FROM FRED SHORT

Comment #60: I am a research scientist at the Jackson Estuarine Lab on Great Bay. My field of research is eelgrass. And all the data that you've seen presented earlier by Charlie Hall and colleagues is my data. I would say, and you can ask other scientists, we probably have the best record of eelgrass data of any estuary in the country for sure, and maybe in the world. I've been working here for 30 years. What I do is monitor and look and experiment on eelgrass. It's in my backyard, so to speak.

I'm concerned about the health of the bay and I'm concerned about eelgrass. There's a direct connection there. How well eelgrass is doing is an indicator of how well the bay is doing. So, it's not surprising when we see information put up that says the oysters are declining and the system is changing when the eelgrass is changing. The eelgrass is actually indicating that. By monitoring the eelgrass change, we can tell you that the system is getting more and more degraded and, in this case, it's becoming more and more polluted.

The presentation that Dr. Hall made was quite complicated with all his graphs and everything. He doesn't quite have it right. He's just come into the system from Washington DC as a paid expert and looked at some of the data. But, he doesn't have all the concepts right. He doesn't understand the system. You can't say things about Great Bay and have them mean the whole estuary all the way down to Portsmouth Harbor on one voice, and have them mean just the inner part of Great Bay by Adams Point and the rivers in the next voice.

The systems are different. In Great Bay, it's a shallow intertidal system, and macro algae, as he mentioned, seaweeds, are the problem. They are nuisance seaweeds that take up nitrogen and grow very fast in the warm summer and crowd out the eelgrass.

The other parts of the river, Little Bay, the Piscataqua River are deep systems. That's where our navigation channels are. Those systems function very differently than Great Bay. And in that

part of the system, they're limited by how much light gets through the water. Phytoplankton is the concern and it is directly driven by the nitrogen coming into the system.

It's a complicated system, but, it's a simple problem. And the problem is, we have too much nitrogen.

NHDES has done a fabulous job of looking at all the data that we have on the bay. We have data going back to the '70s on nitrogen and on various aspects of the estuary and they've pulled it all together. Phil Trowbridge has analyzed it. They've done a very thorough job of reviewing it. They had an advisory committee that reviewed everything and discussed all the parts of the report. So, it's not like it is untested data that just a couple of people pulled together.

The criticisms that Dr. Hall has made are not completely straight. DIN is not total nitrogen. Total nitrogen is the sum of the organic and the inorganic nitrogen. So, if you're going to fertilize your garden, you can go to the store and you can buy inorganic nitrogen and throw it on your garden and everything grows great. You can go to the farm and get manure and throw it on the garden and everything grows great too, but, that's organic nitrogen, that's not DIN, but, it's part of total nitrogen. Either one makes your garden grow really well. Also, when either one gets into the bay, it makes the algae grow very well. You can't dismiss one whole section of the nitrogen by saying it's not what the plants prefer, because the plants will use whatever they have coming down the pipe, basically whatever gets into the system.

Our problem is, we have too much nitrogen going into the system. Nitrogen from the wastewater treatment facilities is about a third of what is coming into the system and two thirds is non point source. The obvious thing might be, well, let's tackle the two thirds part. But, we don't even know the sources of all the two thirds part. We know that some is from septic systems, some is from runoff, and a lot is from the atmosphere. There are a lot of ways that that nitrogen gets into the non point source.

We, EPA and UNH, are all working on ways to reduce the nitrogen coming into the bay. That will work and it will help. But we also need to reduce the point sources, particularly the ones that dump directly into the rivers below the dam and those that are large discharges and dump right into the bay where there is no filtering, nothing to takes the nitrogen out. Those are the ones that we really need to make reductions on.

I understand the problems of the hard economic times. I see that and I know it's difficult. But, what EPA is putting forward comes from DES and it's what the data says, what the results say.

I encourage you to support this to the greatest extent you can for the sake of the bay, the stripers, the lobsters and the various organisms that we love and are important to our estuarine system.

Response #60: EPA appreciates the comment and notes it for the record.

<u>COMMENTS FROM TOM IRWIN</u>

Comment #61: I am Tom Irwin with the New Hampshire Office of the Conservation Law Foundation. I typically prefer not to read statements into the record, however, I am speaking on behalf of a number of groups so, if you'll bear with me, I would like to read into the record a joint statement of the Conservation Law Foundation, Conservation New Hampshire, Environment New Hampshire, Great Bay Trout Unlimited, New Hampshire Audubon and the New Hampshire Coastal Protection Partnership.

We write to support the Environmental Protection Agency's Draft Permit for the Town of Newmarket New Hampshire's wastewater treatment facility. In particular, we commend the EPA for proposing significant much needed reductions in total nitrogen pollution from the Newmarket wastewater treatment plant, which discharges into the Lamprey River, part of the Great Bay estuary.

Regrettably, the Great Bay estuary is in decline. Every three years, the Piscataqua Region Estuary Partnership, formerly the New Hampshire Estuaries Program publishes a statement the estuaries report tracking specific indicators of estuarine health in the Great Bay and the Hampton Seabrook estuaries. One need go no further than these recent reports and their increasingly negative findings to find a troubling reality. The health of the Great Bay estuary is on a downward trajectory. The most recent state of the estuaries report, published in 2009, found that out of the 12 primary indicators tracked by PREP, 11 showed negative or cautionary trends.

Included among the four negative trends documented in the 2009 report, are increased nitrogen concentrations in Great Bay and the loss of eelgrass, the cornerstone of the Great Bay ecosystem in Great Bay, and the complete disappearance of eelgrass in other areas of the system.

Importantly, the interpretations of indicators in this report were reviewed by Prep's technical advisory committee and other experts and therefore represent the scientific consensus regarding conditions in EPA's estuaries. Thus, scientific consensus as of 2009 is that the health of the Great Bay estuary is in decline.

Consistent with findings in the 2009 state of the estuaries report, DES and the EPA have designated waters throughout the Great Bay estuary as violating water quality standards as a result of elevated nitrogen concentrations, eelgrass loss and low dissolved oxygen. The Lamprey River has been designated as being impaired for aquatic life use as a result of nitrogen pollution with the complete disappearance of eelgrass and with elevated chlorophyll-a and low dissolved oxygen. Immediately downstream, Great Bay has been listed as impaired for aquatic life use as a result of nitrogen pollution and for significant eelgrass declines.

The Clean Water Act makes clear that permitted discharges shall not cause or contribute to violations of water quality standards. This is the touchstone that must guide EPA in its permitting decision.

In light of the conditions in the estuary and a documented need to reduce nitrogen loads in the Lamprey River watershed by 41 percent, and in light of the detailed scientific assessment conducted by the Department of Environmental Services, a process that took more than three years and it included input from a technical advisory committee and outside experts, discharges

of total nitrogen from the Newmarket wastewater treatment plant must, as a matter of law, be reduced to the fullest extent. And as acknowledged in the EPA's Fact Sheet, must be supplemented with measures to reduce nitrogen pollution from storm water and non point sources.

We strongly support the Draft Permit's important provisions addressing nitrogen pollution. We commend EPA for taking this essential step toward restoring the estuary's health. We urge EPA to promptly proceed to finalization of this permit and to work with the Town of Newmarket to develop an implementation schedule that is both feasible and protective of the estuary.

The Lamprey River, Great Bay and the estuary as a whole are natural treasures that are vital not only for their natural resource values but for the role they play in the economy and the culture of the seacoast region. We urge you to proceed promptly and without delay. And we thank you for your efforts to protect this remarkable resource.

I'd also like to just briefly address one or two points on behalf of Conservation Law Foundation. In particular, it was stated in an earlier presentation that the Conservation Law Foundation has taken the position that urban sprawl is the problem. Urban sprawl is a very significant part of the problem. We have seen significant growth in impervious surface cover, roads, pavement, which has contributed significantly to the nitrogen pollution problem. But, waste water treatment plants are very definitely a part of the problem.

I would agree with that presenter that we need to take a holistic approach. EPA has acknowledged as much in its Fact Sheet. And we acknowledge and appreciate that fact, that we need to address the point sources and, we need to address storm water and non point sources.

The last point I would make is, along the lines of this being a holistic approach, I would agree with the comments to the effect that this is a watershed wide problem. And it's one in which we will need the participation of municipalities that don't have wastewater treatment plants. All these communities need to be a part of the solution. But, we need to address the point sources, the places where we can, through technology to achieve real reductions and in short order to address the problem.

I would suggest that, if we don't move quickly, the costs could be much higher in the future. If we wait too long, allow the problem to get worse, the degradation to grow worse, the cost of solving the problem will only increase.

Response #61: EPA appreciates the comment and notes it for the record.

Please see Response #44 and #54 relative to the role of nonpoint sources and the need to address these sources in order to achieve water quality standards

COMMENTS FROM PETER WHELAN

Comment #62: My name is Peter Whelan. I'm a resident of Portsmouth, New Hampshire. I'm on the board of directors of Coastal Conservation Association of New Hampshire. We have about 260 members here in the state and about 20,000 members across the country.

CCA New Hampshire supports the Draft Permit provisions of the EPA permit for Newmarket. We also support a total solution for the bay, both point and non point source pollution.

CCA is very active in the total oyster restoration in the bay. We have an ongoing program where we are actually collecting shells, working with UNH, and actually depositing them into the bay.

We also urge State and Federal support for Newmarket through grants and additional funds to help meet the requirements. We cannot allow the bay to collapse. That is a shared resource of all the citizens here in New Hampshire. We support your Draft Permit and hope that you can move forward as quickly as possible.

Just on a personal note, I hear the buzzword adaptive management a lot in some of these presentations. And to me, some of this adaptive management really is a buzzword for a delay. We can't allow the bay to collapse. I'm on the water all summer long and I have a fishing business. I've watched the eelgrass decline over the past 10 years. It is dramatic.

Response #62: EPA appreciates the comment and notes it for the record.

COMMENTS FROM RAY KONISKY

Comment #63: I am Ray Konisky and I am with the Nature Conservancy. It is a nonprofit conservation organization. We have quite a stake here in Newmarket. We have been here a long time.

We own quite a bit of property in town. The Leverland Preserve (phonetic) is one of our preserves. My office is over on Bay Road. We work directly with the bay on a number of different fronts.

This is an area and an interest that is central to us. We have written comments that I will submit. I just wanted to talk a little bit from the heart for a second, because I am out there as well as a number of you folks are, to see what is going on in our bay and our situation. I can tell you, that it is very eye opening. Rather than to look at so much decline, there is a lot of hope out there. We have, just at the end of the Lamprey River, a good solid half acre of oyster reef that is viable and productive and reproducing and working in that system.

The eelgrass is gone from that river. But, as you go further into the bay, in some of the shallower areas, as Fred Short describes, it is still there.

Adam Schroadter talks about using Maryland and the Chesapeake as a model. Well, they've lost what they had and we haven't yet. And really, when you get to that point, if we get to that point, and we are at a reflection point here, we have lost something huge that is not too late to help.

This is very germane to the discussion about permitting. We support the EPA's Draft Permit and our writing will suggest that. We do recognize that it needs to be done in a feasible way for both the Town and the taxpayers. I look at the numbers and I see that it's going to cost an average rate payer 80, 90, $100 a month and that is a lot of money.

I just wish I could get those folks to come down to the bay and see what those oysters look like and what this eelgrass looks like. And when you reach down and pick up a handful of what are flounder juveniles that are in those systems, what a productive and amazing system we have here.

I wish I could get people out to see that. They would recognize maybe that that's not money that is being flushed away. It is something that protects something that is really vital to us here.

Response #63: EPA appreciates the comment and notes it for the record.

See Response #53 above relative to projected sewer rates and affordability issues.

COMMENTS FROM TOM MORGAN

Comment #64: I have a statement from the Board of Selectmen. I am the Town Planner for Newington which as you know, is across the bay.

We are writing in response to your request for comments on the proposed limits to point source nitrogen discharge into the Great Bay estuary. The Town of Newington currently has plans underway to upgrade our wastewater treatment plant to meet the proposed nitrogen standard of three milligrams per liter. Concurrently, we are undertaking an aggressive program to reduce non point sources. Obviously, our efforts would be for naught unless other communities in the watershed were to take comparable measures.

Accordingly, the Town of Newington urges the EPA to move quickly and decisively and in a comprehensive fashion to reduce the volume of all sources of nitrogen that contribute to the impairment of water quality in the estuary.

We support the proposed three milligram standard. We have no doubt that building wastewater infrastructure to a rigorous standard will be expensive. Yet, failure to do so will ultimately cost us a great deal more.

Response #64: EPA appreciates the comment and notes it for the record.

COMMENTS FROM PETE RICHARDSON

Comment #65: I represent nobody but myself, Pete Richardson, a resident of Exeter. I want to thank the EPA for doing their duty and pointing out our duty to care for the land and water in ways that allow the earth to continue to provide us clean air, water, food, that we must have to survive.

I would remind us all, but it's already been done earlier, that what we are discussing tonight, a wastewater treatment facility, daunting as that is, is only a small portion of - only a third of the problem. We must also address the larger source of which is much more diffuse, storm water, septic tanks, fertilizer, road salt, wetland buffers, culverts, impervious surfaces, including roofs, parking lots and more, the list goes on.

Each one of us will have to change our thinking about our lives and that is not easy. I believe we can do it all, but we have to start now. There are lots of unanswered questions I know. But, we can do what we must. The need is great but so are we.

Response #65: EPA appreciates the comment and notes it for the record.

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