AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCAHRGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act, as amended, (33 U.S.C. §1251 et seq.; the "CWA"),

The Town of Exeter, New Hampshire

is authorized to discharge from the Town of Exeter Wastewater Treatment Plant located at

13 Newfields Road
Exeter, New Hampshire 03833

to the receiving water named:

Squamscott River (Hydrologic Basin Code: 01060003)

in accordance with the effluent limitations, monitoring requirements, and other conditions set forth herein.

The permit will become effective on the first day of the calendar month immediately following sixty days after signature.

This permit and the authorization to discharge expire at midnight, five (5) years from the effective date.

This permit supersedes the permit issued on July 5, 2000.

This permit consists of 18 pages in Part I including effluent limitations, monitoring requirements, etc., Attachments A (Marine Acute Toxicity Test Procedure and Protocol dated July 2012), Attachment B (List of Combined Sewer Overflows), Sludge Compliance Guidance, and Part II including General Conditions and Definitions.

Signed this 12th day of December, 2012.

/S/ SIGNATURE ON FILE

Stephen S. Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency
Region I
Boston, Massachusetts

PART I.A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge treated domestic and industrial wastewater from Outfall Serial Number 001 to the Squamscott River. Such discharges shall be limited and monitored by the permittee as specified below. Samples taken in compliance with the monitoring requirements specified below shall be taken at the end of all processes, including disinfection, or at an alternative representative location approved by the EPA and NHDES-WD.

Effluent Parameter	**Effluent Limit**			**Monitoring Requirement**	
	Average Monthly	**Average Weekly**	**Maximum Daily**	**Frequency**	**Sample Type**
Flow, MGD	Report	---	Report	Continuous	Recorder[1]
BOD_5; mg/l (lb/d)	30 (751)	45 (1126)	50 (1251)	2/Week[2]	Grab[13]
TSS; mg/l (lb/d)	30 (751)	45 (1126)	50 (1251)	2/Week[2]	Grab[13]
pH Range[3]; Standard Units	6.0 to 9.0 (See Section I.H.5.)			1/Day	Grab[13]
Fecal Coliform[3,4]; Colonies/100 ml	14	---	Report	1/Day	Grab
Fecal Coliform[3,4]; percent	---	---	Report	1/Day	Grab
Enterococci Bacteria[3,5]; Colonies/100ml	Report	---	Report	2/Week	Grab
Total Residual Chlorine[6]; mg/l	0.19	---	0.33	2/Day	Grab
Total Nitrogen[7] mg/l (lb/d) **Applicable November 1 – March 31**	Report	---	---	1/Week	Grab[13]
Total Nitrogen[7,8], mg/l (lb/d) **Applicable April 1 – October 31**	3.0 (75)	---	---	1/Week	Grab[13]
Whole Effluent Toxicity					
LC50[9,10,12]; Percent Effluent	---	---	100	2/Year	Grab[13]
Ammonia Nitrogen as N[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Aluminum[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Cadmium[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Chromium[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Copper[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Lead[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Nickel[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Zinc[11]; mg/l	---	---	Report	2/Year	Grab[13]

* **SEE PAGES 4 AND 5 FOR FOOTNOTES.**

PART I.A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

2. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge stormwater and wastewaters from Combined Sewer Outfall Number 003 into Clemson Pond. These discharges are authorized only during wet weather. Such discharges shall be limited to the outfall listed, and shall be monitored by the permittee as specified below. Samples specified below shall be taken at a location that provides a representative analysis of the effluent.

Effluent Characteristic	Discharge Limitation	Monitoring Requirement	
	Wet Weather Event Maximum	Measurement Frequency	Sample Type
Escherichia coli Bacteria[3, 5, 14] (colonies/100 ml)	1000	1/Year	Grab

EXPLANATION OF FOOTNOTES APPLICABLE TO PART I.A.1 on page 2

1. The effluent flow shall be continuously measured and recorded using a flow meter and totalizer.

2. Influent concentrations of both BOD_5 and TSS shall be monitored two (2) days per month.

3. State certification requirement.

4. Fecal coliform shall be tested using an EPA approved test method (see 40 C.F.R. Part 136).

   The average monthly value for fecal coliform shall be determined by calculating the geometric mean using the daily sample results. Not more than 10 percent of the collected samples shall exceed a most probable number (MPN) of 43 per 100 ml for a 5-tube decimal dilution test. Furthermore, all fecal coliform data collected must be submitted with the monthly discharge monitoring reports (DMRs).

   The permittee is required to report two (2) statistics each month. One is the geometric mean fecal coliform value expressed in terms of "MPN per 100 ml" (reported as average monthly), and the second is the percentage of collected samples each month that exceeds an MPN of 43 per 100 ml for the 5-tube decimal dilution test referenced above. The latter statistic will be used to judge compliance with that part of the limit that reads "Not more than 10 percent of the collected samples shall exceed a most probably number (MPN) of 43 per 100 ml for a 5-tube decimal dilution test."

5. Enterococci and Escherichia coli bacteria shall be tested using an EPA approved test method (see 40 C.F.R. Part 136).

6. Total Residual Chlorine shall be tested using an EPA approved test method (see 40 C.F.R. Part 136). The method chosen to test total residual chlorine shall have a minimum level of detection of at least the total chlorine residual permit limit specified on page 2 of the permit.

7. Total nitrogen shall be calculated by adding the total kjeldahl nitrogen (TKN) to the total nitrate (NO_3) and nitrite (NO_2).

   The permittee shall report the monthly average mass and concentration each month.

8. The nitrogen limit is a rolling seasonal average limit, which is effective from April 1 – October 31 of each year. The first value for the seasonal average will be reported after an entire April through October period has elapsed following the effective date of the permit (results do not have to be from the same year). For example, if the permit becomes effective on May 1, 2013, the permittee will calculate the first seasonal average from samples collected during the months of May through October 2013 and April 2014, and report this average on the April 2014 DMR. For each subsequent month that the seasonal limit is in effect, the seasonal average shall be calculated using samples from that month and the previous six months that the limit was in effect.

The permittee shall optimize the operation of the treatment facility for the removal of total nitrogen during the period November 1 through March 31. All available treatment equipment in place at the facility shall be operated unless equal or better performance can be achieved in a reduced operational mode. The addition of a carbon source that may be necessary in order to meet the total nitrogen limit from April 1 through October 31 is not required during the period November 1 through March 31.

9. The permittee shall conduct acute toxicity tests on effluent samples using two species, mysid shrimp (*Mysidopsis bahia*) and inland silverside (*Menidia beryllina*), following the protocol in Attachment A (Marine Acute Toxicity Test Procedure and Protocol dated July 2012). Toxicity testing shall be performed two (2) times each year during the first quarter (January 1 – March 31) and third quarter (July 1 – September 30) of each year. Toxicity test results are to be submitted by the 15th day of the month following the end of the quarter sampled.

10. LC50 is defined as the percent of effluent (treated wastewater) that causes mortality to 50 percent of the test organisms. The permit limit of 100 percent is defined as a sample composed of 100 percent effluent.

11. For each whole effluent toxicity test the permittee shall report on the appropriate discharge monitoring report (DMR) the concentrations of ammonia nitrogen as nitrogen and total recoverable aluminum, cadmium, copper, chromium, lead, nickel, and zinc found in the 100 percent effluent sample. All these aforementioned chemical parameters shall be determined to at least the minimum quantification level (ML) show in Attachment A or as amended.

12. The permit shall be modified, or alternatively revoked and reissued, to incorporate additional toxicity testing requirements, including chemical specific limits, if the results of the toxicity tests indicate the discharge causes an exceedance of any State water quality criterion. Results from these toxicity tests are considered "New Information" and the permit may be modified as provided in 40 C.F.R. § 122.62(a)(2).

13. If the treatment plant is upgraded during the life of this permit to a treatment process that does not utilize lagoon treatment as the primary treatment technology, the effluent sample type shall change to a 24 hour composite sample upon completion of the upgrade.

14. The permittee shall sample the discharge from the combined sewer outfall listed in Attachment B at least once per year. All attempts must be made to begin sampling during the first one half hour after the outfall starts discharging. When this is not possible, a sample shall be collected as soon as possible after the beginning of the outfall starting to discharge. The "event maximum" value for Escherichia coli shall be reported on the appropriate DMR for the month sampled. Report a no discharge code of "E" (analysis not conducted) on the DMR for <u>all other months</u>.

    The permittee shall also perform CSO and receiving water sampling as described in Part I.F.3. below.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIRMENTS (Continued)

3. The discharge shall not cause a violation of the water quality standards of the receiving water.

4. The discharge shall be adequately treated to ensure that the surface water remains free from pollutants in concentrations or combinations that settle to form harmful deposits, float as foam, debris, scum, or other visible pollutants. It shall be adequately treated to ensure that the surface waters remain free from pollutants which produce odor, color, taste, or turbidity in the receiving waters which is not naturally occurring and would render it unsuitable for its designated uses.

5. The permittee's treatment facility shall maintain a minimum of 70 percent removal for BOD_5 and 65 percent for TSS. The percent removal shall be calculated based on average monthly influent and effluent concentrations. If the treatment plant is upgraded during the life of this permit to treatment process that does not utilize lagoon treatment as the primary treatment technology, the facility shall maintain a minimum of 85 percent removal for BOD_5 and TSS upon completion of the upgrade.

6. When the effluent discharged for a period of three consecutive months exceeds 80 percent of the 3.0 mgd design flow, 2.4 mgd, the permittee shall submit to the permitting authorities a projection of loadings up to the time when the design capacity of the treatment facility will be reached and a program for maintaining satisfactory treatment levels consistent with approved water quality management plans. Before the design flow will be reached, or whenever the treatment necessary to achieve permit limits cannot be assured, the permittee may be required to submit plans for facility improvements.

7. All publicly owned treatment works (POTWs) must provide adequate notice to both EPA-New England and the New Hampshire Department of Environmental Services – Water Division (NHDES-WD) of the following:

    a. Any new introduction of pollutants into the POTW from an indirect discharger in a primary industrial category (see 40 C.F.R. §122 Appendix A as amended) discharging process water;

    b. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit; and

    c. For the purpose of this paragraph, adequate notice shall include information on:

        i. The quantity and quality of effluent introduced into the POTW; and

        ii. Any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW

8. The permittee shall not discharge into the receiving waters any pollutant or combination of pollutants in toxic amounts.

B. UNAUTHORIZED DISCHARGES

The permit only authorizes discharges in accordance with the terms and conditions of this permit and only from the outfalls listed in Part 1.A.1 and Part 1.A.2 (see Attachment B) of this permit. Discharges of wastewater from any other point source are not authorized under this permit. Dry weather overflows are prohibited. All dry weather sanitary and/or industrial discharges from any CSO must be reported to EPA-New England and the State within 24 hours in accordance with the reporting requirements for plant bypass (see Paragraph D.1.e. of Part II of this permit).

C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance of the sewer system shall be in compliance with the General Requirements of Part II and the following terms and conditions. The permittee is required to complete the following activities on its collection system:

1. Maintenance Staff

   The permittee shall provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit.

2. Preventative Maintenance Program

   The permittee shall maintain an ongoing preventative maintenance program to prevent overflows and bypasses caused by malfunctions or failures of the sewer system infrastructure. The program shall include an inspection program designed to identify all potential and actual unauthorized discharges.

3. Infiltration/Inflow

   The permittee shall control infiltration and inflow (I/I) into the sewer system as necessary to prevent high flow related unauthorized discharges from their collection systems and high flow related violations of the wastewater treatment plant's effluent limitations.

4. Collection System Mapping

Within 30 months of the effective date of the permit, the permittee shall prepare a map of the sewer collection system it owns. The map shall be on a street map of the community, with sufficient detail and at a scale to allow easy interpretation. The collection system information shown on the map shall be based on current conditions. Such map(s) shall include, but not be limited to the following:

   a. All sanitary sewer lines and related manholes;

b. All combined sewer lines and related manholes;
c. All combined sewer regulators and any known or suspected connections between the sanitary sewer and storm drain system (e.g. combined manholes);
d. All outfalls, including the treatment plant outfall(s), CSOs, combined manholes, and any known or suspected SSOs;
e. All pump stations and force mains;
f. The wastewater treatment facility(ies);
g. All surface waters (labeled);
h. Other major appurtenances such as inverted siphons and air release valves;
i. A numbering system which uniquely identifies overflow points, regulators and outfalls;
j. The scale and a north arrow; and
k. The pipe diameter, age and type of pipe, the length of pipe between manholes, the direction of flow, and the pipe rim and invert elevations.

5. Collection System O&M Plan

The permittee shall develop and implement a collection system operation and maintenance plan. The plan shall be submitted to EPA and NHDES **within six months of the effective date of this permit** (see page 1 of this permit for the effective date). The plan shall describe the permittee's programs for preventing I/I related effluent limit violations and all unauthorized discharges of wastewater, including overflows and by-passes.

The plan shall include:

a. A description of the overall condition of the collection system including a list of recent studies and construction activities;
b. A preventative maintenance and monitoring program for the collection system;
c. Recommended staffing to properly operate and maintain the sanitary sewer collection system;
d. The necessary funding level and the source(s) of funding for implementing the plan;
e. Identification of known and suspected overflows, including combined manholes. A description of the cause of the identified overflows, and a plan for addressing the overflows consistent with the requirements of this permit;
f. An ongoing program to identify and remove sources of I/I. The program shall include an inflow identification and control program that focuses on the disconnection and redirection of illegal sump pumps and roof down spouts; and
g. An educational public outreach program for all aspects of I/I control, particularly private inflow.

For each of the above activities that are not completed and implemented as of the submittal date, the plan shall provide a schedule for its completion.

D. ALTERNATE POWER SOURCE

In order to maintain compliance with the terms and conditions of this permit, the permittee shall provide an alternate power source with which to sufficiently operate the publicly owned treatment works, as defined at 40 C.F.R. § 122.2, which references the definition at 40 C.F.R. § 403.3(o).

E. SLUDGE CONDITIONS

1. The permittee shall comply with all existing Federal and State laws and regulations that apply to sewage sludge use and disposal practices and with the Clean Water Act (CWA) Section 405(d) technical standards.

2. The permittee shall comply with the more stringent of either State (Env-Wq 800) or Federal (40 C.F.R. Part 503) requirements.

3. The technical standards (Part 503 regulations) apply to facilities which perform one or more of the following use or disposal practices.

    a. Land Application – The use of sewage sludge to condition or fertilize the soil.
    b. Surface Disposal – The placement of sewage sludge in a sludge only landfill.
    c. Fired in a sewage sludge incinerator.

4. The 40 C.F.R. Part 503 conditions do not apply to facilities that place sludge within a municipal solid waste landfill (MSWLF). Part 503 relies on 40 C.F.R. Part 258 criteria, which regulates landfill disposal, for sewage sludge disposed of in a MSWLF. These conditions also do not apply to facilities which do not dispose of sewage sludge during the life of the permit, but rather treat the sludge (lagoon, reed beds), or are otherwise excluded under 40 C.F.R. Part 503.6.

5. The permittee shall use and comply with the attached Sludge Compliance Guidance document to determine appropriate conditions. Appropriate conditions contain the following items:

    a. General Requirements
    b. Pollutant Limitations
    c. Operational Standards (pathogen reduction and vector attraction reductions requirements)
    d. Management Practices
    e. Record Keeping
    f. Monitoring
    g. Reporting

    Depending on the quality of material produced by a facility all conditions may not apply to the facility.

6. If the sludge disposal method requires monitoring, the permittee shall monitor the pollutant concentrations, pathogen reduction, and vector attraction reduction at the following frequency. The frequency is based upon the volume of sewage sludge generated at the facility in dry metric tons per year.

    a. Less than 290……1/Year
    b. 290 to less than 1,500……1/Quarter
    c. 1,500 to less than 15,000……6/Year
    d. 15,000 plus……1/Month

7. The permittee shall perform all required sewage sludge sampling using the procedures detailed in 40 C.F.R. Part 503.8.

8. When the permittee is responsible for an annual report containing the information specified in the regulations, the report shall be submitted by February 19th of each year. Reports shall be submitted to the address contained in the reporting section of the permit.

9. Sludge monitoring is not required by the permittee when the permittee is not responsible for the ultimate sludge use or disposal or when the sludge is disposed of in a MSWLF. The permittee must be assured that any third party contractor is in compliance with appropriate regulatory requirements. In such cases, the permittee is required only to submit an annual report by February 19th of each year containing the following information:

    a. Name and address of the contractor responsible for sludge use and disposal.
    b. Quantity of sludge in dry metric tons removed from the facility.

    Reports shall be submitted to the address contained in the reporting section of the permit.

F. COMBINED SEWER OVERFLOW CONDITIONS

1. Effluent Limitations

    a. During wet-weather periods, the permittee is authorized to discharge stormwater/wastewater from combined sewer overflows (CSOs) to receiving water (see Attachment B), subject to the following effluent limitations

        i. The discharges may not cause or contribute to violations of Federal or State water quality standards.

        ii. The discharges shall receive treatment at a level providing Best Practicable Control Technology Currently Available (BPT), Best Conventional Pollutant Control Technology (BCT) to control and abate conventional pollutants and Best Available Technology Economically Achievable (BAT) to control and abate non-conventional and toxic pollutants. EPA-New England has made a Best Professional Judgment

(BPJ) determination that BPT, BCT, and BAT for CSOs include the implementation of the nine Minimum Technology Based Limitations (MTBLs) specified below otherwise known as Nine Minimum Controls (NMC):

1. Proper operation and regular maintenance programs for the sewer system and the combined sewer overflow points;

2. Maximum use of the collection system for storage;

3. Review and modification of industrial pretreatment program requirements to assure CSO impacts are minimized;

4. Maximization of flow to the POTW for treatment;

5. Prohibition of dry weather overflows from CSOs;

6. Control of solid and floatable materials in CSO discharges;

7. Pollution prevention programs that focus on contaminant reduction activities;

8. Public notification to ensure that the public receives adequate notification of CSO occurrences and CSO impacts; and

9. Monitoring to effectively characterize CSO impacts and the efficacy of CSO controls.

iii. Implementation of these nine minimum controls is required by the effective date of this permit. The permittee shall implement these controls in accordance with Part I.F.2 of this permit. Within one year from permit issuance, the permittee shall submit to EPA and NHDES-WD a report titled "Report on Nine Minimum Control Measures". This document must include a detailed analysis of specific activities the permittee has undertaken and will undertake to implement the nine minimum controls and additional controls beyond the nine minimum controls the permittee can feasibly implement. The specific activities included in the documentation must include the minimum requirements set forth in Part I.F.2 of the permit and additional activities the permittee can reasonably undertake.

2. Nine Minimum Controls – Minimum Implementation Levels

a. The Permittee must implement the nine minimum controls in accordance with their nine minimum controls documentation and with any revisions to that documentation that

may be required. This implementation must include the following controls plus other controls the permittee can feasibly implement as set forth in the documentation.

b. Each CSO structure/regulator, pumping station and/or tidegate shall be routinely inspected, at a minimum of once per month, to insure that they are in good working condition and adjusted to minimize combined sewer discharges and tidal surcharging (Nine Minimum Control Numbers 1, 2, and 4). The following inspection results shall be recorded: date and time of the inspection, the general condition of the facility, and whether the facility is operating satisfactorily. If maintenance is necessary, the permittee shall record: the description of the necessary maintenance, the date the necessary maintenance was performed, and whether the observed problem was corrected. The permittee shall maintain all records of inspections for at least three years.

   Annually, not later than January 15th, the permittee shall submit a certification to EPA and the NHDES-WD which states that the previous calendar year's monthly inspections were conducted, results recorded, and records maintained.

   EPA and the NHDES-WD have the right to inspect any CSO related structure or outfall at any time without prior notification to the permittee

c. Discharges to the combined system of septage, holding tank wastes, or other material which may cause a visible sheen or containing floatable material are prohibited during wet weather when CSO discharge may be active (Nine Minimum Control Numbers 3, 6, and 7).

d. Dry weather overflows are prohibited (Nine Minimum Control Number 5). All dry weather sanitary and/or industrial discharges from CSOs must be reported to EPA and the NHDES-WD within 24 hours in accordance with the reporting requirements for plant bypass (paragraph D.1.e of Part II of this permit).

e. The permittee shall quantify and record all discharges from combined sewer outfalls (Nine Minimum Control Number 9). Quantification may be through direct measurement or estimation. When estimating, the permittee shall make reasonable efforts (i.e. gaging, measurement) to verify the validity of the estimation technique. The following information must be recorded for each combined sewer outfall for each discharge event:

   - Estimated duration (hours) of discharge;
   - Estimated volume (gallons) of discharge: and
   - National Weather Service precipitation data from the nearest gage where precipitation is available at daily (24-hour) intervals and the nearest gage where precipitation is available at one-hour intervals. Cumulative precipitation per discharge event shall be calculated.

The permittee shall maintain all records of discharges for at least six years after the effective date of this permit.

Annually, no later than January 15th, and in conjunction with the requirement in Part I.F.2.b. of this permit, the permittee shall submit a certification to EPA and the NHDES-WD which states that all discharges were recorded and records maintained for the previous calendar year.

f. The permittee shall install and maintain identification signs for all combined sewer outfall structures (Nine Minimum Control Number 8). The signs must be located at or near the combined sewer outfall structures and easily readable by the public. These signs shall be a minimum of 12 x 18 inches in size, with white lettering against a green background, and shall contain the following information:

TOWN OF EXETER
WET WEATHER
SEWAGE DISCHARGE
OUTFALL #

g. The permittee shall provide immediate notification to the NHDES-WD in the event of a CSO discharge.

h. The permittee shall provide notification to the public of CSO discharges and impacts on recreational uses of Clemson Pond and, if necessary, the Squamscott River.

3. CSO and Clemson Pond Monitoring

During the first full calendar year of the permit, the permittee shall perform sampling on the CSO inflow to Clemson Pond and at the outlet of Clemson Pond once per quarter. The permittee shall use NHDES Shellfish Monitoring Program stations to perform these samples. Influent samples to Clemson Pond shall be collected at Shellfish Monitoring Station SQMPS009 (42° 59' 4.92" N, 70° 56' 55.2" W). Samples at the outlet of Clemson Pond shall be collected just inside the tide gate and Shellfish Monitoring Station SQMPS010 (42° 59' 12.9" N, 70° 57' 1.98" W).

This sampling shall be performed once per quarter for a CSO event of at least 40,000 gallons. Samples shall be taken at each sampling station, SQMPS009 and SQMPS010 twice per day (2/day) for three (3) consecutive days. The first samples shall be collected as soon as practicable after the start of the CSO discharge.

Each sample collected shall be tested for Fecal Coliform Bacteria (MPN – 5 tube test), Enterococci Bacteria, salinity, and temperature.

At the end of the one year sampling period, the permittee shall submit the monitoring results to EPA and the NHDES by January 15th of the following year. If the monitoring data reveals the

need to add additional limits or conditions the permit may be modified or alternatively revoked and reissued.

G. MONITORING AND REPORTING

Monitoring results shall be summarized for each calendar month and reported on separate Discharge Monitoring Report Form(s) (DMRs) postmarked no later than the 15th day of the month following the completed reporting period.

Signed and dated original DMRs and all other reports or notifications required herein or in Part II shall be submitted to the Director at the following address:

U.S. Environmental Protection Agency
Water Technical Unit (SMR-04)
5 Post Office Square - Suite 100
Boston, MA 02109-3912

Duplicate signed copies (original signature) of all written reports or notifications required herein or in Part II shall be submitted to the State at:

New Hampshire Department of Environmental Services (NHDES)
Water Division
Wastewater Engineering Bureau
29 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302-0095

All verbal reports or notifications shall be made to both EPA and NHDES.

H. STATE PERMIT CONDITIONS

1. The permittee shall not at any time, either alone or in conjunction with any person or persons, cause directly or indirectly the discharge of waste into the said receiving water unless it has been treated in such a manner as will not lower the legislated water quality classification or interfere with the uses assigned to said water by the New Hampshire Legislature (RSA 485-A:12).

2. This NPDES Discharge Permit is issued by EPA under Federal and State law. Upon final issuance by EPA, the New Hampshire Department of Environmental Services-Water Division (NHDES-WD) may adopt this permit, including all terms and conditions, as a State permit pursuant to RSA 485-A:13.

3. EPA shall have the right to enforce the terms and conditions of this Permit pursuant to federal law and NHDES-WD shall have the right to enforce the Permit pursuant to state law, if the Permit is adopted. Any modification, suspension or revocation of this Permit shall be effective only with respect to the Agency taking such action, and shall not affect the validity or status of the Permit as issued by the other Agency.

4. Pursuant to New Hampshire Statute RSA 485-A:13,I(c), any person responsible for a bypass or upset at a wastewater treatment facility shall give immediate notice of a bypass or upset to all public or privately owned water systems drawing water from the same receiving water and located within 20 miles downstream of the point of discharge regardless of whether or not it is on the same receiving water or on another surface water to which the receiving water is a tributary. The permittee shall maintain a list of persons, and their telephone numbers, who are to be notified immediately by telephone. In addition, written notification, which shall be postmarked within 3 days of the bypass or upset, shall be sent to such persons.

5. The pH range of 6.5 to 8.0 Standard Units (S.U.) must be achieved in the final effluent unless the permittee can demonstrate to NHDES-WD: (1) that the range should be widened due to naturally occurring conditions in the receiving water or (2) that the naturally occurring receiving water pH is not significantly altered by the permittee's discharge. The scope of any demonstration project must receive prior approval from NHDES-WD. In no case, shall the above procedure result in pH limits outside the range of 6.0 – 9.0 S.U., which is the federal effluent limitation guideline regulation for pH for secondary treatment and is found in 40 CFR 133.102(c).

6. Pursuant to New Hampshire Code of Administrative Rules, Env-Wq 703.07(a):

   (a) Any person proposing to construct or modify any of the following shall submit an application for a sewer connection permit to the department:

   (1) Any extension of a collector or interceptor, whether public or private, regardless of flow;

   (2) Any wastewater connection or other discharge in excess of 5,000 gpd;

   (3) Any wastewater connection or other discharge to a WWTP operating in excess of 80 percent design flow capacity based on actual average flow for 3 consecutive months;

   (4) Any industrial wastewater connection or change in existing discharge of industrial wastewater, regardless of quality or quantity; and

   (5) Any sewage pumping station greater than 50 gpm or serving more than one building.

7. For each new or increased discharge of industrial waste to the POTW, the permittee shall submit, in accordance with Env-Ws 904.14(e) an "Industrial Wastewater Discharge Request Application" approved by the permittee in accordance with 904.13(a). The "Industrial Wastewater Discharge Request Application" shall be prepared in accordance with Env-Ws 904.10.

8. Pursuant to Env-Ws 904.17, at a frequency no less than every five years, permittees are required to submit:

a. A copy of its current sewer use ordinance. The sewer use ordinance shall include local limits pursuant to Env-Ws 904.04 (a).

b. A current list of all significant indirect discharges to the POTW. As a minimum, the list shall include for each industry, its name and address, the name and daytime telephone number of a contact person, products manufactured, industrial processes used, existing pretreatment processes, and discharge permit status.

c. A list of all permitted indirect dischargers; and

d. A certification that the municipality is strictly enforcing its sewer use ordinance and all discharge permits it has issued.

9. If chlorine is used for disinfection, a recorder which continuously records the chlorine residual prior to dechlorination shall be provided. The minimum, maximum and average daily residual chlorine values, measured prior to dechlorination, shall be submitted with monthly Discharge Monitoring Reports. Charts from the recorder, showing the continuous chlorine residual shall be maintained by the permittee for a period no less than (5) years.

10. The Exeter Public Works Department/Wastewater Treatment Facility is responsible for immediately notifying the New Hampshire Department of Environmental Services, Watershed Management Bureau, Shellfish Section of possible high bacteria/virus loading events from the facility or its sewage collection infrastructure. Such events include:

    a. Any lapse or interruption of normal operation of the Wastewater Treatment Plant's disinfection system, or other event that results in the discharge of sewage from the Wastewater Treatment Plant or sewer infrastructure (pump stations, manholes, combined sewer overflows, etc.) that has not undergone full treatment as specified in the NPDES permit, or

    b. Daily flows in excess of the 3.0 MGD design flow for the facility, or

    c. Daily post-disinfection effluent sample result of 43 fecal coliform/100ml or greater. Notification shall also be made for instances where NPDES-related bacteria sampling is not completed, or where the results of such sampling are invalid.

    "Immediate" notification with respect to reporting daily post-disinfection effluent sample results shall mean "as soon as the laboratory tests are completed".

    The notification requirement also applies to all incidents of combined sewer overflow discharges. Notification to the NHDES Shellfish Program shall be made using the program's 24-hour pager. Upon initial notification of a possible high bacteria/virus loading event, NHDES Shellfish Program staff will determine the most suitable interval for continued notification and updates on an event-by-event basis.

11. In addition to submitting DMRs, monitoring results shall also be summarized for each calendar month and reported on separate Monthly Operating Report Form(s) (MORs) postmarked no later than the 15th day of the month following the completed reporting period. Signed and dated MORs shall be submitted to:

New Hampshire Department of Environmental Services (NHDES)
Water Division
Wastewater Engineering Bureau
P.O. Box 95, 29 Hazen Drive
Concord, New Hampshire 03302-0095

I. SPECIAL CONDITIONS

1. pH Limit Adjustment

The Permittee may submit a written request to the EPA requesting a change in the permitted pH limit range to be not less restrictive than 6.0 to 9.0 Standard Units found in the applicable National Effluent Limitation Guideline (Secondary Treatment Regulations in 40 C.F.R. Part 133) for this facility. The Permittee's written request must include the State's letter containing an original signature (no copies). The State's approval letter shall state that the Permittee has demonstrated to the State's satisfaction that as long as discharges to the receiving water from a specific outfall are within a specific numeric pH range, the naturally occurring receiving water pH will be unaltered. The letter must specify for each outfall the associated numeric pH limit range. Until written notice is received by certified mail from the EPA indicating the pH limit range has been changed, the Permittee is required to meet the permitted pH limit range in the respective permit.

2. Requirements for POTWs with Effluent Diffusers

a) Effluent diffusers shall be maintained when necessary to ensure proper operation. Proper operation means that the plumes from each port will be balanced relative to each other and that they all have unobstructed flow. Maintenance may include dredging in the vicinity of the diffuser, cleaning out of solids in the diffuser header pipe, removal of debris and repair/replacement of riser ports and pinch valves.

b) Any necessary maintenance dredging must be performed only during the marine construction season authorized by the New Hampshire Fish and Game Department and only after receiving all necessary permits including those from the NHDES Wetlands Bureau, U.S. Coast Guard, and the U.S. Army Corps of Engineers.

c) To determine if maintenance will be required, the permittee shall have a licensed diver or licensed marine contractor inspect and videotape the operation of the diffuser. The inspections and videotaping shall be performed once every two years with the first inspection required during the first calendar year following final permit issuance.

d) Copies of a report summarizing the results of each diffuser inspection shall be submitted to EPA and NHDES-WD by December 31st of the year the inspection occurred. Where it is determined that maintenance will be necessary, the permittee shall also provide the proposed schedule for the maintenance.

3. Nonpoint Source Nitrogen Reductions

In order to achieve water quality standards in the Squamscott River significant reductions in non-point sources of total nitrogen are necessary in conjunction with achieving the total nitrogen limitations in this discharge permit. 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 review the status of the activities described above in items (1), (2), and (3) at 12 month intervals from the date of issuance. In the event the activities described above are not carried out within the timeframe of this permit (5 years), EPA will reopen the permit and incorporate any more stringent total nitrogen limit required to assure compliance with applicable water quality standards.

ATTACHMENT A

MARINE ACUTE
TOXICITY TEST PROCEDURE AND PROTOCOL

I. GENERAL REQUIREMENTS

The permittee shall conduct acceptable acute toxicity tests in accordance with the appropriate test protocols described below:

- **2007.0 - Mysid Shrimp (Americamysis bahia) definitive 48 hour test.**
- **2006.0 - Inland Silverside (Menidia beryllina) definitive 48 hour test.**

Acute toxicity data shall be reported as outlined in Section VIII.

II. METHODS

The permittee shall use the most recent 40 CFR Part 136 methods. Whole Effluent Toxicity (WET) Test Methods and guidance may be found at:

http://water.epa.gov/scitech/methods/cwa/wet/index.cfm#methods

The permittee shall also meet the sampling, analysis and reporting requirements included in this protocol. This protocol defines more specific requirements while still being consistent with the Part 136 methods. If, due to modifications of Part 136, there are conflicting requirements between the Part 136 method and this protocol, the permittee shall comply with the requirements of the Part 136 method.

III. SAMPLE COLLECTION

A discharge and receiving water sample shall be collected. The receiving water control sample must be collected immediately upstream of the permitted discharge's zone of influence. The acceptable holding times until initial use of a sample are 24 and 36 hours for on-site and off-site testing, respectively. A written waiver is required from the regulating authority for any hold time extension. Sampling guidance dictates that, where appropriate, aliquots for the analysis required in this protocol shall be split from the samples, containerized and immediately preserved, or analyzed as per 40 CFR Part 136. EPA approved test methods require that samples collected for metals analyses be preserved immediately after collection. Testing for the presence of total residual chlorine[1] (TRC) must be analyzed immediately or as soon as possible, for all effluent samples, prior to WET testing. TRC analysis may be performed on-site or by the toxicity testing laboratory and the samples must be dechlorinated, as necessary, using sodium thiosulfate prior to

[1] For this protocol, total residual chlorine is synonymous with total residual oxidants

sample use for toxicity testing. If performed on site the results should be included on the COC presented to WET laboratory.

Standard Methods for the Examination of Water and Wastewater describes dechlorination of samples (APHA, 1992). Dechlorination can be achieved using a ratio of 6.7 mg/L anhydrous sodium thiosulfate to reduce 1 mg/L chlorine. If dechlorination is necessary, a thiosulfate control consisting of the maximum concentration of thiosulfate used to dechlorinate the sample in the toxicity test control water must also be run in the WET test.

All samples submitted for chemical and physical analyses will be analyzed according to Section VI of this protocol. Grab samples must be used for pH, temperature, and total residual chlorine (as per 40 CFR Part 122.21).

All samples held for use beyond the day of sampling shall be refrigerated and maintained at a temperature range of 0-6° C.

IV. DILUTION WATER

Samples of receiving water must be collected from a location in the receiving water body immediately upstream of the permitted discharge's zone of influence at a reasonably accessible location. Avoid collection near areas of obvious road or agricultural runoff, storm sewers or other point source discharges and areas where stagnant conditions exist. EPA strongly urges that screening for toxicity be performed prior to the set up of a full, definitive toxicity test any time there is a question about the test dilution water's ability to achieve test acceptability criteria (TAC) as indicated in Section V of this protocol. The test dilution water control response will be used in the statistical analysis of the toxicity test data. All other control(s) required to be run in the test will be reported as specified in the Discharge Monitoring Report (DMR) Instructions, Attachment F, page 2,Test Results & Permit Limits.

The test dilution water must be used to determine whether the test met the applicable TAC. When receiving water is used for test dilution, an additional control made up of standard laboratory water (0% effluent) is required. This control will be used to verify the health of the test organisms and evaluate to what extent, if any, the receiving water itself is responsible for any toxic response observed.

If dechlorination of a sample by the toxicity testing laboratory is necessary a "sodium thiosulfate" control, representing the concentration of sodium thiosulfate used to adequately dechlorinate the sample prior to toxicity testing, must be included in the test.

If the use of alternate dilution water (ADW) is authorized, in addition to the ADW test control, the testing laboratory must, for the purpose of monitoring the receiving water, also run a receiving water control.

If the receiving water is found to be, or suspected to be toxic or unreliable, ADW of known quality with hardness similar to that of the receiving water may be substituted. Substitution is

species specific meaning that the decision to use ADW is made for each species and is based on the toxic response of that particular species. Substitution to an ADW is authorized in two cases. The first is the case where repeating a test due to toxicity in the site dilution water requires an **immediate decision** for ADW use be made by the permittee and toxicity testing laboratory. The second is in the case where two of the most recent documented incidents of unacceptable site dilution water toxicity require ADW use in future WET testing.

For the second case, written notification from the permittee requesting ADW use **and** written authorization from the permit issuing agency(s) is required **prior to** switching to a long-term use of ADW for the duration of the permit.

Written requests for use of ADW must be mailed with supporting documentation to the following addresses:

Director
Office of Ecosystem Protection (CAA)
U.S. Environmental Protection Agency, Region 1
Five Post Office Square, Suite 100
Mail Code OEP06-5
Boston, MA 02109-3912

and

Manager
Water Technical Unit (SEW)
U.S. Environmental Protection Agency
Five Post Office Square, Suite 100
Mail Code OES04-4
Boston, MA 02109-3912

Note: USEPA Region 1 retains the right to modify any part of the alternate dilution water policy stated in this protocol at any time. Any changes to this policy will be documented in the annual DMR posting.

See the most current annual DMR instructions which can be found on the EPA Region 1 website at http://www.epa.gov/region1/enforcementandassistance/dmr.html for further important details on alternate dilution water substitution requests.

V. TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA

EPA Region 1 requires tests be performed using four replicates of each control and effluent concentration because the non-parametric statistical tests cannot be used with data from fewer replicates. The following tables summarize the accepted Americamysis and Menidia toxicity test conditions and test acceptability criteria:

EPA NEW ENGLAND EFFLUENT TOXICITY TEST CONDITIONS FOR THE MYSID, AMERICAMYSIS BAHIA 48 HOUR TEST[1]

1. Test type	48hr Static, non-renewal
2. Salinity	25ppt ± 10 percent for all dilutions by adding dry ocean salts
3. Temperature (^oC)	$20^oC \pm 1^oC$ or $25^oC \pm 1^oC$, temperature must not deviate by more than 3^oC during test
4. Light quality	Ambient laboratory illumination
5. Photoperiod	16 hour light, 8 hour dark
6. Test chamber size	250 ml (minimum)
7. Test solution volume	200 ml/replicate (minimum)
8. Age of test organisms	1-5 days, < 24 hours age range
9. No. Mysids per test chamber	10
10. No. of replicate test chambers per treatment	4
11. Total no. Mysids per test concentration	40
12. Feeding regime	Light feeding using concentrated Artemia naupli while holding prior to initiating the test
13. Aeration [2]	None
14. Dilution water	5-30 ppt, +/- 10%; Natural seawater, or deionized water mixed with artificial sea salts
15. Dilution factor	≥ 0.5
16. Number of dilutions [3]	5 plus a control. An additional dilution at the permitted effluent concentration (%

	effluent) is required if it is not included in the dilution series.
17. Effect measured	Mortality - no movement of body appendages on gentle prodding
18. Test acceptability	90% or greater survival of test organisms in control solution
19. Sampling requirements	For on-site tests, samples are used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples must be first used within 36 hours of collection.
20. Sample volume required	Minimum 1 liter for effluents and 2 liters for receiving waters

Footnotes:

[1] Adapted from EPA 821-R-02-012

[2] If dissolved oxygen falls below 4.0 mg/L, aerate at rate of less than 100 bubbles/min. Routine D.O. checks are recommended.

[3] When receiving water is used for dilution, an additional control made up of standard laboratory dilution water (0% effluent) is required.

EPA NEW ENGLAND TOXICITY TEST CONDITIONS FOR THE INLAND SILVERSIDE, MENIDIA BERYLLINA 48 HOUR TEST[1]

1. Test Type	48 hr Static, non-renewal
2. Salinity	25 ppt ± 10 % by adding dry ocean salts
3. Temperature	20°C ± 1°C or 25°C ± 1°C, temperature must not deviate by more than 3°C during test
4. Light Quality	Ambient laboratory illumination
5. Photoperiod	16 hr light, 8 hr dark
6. Size of test vessel	250 mL (minimum)
7. Volume of test solution	200 mL/replicate (minimum)
8. Age of fish	9-14 days; 24 hr age range
9. No. fish per chamber	10 (not to exceed loading limits)
10. No. of replicate test vessels per treatment	4
11. Total no. organisms per concentration	40
12. Feeding regime	Light feeding using concentrated Artemia nauplii while holding prior to initiating the test
13. Aeration[2]	None
14. Dilution water	5-32 ppt, +/- 10% ; Natural seawater, or deionized water mixed with artificial sea salts.
15. Dilution factor	≥ 0.5
16. Number of dilutions[3]	5 plus a control. An additional dilution at the permitted concentration (% effluent) is required if it is not included in the dilution series.
17. Effect measured	Mortality-no movement on gentle prodding.

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18. Test acceptability	90% or greater survival of test organisms in control solution.
19. Sampling requirements	For on-site tests, samples must be used within 24 hours of the time they are removed from the sampling device. Off-site test samples must be used within 36 hours of collection.
20. Sample volume required	Minimum 1 liter for effluents and 2 liters for receiving waters.

Footnotes:

[1] Adapted from EPA 821-R-02-012.

[2] If dissolved oxygen falls below 4.0 mg/L, aerate at rate of less than 100 bubbles/min. Routine D.O. checks recommended.

[3] When receiving water is used for dilution, an additional control made up of standard laboratory dilution water (0% effluent) is required.

V.1. Test Acceptability Criteria

If a test does not meet TAC the test must be repeated with fresh samples within 30 days of the initial test completion date.

V.2. Use of Reference Toxicity Testing

Reference toxicity test results and applicable control charts must be included in the toxicity testing report.

If reference toxicity test results fall outside the control limits established by the laboratory for a specific test endpoint, a reason or reasons for this excursion must be evaluated, correction made and reference toxicity tests rerun as necessary.

If a test endpoint value exceeds the control limits at a frequency of more than one out of twenty then causes for the reference toxicity test failure must be examined and if problems are identified corrective action taken. The reference toxicity test must be repeated during the same month in which the exceedance occurred.

If two consecutive reference toxicity tests fall outside control limits, the possible cause(s) for the exceedance must be examined, corrective actions taken and a repeat of the reference toxicity test must take place immediately. Actions taken to resolve the problem must be reported.

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V.2.a. Use of Concurrent Reference Toxicity Testing

In the case where concurrent reference toxicity testing is required due to a low frequency of testing with a particular method, if the reference toxicity test results fall slightly outside of laboratory established control limits, but the primary test met the TAC, the results of the primary test will be considered acceptable. However, if the results of the concurrent test fall well outside the established **upper** control limits i.e. ≥3 standard deviations for IC25s and LC50 values and ≥ two concentration intervals for NOECs or NOAECs, and even though the primary test meets TAC, the primary test will be considered unacceptable and must be repeated.

VI. CHEMICAL ANALYSIS

At the beginning of the static acute test, pH, salinity, and temperature must be measured at the beginning and end of each 24 hour period in each dilution and in the controls. The following chemical analyses shall be performed for each sampling event.

Parameter	Effluent	Diluent	Minimum Level for effluent[*1] (mg/L)
pH	x	x	---
Salinity	x	x	ppt(o/oo)
Total Residual Chlorine [*2]	x	x	0.02
Total Solids and Suspended Solids	x	x	---
Ammonia	x	x	0.1
Total Organic Carbon	x	x	0.5
Total Metals			
Cd	x	x	0.0005
Pb	x	x	0.0005
Cu	x	x	0.003
Zn	x	x	0.005
Ni	x	x	0.005

Superscript:

[*1] These are the minimum levels for effluent (fresh water) samples. Tests on diluents (marine waters) shall be conducted using the Part 136 methods that yield the lowest MLs.

[*2] Either of the following methods from the 18th Edition of the APHA Standard Methods for the Examination of Water and Wastewater must be used for these analyses:

-Method 4500-Cl E Low Level Amperometric Titration (the preferred method);
-Method 4500-CL G DPD Photometric Method.

VII. TOXICITY TEST DATA ANALYSIS

LC50 Median Lethal Concentration

An estimate of the concentration of effluent or toxicant that is lethal to 50% of the test organisms during the time prescribed by the test method.

Methods of Estimation:

- Probit Method
- Spearman-Karber
- Trimmed Spearman-Karber
- Graphical

See flow chart in Figure 6 on page 73 of EPA 821-R-02-012 for appropriate method to use on a given data set.

No Observed Acute Effect Level (NOAEL)

See flow chart in Figure 13 on page 87 of EPA 821-R-02-012.

VIII. TOXICITY TEST REPORTING

A report of results must include the following:

- Toxicity Test summary sheet(s) (Attachment F to the DMR Instructions) which includes:
    - Facility name
    - NPDES permit number
    - Outfall number
    - Sample type
    - Sampling method
    - Effluent TRC concentration
    - Dilution water used
    - Receiving water name and sampling location
    - Test type and species
    - Test start date
    - Effluent concentrations tested (%) and permit limit concentration
    - Applicable reference toxicity test date and whether acceptable or not
    - Age, age range and source of test organisms used for testing
    - Results of TAC review for all applicable controls
    - Permit limit and toxicity test results
    - Summary of any test sensitivity and concentration response evaluation that was conducted

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Please note: The NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs) are available on EPA's website at http://www.epa.gov/NE/enforcementandassistance/dmr.html

In addition to the summary sheets the report must include:

- A brief description of sample collection procedures;
- Chain of custody documentation including names of individuals collecting samples, times and dates of sample collection, sample locations, requested analysis and lab receipt with time and date received, lab receipt personnel and condition of samples upon receipt at the lab(s);
- Reference toxicity test control charts;
- All sample chemical/physical data generated, including minimum levels (MLs) and analytical methods used;
- All toxicity test raw data including daily ambient test conditions, toxicity test chemistry, sample dechlorination details as necessary, bench sheets and statistical analysis;
- A discussion of any deviations from test conditions; and
- Any further discussion of reported test results, statistical analysis and concentration-response relationship and test sensitivity review per species per endpoint.

ATTACHMENT B

LIST OF COMBINED SEWER OVERFLOWS

Discharge Serial Number	Location	Present Use	Receiving Water
003	Outlet of the two siphon pipes into Clemson Pond	Combined Discharge	Clemson Pond

EPA REGION I

NPDES PERMIT
SLUDGE COMPLIANCE GUIDANCE

04 NOVEMBER 1999

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1. LAND APPLICATION

This section applies to sewage sludge from the permittee's facility which is applied to the land for the purpose of enriching the soil. The permittee should answer the following questions. The answers to these questions need to be evaluated to determine which permitting scenario for sewage sludge land application applies. After the permitting scenario is determined, the permittee must comply with the directives contained in the chosen scenario.

1.1 Question Algorithm

The permittee should review and answer the following questions. The information gathered from answering these questions will aid the permittee to determine the appropriate land application scenario which applies to the sludge generated at the permittee's waste water treatment facility. The scenario selected will detail which specific Use or Disposal of Sewage Sludge, Part 503, regulations must be complied with for the land application method used by the permittee.

1. What type of land is the sewage sludge being applied to?

   If the sewage sludge/material is to be sold or given away, or applied to a lawn or home garden, the sewage sludge MUST meet Class A pathogen reduction requirements.

2. Is all the sludge generated at the facility used in the same manner?

   If all the sludge is not used the same way, the permittee needs to determine what amounts are used in what manner. Different scenarios may apply to the different portions.

3. Is the sewage sludge in bulk or is it a bagged material?

   Scenario No.1 and No.6 can be applied to bagged materials. All other scenarios apply to bulk sewage sludge only. Bulk material is an amount of sewage sludge greater than one metric ton (2200 lbs).

4. What is the metals content in the sewage sludge for the following metals: arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc?

   If any of the concentrations in Table 1 of 40 CFR §503.13 (b) (1) are exceeded on a dry weight basis, the sewage sludge cannot be land applied. Table 1 is summarized below:

§503.13 Table 1

Maximum Pollutant Concentrations

Arsenic	75 mg/kg
Cadmium	85 mg/kg
Copper	4300 mg/kg
Lead	840 mg/kg
Mercury	57 mg/kg
Molybdenum	75 mg/kg
Nickel	420 mg/kg
Selenium	100 mg/kg
Zinc	7500 mg/kg

5. Does the sludge qualify for "exceptional quality" criteria in accordance with Table 3, 40 CFR §503.13(b)(3)on a dry weight basis? Table 3 is summarized:

§503.13 Table 3

Exceptional Quality Pollutant Concentrations

Arsenic	41 mg/kg
Cadmium	39 mg/kg
Copper	1500 mg/kg
Lead	300 mg/kg
Mercury	17 mg/kg
Nickel	420 mg/kg
Selenium	100 mg/kg
Zinc	2800 mg/kg

In addition, Class A pathogen reduction (see Section 4), and achievement of one of the vector attraction reduction alternatives 1 through 8 (see Section 5) must be attained.

NOTHING ELSE QUALIFIES AS EXCEPTIONAL QUALITY

6. What is the level of pathogen reduction achieved, Class A or Class B?

   Refer to Section 4, Pathogen Reduction, to select the appropriate method that is used to reduce the pathogens in the sewage sludge produced at the facility.

7. What is the method for vector attraction reduction?

   Refer to Section 5, Vector Attraction Reduction, to select the appropriate method that is used to reduce the pathogens in the sewage sludge produced at the facility.

8. What is the amount of sewage sludge used in dry metric tons/365 day period?

   This determines the frequency of monitoring (see Section 6) for the pollutants, pathogens and vectors. Use the table below to make the determination:

Sampling Frequency Table

SEWAGE SLUDGE PRODUCED (metric tons per 365 day period)	**SAMPLING FREQUENCY**
0<Sludge (tons) <290	Once Per year
290≤Sludge (tons) <1500	Once Per Quarter (four times per year)
1500≤Sludge (tons) <15000	Once Per 60 days (six times per year)
Sludge (tons) ≤15000	Once Per Month (12 times per year)

1.2 Scenario Determination

After the information is gathered and evaluated from the questions in the preceding section, the permittee can select the appropriate land application scenario from the table on page 1.4.

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Land Application Scenario Selection Table

SCENARIO	LAND TYPE	BULK/ BAGGED	POLLUTANT LIMITS[2]	PATHOGENS[3]	VECTORS[3]
No .1	ANY TYPE	BOTH (EQ)	TABLE 3	CLASS A	1-8 ONLY
No .2	SEE BELOW[1]	BULK	TABLE 3	CLASS A	9 OR 10
No .3	SEE BELOW[1]	BULK	TABLE 3	CLASS B	1-10
No .4	SEE BELOW[1]	BULK	TABLE 2	CLASS A	1-10
No .5	SEE BELOW[1]	BULK	TABLE 2	CLASS B	1-10
No .6	ANY TYPE	BAGGED	TABLE 4	CLASS A	1-8 ONLY

1. Land types: Agricultural land, forest, reclamation site or public contact site
2. Refer to 40 CFR §503.13 Table 2, Table 3 and Table 4
3. The Pathogen Reduction Section (Section 4)and Vector Attraction Reduction Section (Section 5) are located after the Scenario section.

1.3. Scenarios

This section contains the sewage sludge land application scenarios. One of these scenarios has been selected by the permittee, based on reading and answering the questions in Section 1.2, to regulate their treatment facility's sewage sludge land application.

1.3.1. Scenario No. 1

This applies to bulk or bagged sewage sludge and materials derived from sewage sludge meeting the pollutant concentrations at §503.13(b)(3); one of the Class A pathogen reduction alternatives at §503.32(a); one of the vector attraction reduction requirements at §503.33(b)(1) through (b)(8). Materials meeting these characteristics are considered "Exceptional Quality" materials and are exempt from the general requirements at §503.12 and the management practices at §503.14. Sludges of this quality may be applied to any type of land.

SLUDGE CONDITIONS

1. Pollutant Limitations

a. The maximum concentrations of metals in the sewage sludge that is applied to the land shell not exceed the following (dry weight basis:

Arsenic	75 mg/kg
Cadmium	85 mg/kg
Copper	4300 mg/kg
Lead	840 mg/kg
Mercury	57 mg/kg
Molybdenum	75 mg/kg
Nickel	420 mg/kg
Selenium	100 mg/kg
Zinc	7500 mg/kg

b. The sewage sludge shall not be applied to the land if any of the pollutant concentrations in Paragraph 1a. are exceeded.

c. The monthly average concentration of metals in the sewage sludge shall not exceed the following (dry weight basis):

Arsenic	41 mg/kg
Cadmium	39 mg/kg
Copper	1500 mg/kg
Lead	300 mg/kg
Mercury	17 mg/kg
Nickel	420 mg/kg
Selenium	100 mg/kg
Zinc	2800 mg/kg

2. The permittee shall meet Class A pathogen requirements utilizing one of the methods specified in 40 CFR §503.32.

3. The permittee shall meet one of the vector attraction reduction requirements specified in 40CFR §503.33. The permittee may only utilize alternatives 1 through 8. If the permittee meets one of the vector attraction reduction alternatives 1 through 5, the Class A pathogen requirements must be met either prior to or at the same time as the vector attraction reduction requirement.

4. The permittee shall monitor the sewage sludge for the pollutants in Paragraph 1a, the pathogen density and the vector attraction reduction requirements at the frequency specified in sludge condition 6 of the permit.

5. The permittee shall develop and retain the following information for five years:

   a. The concentration of each pollutant listed in Paragraph 1a..

   b. The following certification statement:

   "I certify, under penalty of law, that the information that will be used to determine compliance with the Class A pathogen requirements in §503.32(a) and the vector attraction reduction requirements in [insert one of the vector attraction reduction requirements in §503.33(b)(1) through (b)(8)] was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

   c. A description of how the Class A pathogen requirements are met.

   d. A description of how the vector attraction reduction requirements are met.

6. The permittee shall report the information in Paragraphs 5a, b, c, and d annually on February 19. Reports shall be submitted to EPA at the address in the Monitoring and Reporting section of this permit.

7. All sewage sludge sampling and analysis procedures shall be in accordance with the procedures detailed in 40 CFR §503.8.

1.3.2. Scenario No.2

This scenario applies to bulk sewage sludge or materials derived from bulk sewage sludge meeting the following criteria: the pollutant concentrations in §503.13(b)(3); Class A pathogen requirements in §503.32(a); and vector attraction §503.33(b)(9) or (b)(10). Sludge of this quality

may be applied to agricultural land, forest land, public contact site or reclamation site. This scenario has specific requirements for the preparer and the applier.

SLUDGE CONDITIONS

1. The permittee and the applier of the bulk sewage sludge shall comply with the following general requirements:

    a. Bulk sewage sludge shall not be applied the land except in accordance with 40 CFR Part 50J, Subpart B.

    b. The permittee shall provide the person who applies the bulk sewage sludge written notification of the concentration of total nitrogen (as N on a dry weight basis) in the bulk sewage sludge.

    c. The person who applies the bulk sewage sludge shall obtain notice and necessary information from the permittee to comply with the requirements of 40 CFR Part 503, Subpart B.

    d. When the permittee provides the bulk sewage sludge to a person who applies the bulk sewage sludge, the permittee shall provide the person who applies the bulk sewage sludge notice and necessary information to comply with 40 CFR part 503, Subpart B.

    e. When the permittee provides the bulk sewage sludge to a person who prepares the bulk sewage sludge the permittee shall provide the preparer notice and necessary information to comply with 40 CFR Part 503, Subpart B.

    f. The person who applies the bulk sewage sludge shall provide the owner or lease holder of the land on which the bulk sewage sludge is applied notice and necessary information to comply with 40 CFR Part 503, Subpart B.

    g. When bulk sewage sludge is applied in another state, the person who prepares the sewage sludge shall provide notice to the permitting authority for the state in which the sewage sludge will be applied. Notice shall be given prior to the initial application and shall contain the following information:

        i. The location of each site by either street address or latitude and longitude.

        ii. The approximate period of time the bulk sewage sludge will be applied to each site.

iii. The name, address, telephone number and National Pollutant Discharge Elimination System permit number (if applicable) for the person who prepares the bulk sewage sludge.

iv. The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if applicable) for the person who applies the bulk sewage sludge.

2. Pollutant Limitations

a. The maximum concentration of metals in the sewage sludge that is applied to the land shall not exceed the following (dry weight basis):

Arsenic	75 mg/kg
Cadmium	85 mg/kg
Copper	4300 mg/kg
Lead	840 mg/kg
Mercury	57 mg/kg
Molybdenum	75 mg/kg
Nickel	420 mg/kg
Selenium	100 mg/kg
Zinc	7500 mg/kg

b. The sewage sludge shall not be applied to the land if any of the pollutant concentrations in Paragraphs 2a are exceeded.

c. The monthly average concentration of metals in the sewage sludge shall not exceed the following (dry wight basis):

Arsenic	41 mg/kg
Cadmium	39 mg/kg
Copper	1500 mg/kg
Lead	300 mg/kg
Mercury	17 mg/kg

Nickel	420 mg/kg
Selenium	100 mg/kg
Zinc	2800 mg/kg

3. The permittee shall meet Class A pathogen requirements utilizing one of the methods specified in 40 CFR §503.32

4. The person who applies the bulk sewage sludge shall meet either vector attraction reduction requirement 9 or 10 as specified in 40 CFR §503.33.

5. The bulk sewage sludge shall be injected below the surface of the land, or incorporated into the soil within 8 hours after discharge from the pathogen treatment process.

6. The permittee shall monitor the sewage sludge for the pollutants in Paragraph 2a and the pathogen density requirements at the frequency specified in sludge condition 6 of the permit.

7. The person who applies the bulk sewage sludge to the land shall comply with the following management practices:

   a. The bulk sewage sludge shall not be applied to the land if it is likely to adversely affect a threatened or endangered species listed under Section 4 of the Endangered Species Act or its designated habitat.

   b. The bulk sewage sludge shall not be applied to agricultural land, forest land, a public contact site or a land reclamation site that is frozen, snow-covered or flooded so that the bulk sewage sludge enters a wetland or other water of the United States as defined in 40 CFR §122.2, except as provided in a permit issued pursuant to Section 402 or 404 of the Clean Water Act.

   c. Bulk sewage sludge shall not be applied to agricultural land, forest land, and public contact site, or land reclamation site that is less than 10 meters (33 feet) from waters of the United States, as defined in 40 CFR §122.2.

   d. The whole sludge application rate shall be applied at an agronomic rate designed to (i) provide the amount of nitrogen needed by the crop or vegetation grown on the land; and (ii) minimize the amount of nitrogen that passes below the root zone for the crop or vegetation grown of the land into the groundwater.

8. The permittee shall develop and retain the following information for five years:

a. The pollutant concentration for each pollutant listed in Paragraph 2a. of this section.

b. The following certification statement:

"I certify, under penalty of law, that the information that will ve used to determine compliance with the Class A pathogen requirements in §503.32 (a) was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility for fine and imprisonment."

c. A description of how the pathogen requirements are met.

9. The person who applies the bulk sewage sludge shall develop and retain the following information for five years:

a. The following certification requirement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the management practices in §503.14 and the vector attraction reduction requirement in [insert either §503.33 (b)(9) or (b)(10)] was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including fine and imprisonment."

b. A description of how the management practices in §503.14 are met for each site on which the bulk sewage sludge is applied.

c. A description of how the vector attraction reduction requirements are met for each site on which bulk sewage sludge is applied, including a description of how the requirement in Paragraph 5 is met.

10. The permittee shall report the information in paragraphs 8a, b and c annually on February 19. Reports shall be submitted to EPA at the address in the Monitoring and Reporting section of this permit.

11. All sludge sampling and analysis shall be in accordance with the procedures detailed in 40 CFR §503.8.

12. The permittee shall supply the following information/requirements to the person who applies the bulk sewage sludge:

    a. Information in Paragraph 1b.
    b. Requirements in Paragraphs 1f and 5.
    c. Management Practices in Paragraphs 7a through d.
    d. Record keeping requirements in Paragraphs 9a through c.

13. If the permittee intends to apply sludge to land application sites not identified at the time of permit issuance, the permittee shall submit a land application plan 180 days prior to initial application at the new site. The plan shall:

    a. Describe the geographic area covered by the plan;
    b. Identify site selection criteria;
    c. Describe how sites will be managed; and
    d. Provide for advance public notice as required by state and local laws, and notice to landowners and occupants adjacent to or abutting the proposed land application site.

1.3.3. Scenario No. 3

This scenario applies to bulk sewage sludge meeting the following criteria: pollutant concentrations at §503.13(b); Class B pathogens at §503.32(b); and one of the vector attraction reduction requirements found at §503.33(b). Bulk sewage sludge of this quality may be applied to agricultural land, forest land, public contact site or a reclamation site. There are specific requirements for the preparer and applier.

SLUDGE CONDITIONS

1. The permittee and the applier of the bulk sewage sludge shall comply with the following general requirements:

    a. Bulk sewage sludge shall not the applied to the land except in accordance with 40 CFR Part 503 Subpart B.

    b. The permittee shall provide the person who applies the bulk sewage sludge written notification of the concentration of total nitrogen (as N on a dry weight basis) in the bulk sewage sludge.

    c. The person who applies the bulk sewage sludge shall obtain notice and necessary information from the permittee to comply with the requirements of 40 CFR Part 503 Subpart B.

d. When the permittee provides the bulk sewage sludge to a person who applies the bulk sewage sludge, the permittee shall provide the person who applies the bulk sewage notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

e. When the permittee provides the bulk sewage sludge to a person who prepares the bulk sewage sludge, the permittee shall provide the person who prepares the bulk sewage sludge notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

f. The person who applies the bulk sewage sludge shall provide the owner or lease holder of the land on which the bulk sewage sludge is applied notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

g. When bulk sewage sludge is applied in another state, the person who prepares the sewage sludge shall provide notice to the permitting authority for the state in which the sewage sludge will be applied. Notice shall be given prior to the initial application and shall contain the following information:

i. The location of each site by either street address or latitude and longitude.

ii. The approximate period of time the bulk sewage sludge will be applied to each site.

iii. The name, address, telephone number and National Pollutant Discharge Elimination System permit number (if applicable) for the person who prepares the bulk sewage sludge.

iv. The name, address, telephone number, and national Pollutant Discharge Elimination System permit number (if applicable) for the person who applies the bulk sewage sludge.

2. Pollutant Limitations

a. The maximum concentration of metals in the sewage sludge that is applied to the land shall not exceed the following (dry weight basis):

Arsenic	75 mg/kg
Cadmium	85 mg/kg
Copper	4300 mg/kg

Lead	840 mg/kg
Mercury	57 mg/kg
Molybdenum	75 mg/kg
Nickel	420 mg/kg
Selenium	100 mg/kg
Zinc	7500 mg/kg

b. The sewage sludge shall not be applied to the land if any of the pollutant concentrations in Paragraph 2a are exceeded

c. The monthly average concentration of metals in the sewage sludge shall not exceed the following (dry weight basis):

Arsenic	41 mg/kg
Cadmium	39 mg/kg
Copper	1500 mg/kg
Lead	300 mg/kg
Mercury	17 mg/kg
Nickel	420 mg/kg
Selenium	100 mg/kg
Zinc	2800 mg/kg

3. The permittee shall meet Class B pathogen requirements utilizing one of the methods specified in 40CFR §503.32

4. The permittee shall meet one of vector attraction reduction requirements specified in 40CFR §503.33

5. The permittee shall monitor the sewage sludge for the pollutants in Paragraph 2a, the pathogen density requirements and the vector attraction reduction requirements at the frequency specified in sludge condition 6 of the permit.

6. The person who applies the bulk sewage sludge to the land shall comply with the following management practices:

a. The bulk sewage sludge shall not be applied to the land if it is likely to adversely affect a threatened or endangered species listed under Section 4 of the Endangered Species Act or its designated habitat.

b. The bulk sewage sludge shall not be applied to agricultural land, forest land, a public contact site or a land reclamation site that is frozen, snow-covered or flooded so that the bulk sewage sludge enters a wetland or other water of the United States as defined in 40 CFR 122.2, except as provided in a permit issued pursuant to Section 402 or 404 of the Clean Water Act.

c. Bulk sewage sludge shall not be applied to agricultural land, forest land, a public contact site or a land reclamation site that is less than 10 meters (33 feet) from waters of the United States, as defined in 40 CFR §122.2.

d. The whole sludge application rate shall be applied at an agronomic rate designed to (i) provide the amount of nitrogen needed by the crop or vegetation grown on the land; and (ii) minimize the amount of nitrogen that passes below the root zone for the crop or vegetation grown of the land into the groundwater.

7. The person who applies the bulk sewage sludge shall insure that the following site restrictions are met for each site on which the bulk sewage sludge is applied:

a. Food crops with harvested parts that touch the sewage sludge/soil mixture and are not totally above the land surface shall not be harvested for 14 months after application of sewage sludge.

b. Food crops with harvested parts below the surface of the land shall not be harvested for 20 months after application of sewage sludge when the sewage sludge remains on the land surface for four months or longer prior to incorporation into the soil.

c. Food crops with harvested parts below the surface of the land shall not be harvested for 38 months after application of sewage sludge when the sewage sludge remains on the land surface for less than four months prior to incorporation into soil.

d. Food crops, feed crops, and fiber crops shall not be harvested for 30 days after application of sewage sludge.

e. Animals shall not be grazed on the land for 30 days after application of sewage sludge.

f. Turf grown on land where sewage sludge is applied shall not be harvested for one year after application of the sewage sludge when the harvested turf is placed on either land with high potential for public exposure or a lawn.

g. Public access to land with a high potential for public exposure shall be restricted for one year after application of sewage sludge.

h. Public access to land with a low potential for public exposure shall be restricted for 30 days after application of sewage sludge.

8. The permittee shall develop and retain the following information for five years:

a. The concentration of each pollutant listed in Paragraph 2a of this section.

b. The following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the Class B pathogen requirement in §503.32(b) and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(8), if one of those requirements is met] was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information I am aware that there are significant penalties for false certification including the possibility of fine or imprisonment."

c. A description of how the Class B pathogen requirements are met.

d. When the permittee is responsible for meeting the vector attraction reduction requirements, a description of how the vector attraction reduction requirements are met.

9. The person who applies the bulk sewage sludge shall develop and maintain the following information for five years:

a. The following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the management practices in §503.14, the site restrictions in §503.32(b)(5), and the vector attraction reduction requirements in [insert either §503.33(b)(9) or (b)(10), if one of those requirements is met] was prepared for each site on which sewage sludge is applied under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including

the possibility of fine and imprisonment."

b. A description of how the management practices in Paragraphs 6a through d are met for each site.

c. A description of how the site restrictions in Paragraphs 7a through h are met for each site.

d. When the applier is responsible for meeting the vector attraction reduction requirements, a description of how the vector attraction reduction requirements in either §503.33(b)(9) or (b)(10) is met.

10. The permittee shall report the information in Paragraph 8a, b, c and d annually on February 19. Reports shall be submitted to the address in the Monitoring and Reporting section of this permit.

11. All sludge sampling and analysis shall be in accordance with the procedures detailed in 40CFR §503.8

12. The permittee shall notify the person who applies the bulk sewage sludge of the following information/requirements:

    a. Information in Paragraph 1b.
    b. Requirement in Paragraph 1f.
    c. Management practices in Paragraph 6a through d.
    d. Site Restrictions in Paragraph 7a through h.
    e. Record keeping requirements in Paragraphs 9a through d.

13. If the permittee intends to apply sludge to land application sites not identified at the time of permit issuance, the permittee shall submit a land application plan 180 days prior to initial application at the mew site. The plan shall:

    a. Describe the geographic area covered by the plan;
    b. Identify site selection criteria;
    c. Describe how sites will be managed; and
    d. Provide for advance public notice as required by state and local laws, and notice to landowners and occupants adjacent to or abutting the proposed land application site.

1.3.4. Scenario No. 4

This scenario applies to bulk sewage sludge meeting the following criteria: pollutant concentrations at §503.13(b)(2); Class A pathogen requirements at §503.32(a); and one of the

vector attraction reduction requirement found at §503.33(b). Bulk sewage sludge of this quality may be applied to agricultural land, forest land, public contact site or a reclamation site. There are specific requirements for the preparer and the applier.

SLUDGE CONDITIONS

1. The permittee and the applier of the bulk sewage sludge shall comply with the following general requirements:

    a. Bulk sewage sludge shall not be applied to the land except in accordance with 40 CFR Part 503 Subpart B.
    b. Bulk sewage sludge shall not be applied if any of the cumulative pollutant loading rates in Paragraph 2c have been reached on the site.

    c. The permittee shall provide the person who supplies the bulk sewage sludge written notification of the concentration of total nitrogen (as N on a dry weight basis) in the bulk sewage sludge.

    d. The person who applies the bulk sewage sludge shall obtain notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart b.

    e. The person who applies the bulk sewage sludge shall obtain the following information:

        i. Prior to the application of bulk sewage sludge, the person who proposes to apply the bulk sewage shall contact the permitting authority for the state in which the bulk sewage sludge will be applied to determine whether bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) has been applied to the site since July 20, 1993.

        ii. If bulk sewage sludge subject to the cumulative pollutant loading rates has not been applied to the site, the cumulative amount for each pollutant listed in Paragraph 2c may be applied.

        iii. If bulk sewage sludge subject to the cumulative pollutant loading rates has been applied to the site since July 20, 1993, and the cumulative amount of each pollutant applied to the site since that date is known, the cumulative amount of each pollutant applied to the site shall be used to determine the additional amount of each pollutant that can be applied to the site such that the loading rates in Paragraph 2c are not exceeded.

        iv. If bulk sewage sludge subject to the cumulative pollutant loading rates has been applied to the site since July 20, 1993, and the cumulative amount of

each pollutant applied to the site since that date is not known, an additional amount of any pollutant may not be applied to the site.

f. When the permittee provides the bulk sewage sludge to a person who applies the bulk sewage sludge, the permittee shall provide the person who applies the bulk sewage notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

g. When the permittee provides the bulk sewage sludge to a person who prepares the bulk sewage sludge, the permittee shall provide the person who prepares the bulk sewage sludge notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

h. The person who applies the bulk sewage sludge shall provide the owner or lease holder of the land on which the bulk sewage sludge is applied notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

i. When the bulk sewage sludge is applied in another state, the person who prepares the sewage sludge shall provide notice to the permitting authority for the state in which the sewage sludge will be applied. Notice shall be given prior to the initial application and shall contain the following information:

    i. The location of each site by either street address or latitude and longitude.

    ii. The approximate period of time the bulk sewage sludge will be applied to each site.

    iii. The name, address, telephone number and National Pollutant Discharge Elimination System permit number (if applicable) for the person who prepares the bulk sewage sludge.

    iv. The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if applicable) for the person who applies the bulk sewage sludge.

j. The person who applies the bulk sewage sludge shall provide written notice, prior to the initial application of the bulk sewage sludge, to the permitting authority for the State in which the bulk sewage sludge will be applied. The notice shall include:

    i. The location, by either street address or latitude and longitude, of the land application site.

ii. The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) of the person who will apply the bulk sewage sludge.

2. Pollutant limitations

a. The maximum concentration of metal in the sewage sludge that is applied to the land shall not exceed the following (dry weight basis):

Arsenic	75 mg/kg
Cadmium	85 mg/kg
Copper	4300 mg/kg
Lead	840 mg/kg
Mercury	57 mg/kg
Molybdenum	75 mg/kg
Nickel	420 mg/kg
Selenium	100 mg/kg
Zinc	7500 mg/kg

b. The sewage sludge shall not be applied to the land if any of the pollutant concentrations in Paragraph 2a are exceeded.

c. The cumulative pollutant loading rates for each site shall not exceed the following (kilograms per hectare):

Arsenic	41 kilograms/hectare
Cadmium	39 kilograms/hectare
Copper	1500 kilograms/hectare
Lead	300 kilograms/hectare
Mercury	17 kilograms/hectare
Nickel	420 kilograms/hectare
Selenium	100 kilograms/hectare
Zinc	2800 kilograms/hectare

d. Bulk sewage sludge shall not be applied to a site on which any of the cumulative pollutant loading rates have been reached.

3. The permittee shall meet Class A pathogen requirements utilizing one of the methods specified in 40CFR §503.32

4. The permittee shall meet one of the vector attraction reduction requirements specified in 40CFR §503.33. The permittee may only utilize alternatives 1 through 8. If the permittee meets one of the vector attraction reduction alternatives 1 through 5, the Class A pathogen requirements must be met either prior to or at the same time as the vector attraction reduction requirement.

5. The permittee shall monitor the sewage sludge for the pollutants in Paragraph 2a, the pathogen density requirements and the vector attraction reduction requirements at the frequency specified in sludge condition 6 of the permit.

6. The person who applies the bulk sewage sludge to the land shall comply with the following management practices:

a. The bulk sewage sludge shall not be applied to the land if it is likely to adversely affect threatened or endangered species listed under Section 4 of the Endangered Species Act or its designated habitat.

b. The bulk sewage sludge shall not be applied to agricultural land, forest land, a public contact site or a land reclamation site that is frozen, snow-covered or flooded so that the bulk sewage sludge enters a wetland or other water of the United States as defined in 40 CFR §122.2, except as provided in a permit issued pursuant to Section 402 or 404 of the Clean Water Act.

c. Bulk sewage sludge shall not be applied to agricultural land, forest land, a public contact site, or a land reclamation site that is less than 10 meters (33 feet) from waters of the United States, as defined in 40 CFR §122.2.

d. The whole sludge application rate shall be applied at an agronomic rate designed to (i) provide the amount of nitrogen needed by the crop or vegetation grown on the land and (ii) minimize the amount of nitrogen that passed below the root zone for the crop or vegetation grown on the land into the groundwater.

e. The permittee shall develop and maintain the following information for five years:

f. The concentration of each pollutant listed in paragraph 2a in the bulk sewage sludge.

g. The following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the Class A pathogen requirement in §503.32(a) and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in §503.33(b)(1) through (b)(8), if one of the those requirements is met] was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine or imprisonment."

h. A description of how the Class A pathogen requirements are met.

i. When the permittee is responsible for meeting the vector attraction reduction requirements, a description of how the vector attraction reduction requirements are met.

7. The person who applies the bulk sewage sludge shall develop and retain the following information indefinitely:

a. The location, by either street address of latitude and longitude, of each site on which bulk sewage sludge is applied.

b. The number of hectares in each site on which bulk sewage sludge is applied.

c. The date bulk sewage sludge is applied to each site.

d. The cumulative amount of each pollutant listed in Paragraph 2a in the bulk sewage sludge applied to each site, including the amount in Paragraph 1e(iii) of this section (in kilograms).

e. The amount of sewage sludge applied to each site (in metric tons).

f. The following certification statement:

"I certify, under penalty fo law, that the information that will be used to determine compliance with the requirements to obtain information in §503.12(e)(2){Paragraphs 1e (i through iv) of this permit) was prepared for each site on which sewage sludge was applied under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including fine and imprisonment."

g. A description of how the requirements to obtain the information in Paragraph 1e

(i through iv) are met.

8. The person who applies the bulk sewage sludge shall develop and maintain the following information for five years:

a. The following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the management practices in §503.14 was prepared for each site on which sewage sludge was applied my direction and supervision in accordance with the system designed to ensured that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

b. A description of how the management practices in Paragraphs 6a through d are met for each site.

c. When the applier is responsible for meeting the vector attraction reduction requirements, the following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the vector attraction reduction requirement in [insert either §503.33(b)(9) or (b)(10)§] was prepared under my direction and supervision in accordance with the system designed to endure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

d. When the applier is responsible for meeting the vector attraction reduction requirements, a description of how the vector attraction reduction requirement in either §503.33(b)(9) or (b)(10) is met.

e. The permittee shall report the information in Paragraphs 7a, b, c and d annually on February 19. Reports shall be submitted to EPA at the address in the Monitoring and Reporting section of this permit.

9. When 90 percent or more of any of the cumulative pollutant loading rates are reached, the person who applies the bulk sewage sludge shall report the information in Paragraphs 10a through d annually on February 19. Reports shall be submitted to EPA at the address in the Monitoring and Reporting section of this permit.

10. All sludge sampling and analysis shall be in accordance with the procedures detailed in 40CFR §503.8.

11. The permittee shall notify the applier of the following information/requirements:

    a. Requirements in paragraphs 1b, 1d, 1e, 1j, 2c and 2d.
    b. Information in Paragraph 1c.
    c. The management practices in Paragraphs 6a through d.
    d. Record keeping requirements in Paragraph 8a through g and Paragraphs 9a through d.
    e. Reporting requirements in Paragraph 11.

12. If the permittee intends to apply sludge to land application sites not identified at the time of permit issuance, the permittee shall submit a land application plan 180 days prior to initial application at the new site. The plan shall:

    a. Describe the geographic area covered by the plan;
    b. Identify site selection criteria;
    c. Describe how sited will be managed; and
    d. Provide for advance public notice as required by state and local laws, and notice to landowners and occupants adjacent to or abutting the proposed land application site.

1.3.5 Scenario No.5

This scenario applies to bulk sewage sludge meeting the following criteria: pollutant concentrations at §503.13(b)(2); Class B pathogen requirements at §503.32(b); and one of the vector attraction reduction requirements found at §503.33(b). Bulk sewage sludge of this quality may be applied to agricultural land, forest land, public contact site or a reclamation site. There are specific requirements for the preparer and the applier.

SLUDGE CONDITIONS

1. The permittee and the applier of the bulk sewage sludge shall comply with the following general requirements:

    a. Bulk sewage sludge shall not be applied to the land except in accordance with 40 CFR Part 503 Subpart B.

    b. Bulk sewage sludge shall not be applied if any of the cumulative pollutant loading rates in Paragraph 2c have been reached on the site.

    c. The permittee shall provide the person who applies the bulk sewage sludge written notification of the concentration of total nitrogen (as N on a dry weight basis) in the bulk sewage sludge.
    d. The person who applies the bulk sewage sludge shall obtain notice and necessary

information to comply with the requirements of 40 CFR Part 503 Subpart B.

e. The person who applies the bulk sewage sludge shall obtain the following information:

   i. Prior to application of bulk sewage sludge, the person who propose to apply the bulk sewage shall contact the permitting authority for the state in which the bulk sewage sludge will be applied to determine whether bulk sewage sludge subject to the cumulative pollutant loading rates in §503.13(b)(2) has been applied to the site since July 20, 1993.

   ii. If bulk sewage sludge subject to the cumulative pollutant loading rates has not been applied to the site, the cumulative amount for each pollutant listed in Paragraph 2c may be applied.

   iii. If bulk sewage sludge subject to the cumulative pollutant loading rates has been applied to the site since July 20, 1993, and the cumulative amount of each pollutant applied to the site since that date is known, the cumulative amount of each pollutant applied to the site shall be used to determine the additional amount of each pollutant that can be applied to the site such that the loading rates in Paragraph 2c are not exceeded.

   iv. If bulk sewage sludge subject to the cumulative pollutant loading rates has been applied to the site since July 20, 1993, and the cumulative amount of each pollutant applied to the site since that date is not known, an additional amount of any pollutant may not be applied to the site.

f. When the permittee provides the bulk sewage sludge to a person who applies the bulk sewage sludge, the permittee shall provide the person who applies the bulk sewage notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

g. When the permittee provides the bulk sewage sludge to a person who prepares the bulk sewage sludge, the permittee shall provide the person who prepares the bulk sewage sludge notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

h. The person who applies the bulk sewage sludge shall provide the owner or lease holder of the land on which the bulk sewage sludge is applied notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

i. When bulk sewage sludge is applied in another state, the person who prepares the

sewage sludge shall provide notice to the permitting authority for the state in which the sewage sludge will be applied. Notice shall be given prior to the initial application and shall contain the following information:

i. The location of each site by either street address or latitude and longitude.

ii. The approximate period of time the bulk sewage sludge will be applied to each site.

iii. The name, address, telephone number and National Pollutant Discharge Elimination System permit number (if applicable) for the person who prepares the bulk sewage sludge.

iv. The name, address, telephone number and National Pollutant Discharge Elimination System permit number (if applicable) for the person who applies the bulk sewage sludge.

j. The person who applies the bulk sewage sludge shall provide written notice, prior to the initial application of the bulk sewage sludge, to the permitting authority for the State in which the bulk sewage sludge will be applied. The notice shall include:

i. The location, by either street address or latitude and longitude, of the land application site.

ii. The name, address, telephone number and National Pollutant Discharge Elimination System permit number (if appropriate) of the person who will apply the bulk sewage sludge.

2. Pollutant limitations

a. The maximum concentration of metals in the sewage sludge that is applied to the land shall not exceed the following (dry weight basis):

Arsenic	75 mg/kg
Cadmium	85 mg/kg
Copper	4300 mg/kg
Lead	840 mg/kg
Mercury	57 mg/kg
Molybdenum	75 mg/kg

Nickel	420 mg/kg
Selenium	100 mg/kg
Zinc	7500 mg/kg

c. The sewage sludge shall not be applied to the land if any of the pollutant concentration in Paragraph 2a are exceeded.

d. The cumulative pollutant loading rates for each site shall not exceed the following (kilograms per hectare):

Arsenic	41 kilograms/hectare
Cadmium	39 kilograms/hectare
Copper	1500 kilograms/hectare
Lead	300 kilograms/hectare
Mercury	17 kilograms/hectare
Nickel	420 kilograms/hectare
Selenium	100 kilograms/hectare
Zinc	2800 kilograms/hectare

d. Bulk sewage sludge shall not be applied to a site on which any of the cumulative pollutant loading rates have been reached.

3. The permittee shall meet Class B pathogen requirements utilizing one of the methods specified in 40 CFR §503.32

4. The permittee shall meet one of vector attraction reduction requirements specified in 40 CFR §503.33

5. The permittee shall monitor the sewage sludge for the pollutants in Paragraph 2a, the pathogen density requirements and the vector attraction reduction requirements at the frequency specified in sludge condition 6 of the permit.

6. The person who applies the bulk sewage sludge shall insure that the following site restrictions are met for each site on which the bulk sewage sludge is applied:

a. Food crops with harvested parts that touch the sewage sludge/soil mixture and are

not totally above the land surface shall not be harvested for 14 months after application of sewage sludge.

b. Food crops with harvested parts below the surface of the land shall not be harvested for 20 months after application of sewage sludge when the sewage sludge remains on the land surface for four months or longer prior to incorporation into the soil.

c. Food crops with harvested parts below the surface of the land shall not be harvested for 38 months after application of sewage sludge when the sewage sludge remains on the land surface for less than four months prior to incorporation into the soil.

d. Food crops, feed crops, and fiber crops shall not be harvested for 30 days after application of sewage sludge.

e. Animals shall not be grazed on the land for 30 days after application fo sewage sludge.

f. Turf grown on land where sewage sludge is applied shall not be harvested for one year after application of the sewage sludge when the harvested turf is placed on either land with a high potential for public exposure or a lawn.

g. Public access to land with a high potential for public exposure shall be restricted for one year after application of sewage sludge.

h. Public access to land with a low potential for public exposure shall be restricted for 30 days after application of sewage sludge.

7. The person who applies the bulk sewage sludge to the land shall comply with the following management practices:

a. The bulk sewage sludge shall not be applied to the land if it is likely to adversely affect a threatened or endangered species listed under Section 4 of the Endangered Species Act or its designated habitat.

b. The bulk sewage sludge shall not be applied to agricultural land, forest land, a public contact site or a land reclamation site that is frozen, snow-covered or flooded so that the bulk sewage sludge enters a wetland or other water of the United States as defined in 40 CFR §122.2, except as provided in a permit issued pursuant to Section 402 or 404 of the Clean Water Act.

c. Bulk sewage sludge shall not be applied to agricultural land, forest land, a public

contact site, or a land reclamation site that is less than 10 meters (33 feet) from waters of the United States, as defined in 40 CFR §122.2.

d. The whole sludge application rate shall be applied at an agronomic rate designated to (i) provide the amount of nitrogen needed by the crop or vegetation grown on that land; and (ii) minimize the amount of nitrogen that passes below the root zone for the crop or vegetation grown of the land into the groundwater.

8. The permittee shall develop and maintain the following information for five years:

a. The concentration of each pollutant listed in Paragraph 2a in the bulk sewage sludge.

b. The following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the Class B pathogen requirement in §503.32(b) and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in §503.33(b)(1) through (b)(8), if one of those requirements is met] was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility fo fine or imprisonment."

c. A description of how the Class B pathogen requirements are met.

d. When the permittee is responsible for meeting the vector attraction reduction requirements, a description of how the vector attraction reduction requirements are met.

9. The person who applies the bulk sewage sludge shall develop and retain the following information indefinitely:

a. The location, by either street address of latitude and longitude, of each site on which bulk sewage sludge is applied.

b. The number of hectares in each site on which bulk sewage sludge is applied.

c. The date bulk sewage sludge is applied to each site.

d. The cumulative amount of each pollutant listed in Paragraph 2a in the bulk sewage sludge applied to each site, including the amount in Paragraph 1e(iii) of this section. (in kilograms)

e. The amount of sewage sludge applied to each site (in metric tons).

f. The following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the requirement to obtain information in §503.12(e)(2){Paragraphs 1e (i through iv) of this permit.} was prepared for each site on which bulk sewage sludge was applied under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including fine and imprisonment."

g. A description of how the requirements to obtain information Paragraphs 1.e. (i through iv) are met.

10. The person who applies the bulk sewage sludge shall develop and maintain the following information for five years:

a. The following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the management practices in §503.14 was prepared for each site on which bulk sewage sludge was applied under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

b. A description of how the management practices in Paragraphs 7a through d are met for each site.

c. The following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the site restriction in §503.32(b)(5) for each site on which Class B sewage sludge was applied was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including fine and imprisonment."

d. A description of how the site restrictions are met for each site.

e. When the applier is responsible for meeting the vector attraction reduction requirements, the following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the vector attraction reduction requirement in [insert either §503.33(b)(9) or (b)(10)] was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

f. When the applier is responsible for meeting the vector attraction reduction requirements, a description of how the vector attraction reduction requirement in either §503.33(b)(9) or (b)(10) is met.

11. The permittee shall report the information in Paragraphs 8a, b, c and annually on February 19. Reports shall be submitted to the address in the Monitoring and Reporting section of this permit.

12. When 90 percent or more of any of the cumulative pollutant loading rates are reached, the person who applies the bulk sewage sludge shall report the information in Paragraphs 10a through d annually on February 19. Reports shall be submitted to EPA at the address in the Monitoring and Reporting section of this permit.

13. All sludge sampling and analysis shall be in accordance with the procedures detailed in 40 CFR §503.8

14. The permittee shall notify the applier of the following information/requirements:

a. Requirements in Paragraphs 1b, 1d, 1e, 1j, 2c and 2d.
b. Information in Paragraph 1c.
c. The management practices in Paragraphs 7a through d.
d. The site restrictions in paragraphs 6a through h.
e. Record keeping requirements is Paragraph 9a through g and Paragraphs 10a through d.
f. Reporting requirements in Paragraph 12.

15. If the permittee intends to apply sludge to land application sites not identified at the time of permit issuance, the permittee shall submit a land application plan 180 days prior to initial application at the new site. The plan shall:

a. Describe the geographic area covered by the plan;
b. Identify site selection criteria;
c. Describe how sites will be managed; and
d. Provide for advance public notice as required by state and local laws, and notice to landowners and occupants adjacent to or abutting the proposed land application site.

1.3.6. Scenario No.6

This scenario applies to bagged materials sold or given away meeting the annual pollutant loading rates at §503.32(a); and one of the vector attraction reduction requirements at §503.33(b)(1) through (b)(8).

SLUDGE CONDITIONS

1. The permittee and the applier shall meet the following requirements:

   a. The sewage sludge shall be applied in accordance with 40 CFR Part 503 Subpart B.

   b. The person who applies the sewage sludge shall obtain the information needed to comply with 40 CFR Part 503 Subpart B.

   c. When the permittee provides the sewage sludge to a person who prepares the sewage sludge, the permittee shall provide the person who prepares the sewage sludge notice and necessary information to comply with 40 CFR Part 503 Subpart B.

2. Pollutant Limitations

   a. The maximum concentration of metals in the sewage sludge that is applied to the land shall not exceed the following (dry weight basis):

Arsenic	75 mg/kg
Cadmium	85 mg/kg
Copper	4300 mg/kg
Lead	840 mg/kg
Mercury	57 mg/kg
Molybdenum	75 mg/kg

Nickel	420 mg/kg
Selenium	100 mg/kg
Zinc	7500 mg/kg

b. The sewage sludge shall not be applied to the land if any of the pollutant concentrations in Paragraphs 2a are exceeded.

c. The product of the concentration of each pollutant in the sewage sludge and the annual whole sludge application rate for the sewage sludge shall not cause the annual pollutant loading rate for the pollutant loading rates are specified below (kilograms per hectare per 365 day period):

Arsenic	2.0
Cadmium	1.9
Copper	75
Lead	15
Mercury	0.85
Nickel	21
Selenium	5.0
Zinc	140

d. The annual whole sludge application rate shall be determined in the following manner:

i. Analyze a sample of the sewage sludge to determine the concentration for each pollutant listed in Paragraph 2a.

ii Using the pollutant concentrations from Paragraph 2d(i) and the annual pollutant loading rates from Paragraph 2c, calculate the annual whole sludge application rate using the following equation:

$$AWSAR = \frac{APLR}{C \times 0.001}$$

Where:

AWSAR = Annual whole sludge application rate in metric tons per

hectare per 365 day period (dry weight basis)

APLR = Annual pollutant loading rate in kilograms per hectare per 365 day period.

C = Pollutant concentration in milligrams per kilogram of total solids (dry weight basis)

0.001 = Conversion factor

iii The AWSAR for the sewage sludge is the lowest AWSAR calculated in Paragraph 2d(ii).

3. Label Requirements

a. Either a label shall be affixed to the bag or other container in which the sewage sludge is sold or given away or an information sheet shall be provided to any person who receives the sewage sludge.

b. The label information sheet shall contain the following information:

i. The name and address of the person who prepared the sewage sludge.

ii. A statement that application of sewage sludge to the land is prohibited except in accordance with the instructions on the label or information sheet.

iii. The annual whole sludge application rate which does not cause the annual pollutant loading rates in Paragraph 2c to be exceeded.

4. The permittee shall meet Class A pathogen requirements utilizing one of the methods specified in 40 CFR §503.32

5. The permittee shall meet one of the vector attraction reduction requirements specified in 40 CFR §503.33. The permittee may only utilize alternatives 1 through 8. If the permittee meets one of the vector attraction reduction alternatives 1 through 5, the Class A pathogen requirements must be met either prior to or at the same time as the vector attraction reduction requirement.

6. The permittee shall monitor the sewage sludge for the pollutants in Paragraph 2a, the pathogen density, and the vector attraction reduction requirement at the frequency specified in sludge condition 6 of the permit.

7. The permittee shall develop and retain the following information for five years:

a. The annual whole sludge application rate that does not cause the annual pollutant loading rates in Paragraph 2c to be exceeded.

b. The concentration of each pollutant in Paragraph 2a in the sewage sludge.

c. The following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the management practice in §503.14(e), the Class A pathogen requirement in §503.32(a), and the vector attraction reduction requirement in [insert one of the vector attraction reduction requirements in §503.33(b)(1) through (b)(8)] was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine or imprisonment."

d A description of how the Class A pathogen requirements are met.

e. A description of how the vector attraction reduction requirements are met.

8. The permittee shall report the information in Paragraphs 7a through e annually on February 19. Reports shall be submitted to EPA at the address in the Monitoring and Reporting Section of this permit.

9. All sewage sludge sampling and analysis procedures shall be in accordance with procedures detailed in 40 FR §503.8.

2. SURFACE DISPOSAL

This section applies to sewage sludge from the permittee's facility which is by surface disposed. The permittee should answer the following questions. The answer to these questions need to be evaluated to determine which permitting scenario for sewage sludge surface disposal applies. After the permitting scenario is determined, the permittee must comply with the directives contained in the chosen scenario. The permittee must also note the run-off from surface disposal units may be subject to stormwater regulations.

2.1 Question Algorithm

The permittee should review and answer the following questions. The information gathered from answering these questions will aid the permittee in determine the appropriate surface disposal scenario which applies to the sludge generated at the permittee's wastewater treatment facility. The scenario selected will detail which specific Use or Disposal of Sewage Sludge, Part 503, regulations must be complied with for the land application method used by the permittee.

1. Is the facility regulated under 40 CFR §503?

   If the facility disposes of its sludge at a municipal solid waste landfill (MSWLF), 40 CFR §503 regulations do not apply. However, the permittee still has some responsibilities. Permit language is in Scenario No.4.

   The 40 CFR §503 regulations also do not apply in the case of storage of sewage sludge. An EPA rule of thumb is sludge stored on the land for longer than two years is defined as surface disposal. If a permittee claims storage, or treatment, the permittee's facility must be specifically equipped to support sewage sludge storage. Further, the permittee must ultimately have a clear, final disposition for the sewage sludge.

2. Does the following situations exist at a permittee's active sewage sludge disposal unit?

   a. The unit is located within 60 meters (200 feet) of a fault that has had displacement in the Holocene time (10,000 years);

   b. A unit located in a unstable area; or

   c. A unit located in a wetland without a Section 402 or 404 permit.

If any of these situations exist, the active sewage sludge unit should have closed by March 22, 1994. If the active sewage sludge disposal unit is still operating, but one of the previous situations does apply to the unit, that unit must be closed.

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3. Can the permittee's sewage sludge disposal unit demonstrate they are designed to withstand seismic impacts? If this demonstration cannot be made, the unit must close. This demonstration should be made prior to permit issuance.

4. Does the facility have a liner and leachate collection system?

   The liner must have a hydraulic conductivity of 1 X 10^{-7} centimeters per second or less. If the liner does not meet the specified hydraulic conductivity, the sludge disposal unit is regulated as an **unlined** sewage sludge disposal site. There are no pollutant limitations for lined units.

5. What is the distance from the property boundary to the boundary of the active sewage sludge unit? Use the tables below to determine appropriate pollutant limitations for units without a liner or leachate collection on a dry weight basis.

§503.23 TABLE 1
Active Unit Boundary is 150 Meters or More
From Property Boundary

Arsenic	73 mg/kg
Chromium	600 mg/kg
Nickel	420 mg/kg

§503.23 TABLE 2
Active Unit Boundary is Less Than 150 Meters
From Property Boundary

Distance (meters)	Pollutant Concentrations (mg/kg)		
	Arsenic	Chromium	Nickel
0<Distance<25	30	200	210
25<Distance<50	34	220	240
50<Distance<75	39	260	270
75<Distance<100	46	300	320
100<Distance<125	53	360	390
125<Distance<150	62	450	420

6. Does the facility cover the sewage sludge placed in the unit daily?

This practice is considered to achieve both pathogen reduction and vector attraction reduction. If a facility covers the sludge, the permittee must monitor for methane gas.

2.2. Scenario Determination

After the information is gathered and evaluated from the questions in the preceding section, the permittee can select the appropriate surface disposal scenario.

Surface Disposal Scenario Selection Table

SCENARIO	LINED/UNLINED	DISTANCE TO UNIT BOUNDARY
No.1	Unlined	<150m
No.2	Unlined	0 to 150m
No.3	Lined	NA
No.4	Disposed in Municipal Solid Waste Land Fill	NA

2.3. Scenarios

2.3.1. Scenario No.1
Active sewage sludge unit without a liner and leachate collection system with active sewage sludge unit boundary 150 meters or more from the property boundary.

SLUDGE CONDITIONS

1. The permittee and the owner/operator of an active sewage sludge unit shall comply with the following requirements:

   a. Sewage sludge shall not be placed in an active sewage sludge unit unless the requirement of 40 CFR Part 503, Subpart C are met.

   b. An active sewage sludge unit located within 60 meters of a fault that has had displacement in Holocene time; located in an unstable area; or located in a wetland, except as provided in a permit issued pursuant to Section 402 or 404 of the Clean Water Act, shall close by March 22, 1994, unless, in the case of an active sewage sludge unit located within 60 meters of a fault that has displacement n Holocene time, otherwise specified by the permitting authority.

i. The owner/operator of an active sewage sludge unit shall submit a written closure and post closure plan to EPA 180 days prior to the date an active sewage sludge unit closes.

ii. The closure plan shall consider the elements outlined in Section 6. If an element is not applicable, the owner/operator shall state the reasons in the plan.

c. The owner of a surface disposal site shall provide written notification to the subsequent owner of the site that sewage sludge was place on the site. The notice should include elements outlined in Section 7. A copy of the notification shall be submitted to the EPA.

2. Pollutant limitations

a. The maximum concentration of pollutants in the sewage sludge placed in an active sewage sludge unit shall not exceed the following:

Arsenic	73 mg/kg
Chromium	600 mg/kg
Nickel	420 mg/kg

b. Sewage sludge with metals concentrations which exceed the limitations in Paragraph 2a. shall not be placed in a surface disposal unit.

3. The permittee and the owner/operator shall comply with the following management practices:

a. The sewage sludge shall not be placed on an active sewage sludge unit if it is likely to adversely affect a threatened or endangered species listed under Section 4 of the Endangered Species Act or its designated critical habitat.

b. The run-off from an active sewage sludge unit shall be collected and disposed in accordance with applicable stormwater regulations.

c. The run-off collection system for an active sewage sludge unit shall have the capacity to control run-off from a 24 hour - 25 year storm event.

d. i. When a daily cover is placed on an active sewage sludge unit, the concentration of methane gas in air in any structure within the surface disposal site shall not exceed 25 percent of the lower explosive limit, 1.25 percent by volume, for methane gas during the period that the sewage sludge unit is active.

ii The concentration of methane gas in air at the property line of the surface disposal site shall not exceed the lower explosive limit, 5 percent by volume, for methane gas during the period that the sewage sludge unit is active.

e i When a final cover is placed on a sewage sludge unit at closure, and for three years after closure, the concentration of methane gas in air in any structure within the surface disposal site shall not exceed 25 percent by volume, for methane gas.

ii The concentration of methane gas in air at the property line of the surface disposal site shall not exceed the lower explosive limit, 5 percent by volume, for methane gas for three years after the sewage sludge unit closes.

f. A food crop, a feed crop, or a fiber crop shall not be grown on an active sewage sludge unit. The owner/operator of the sewage sludge unit must demonstrate to EPA that public health and the environment are protected from reasonably anticipated adverse effects of pollutants in sewage sludge when crops are grown on a sewage sludge unit.

g. Animals shall not be grazed on an active sewage sludge unit. The owner/operator of the sewage sludge unit must demonstrate to EPA that public health and the environment are protected from reasonably anticipated adverse effects of pollutants in sewage sludge when animals are grazed on a sewage sludge unit.

h. Public access to a surface disposal site shall be restricted for the period that the surface disposal site contains an active sewage sludge unit and for three years after the last sewage sludge unit closes.

i. i. Sewage sludge placed in an active sewage sludge unit shall not contaminate an aquifer.

ii The permittee shall demonstrate that sewage sludge place in an active sewage sludge unit does not contaminate an aquifer by either (1) submission of results of a groundwater monitoring program developed by a qualified groundwater scientist; or (2) submission of a certification by a

qualified groundwater scientist that the sewage sludge does not contaminate and aquifer.

4. The following conditions must be documented by the permittee and owner/operator:

   a. An active sewage sludge unit shall not restrict the flow of a base flood.

   b. If a surface disposal site is located in a seismic impact zone, an active sewage sludge unit shall be designated to withstand the maximum recorded horizontal ground level acceleration.

   c. An active sewage sludge unit shall be located 60 meters or more from a fault that has displacement in Holocene time.

   d. An active sewage sludge unit shall not be located in an unstable area.

   e. An active sewage sludge unit shall not be located in a wetland.

5. If the active sewage sludge unit is not covered daily, the permittee shall meet either Class A or Class B pathogen reduction utilizing one of the methods in Section 4, and one of the vector attraction reduction requirements in Section 5.

6. The permittee shall monitor the sewage sludge for the pollutants in Paragraph 2, the pathogen density, and the vector attraction reduction requirements at the following frequency:

SEWAGE SLUDGE PRODUCED (metric tons per 365 day period)	**SAMPLING FREQUENCY**
0<Sludge(tons)<290	Once per year
0≤Sludge(tons)<1500	Once per quarter (four times per year)
1500≤Sludge(tons)<15000	Once per 60 days (six times per year)
Sludge(tons)≤15000	Once per Month (12 times per year)

7. When a daily cover is placed on an active sewage sludge unit, the air in the structures within a surface disposal site and at the property line of the surface disposal site shall be monitored continuously for methane gas during the time that the surface disposal site contains an active sewage sludge unit and for three years after the sewage sludge unit closes.

8. The permittee shall develop and retain the following information for five years:

a. The concentration for each pollutant listed in Paragraph 2a.

b. The following certification statement:

"I, certify, under penalty of law, that the information that will be used to determine compliance with the pathogen requirements in [insert §503.32(a), §503.32(b)(3)or §503.32(b)(4) when one of those requirements is met] and the vector attraction reduction requirements in [insert one of the vector attraction reduction requirements in §503.33(b)(1) through §503.33(b)(8) when one of those requirements is met] was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including that possibility of fine or imprisonment."

c. A description of how the pathogen requirements are met.

d. When the permittee is responsible for the vector attraction reduction requirements, a description of how the vector attraction reduction requirements are met.

9. The owner/operator of the surface disposal site shall develop and retain the following information for five years:

a. The following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with the management practices in §503.24 and the vector attraction reduction requirement in [insert one of the requirements in §503.33(b)(9) through (b)(11) if one of those requirements is met] was prepared under my direct supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

b. A description of how the management practices in Paragraphs 3a through 3i are met.

c. Documentation that the requirements in Paragraphs 4a through 4e are met.

d. A description of how the vector attraction reduction requirements are met, if the owner/operator is responsible for vector attraction reduction requirements.

10. The permittee shall report the information in Paragraphs 7a through 7d annually on February 19. Reports shall be submitted to EPA at the address in the Monitoring and Reporting section of the permit.

11. All sewage sludge sampling and analysis procedures shall be in accordance with the procedures detailed in Section 7.

12. If the permittee is not the owner/operator of the surface disposal site, the permittee shall notify the owner/operator of the following:

    a. The requirements in Paragraphs 1a through 1c;
    b. The management practices in Paragraphs 3a through 3i;
    c. The requirements in Paragraphs 4a through 4e;
    d. The requirement in Paragraph 7; and
    e. The record keeping requirements in Paragraph 9a through 9d.

2.3.2. Scenario No.2

Active sewage sludge unit without a liner and leachate collection system located less than 150 meters from the property line. The permittee is directed to §503.33 TABLE 2, Active Unit Boundary is Less Than 150 Meters From Property Boundary in order to determine the maximum concentrations pollutants for the appropriate distant to the units boundary.

SLUDGE CONDITIONS

1. The permittee and the owner/operator of an active sewage sludge unit shall comply with following requirements:

    i. Sewage sludge shall not be placed in an active sewage sludge unit unless the requirement of 40 CFR Part 503, Subpart C are met.

    ii. An active sewage sludge unit located within 60 meters of a fault that has had displacement in Holocene time; located in an unstable area; or located in a wetland, except as provided in a permit issued pursuant to Section 402 or 404 of the Clean Water Act, shall close by March 22, 1994, unless, in the case of an active sewage sludge unit located within 60 meters of a fault that has displacement in Holocene time, otherwise specified by the permitting authority.

    i. The owner/operator of an active sewage sludge unit shall submit a written closure and post closure plan to EPA 180 days prior to the date an active sewage sludge unit closes.

ii The closure plan shall consider the elements outlined in Section 6. If an element is not applicable, the owner/operator shall state the reasons in the plan.

c. The owner of a surface disposal site shall provide written notification to the subsequent owner of the site that sewage sludge was place on the site. The notice should include elements outlined in Section 7. A copy of the notification shall be submitted to the EPA.

2. Pollutant limitations

a. The maximum concentration of pollutant in the sewage sludge placed in an active sewage sludge unit shall not exceed the following:

§503.23 TABLE
Active Unit Boundary is Less Than 150 Meters
From Property Boundary

Distance (meters)	**Pollutant concentrations (mg/kg)**		
	Arsenic	Chromium	Nickel
0<Distance<25	30	200	210
25<Distance<50	34	220	240
50<Distance<75	39	260	270
75<Distance<100	46	300	320
100<Distance<125	53	360	390
125<Distance<150	62	450	420

b. Sewage sludge with metals concentrations which exceed the limitations in Paragraph 2a. shall not be placed in a surface disposal unit.

3. The permittee and the owner/operator shall comply with the following management practices:

a. The sewage sludge shall not be placed on an active sewage sludge unit if it is likely to adversely affect a threatened or endangered species listed under Section 4 of the Endangered Species Act or its designated critical habitat.

b. The run-off form an active sewage sludge unit shall be collected and disposed in accordance with applicable stormwater regulations.

c. The run-off collection system for an active sewage sludge unit shall have the capacity to control run-off from a 24 hour - 25 year storm event.

d. i. When a daily cover is placed on an active sewage sludge unit, the concentration of methane gas in air in any structure within the surface disposal site shall not exceed 25 percent of the lower explosive limit, 1.25 percent by volume, for methane gas during the period that the sewage sludge unit is active.

2. The concentration of methane gas in air at the property line of the surface disposal site shall not exceed the lower explosive limit, 5 percent by volume, for methane gas during the period that the sewage sludge unit is active.

e. i. When a final cover is placed on a sewage sludge unit at closure, and for three years after closure, the concentration of methane gas in air in any structure within the surface disposal site shall not exceed 25 percent of the lower explosive limit, 1.25 percent by volume, for methane gas.

2. The concentration of methane gas in air at the property line of the surface disposal site shall not exceed the lower explosive limit, 5 percent by volume, for methane gas for three years after the sewage sludge unit closes.

f. A food crop, a feed crop or fiber crop shall not be grown on an active sewage sludge unit. The owner/operator of the sewage sludge unit must demonstrate to EPA that public health and the environment are protected from reasonably anticipated adverse effects of pollutants in sewage sludge when crops are grown on a sewage sludge unit.

g. Animals shall not be grazed on an active sewage sludge unit. The owner/operator of the sewage sludge unit must demonstrate to EPA that public health and the environment are protected from reasonably anticipated adverse effects of pollutants in sewage sludge when animals are grazed on a sewage sludge unit.

h. Public access to a surface disposal site shall be restricted for the period that the surface disposal site contains an active sewage sludge unit and for site contains an active sewage sludge unit and for three years after the last sewage unit closes.

i. i. Sewage sludge placed in an active sewage sludge unit shall not contaminate an aquifer.

2. The permittee shall demonstrate the sewage sludge place in an active sewage sludge unit does not contaminate an aquifer by either (i) submission of results of a groundwater monitoring program developed by a qualified groundwater scientist; or (2) submission of certification by a qualified groundwater scientist that the sewage sludge does not contaminate an aquifer.

4. The following conditions must be documented by the permittee and owner/operator:

   a. An active sewage sludge unit shall not restrict the flow of a base flood.

   b. If a surface disposal site is located in seismic impact zone, an active sewage sludge unit shall be designed to withstand the maximum recorded horizontal ground level acceleration.

   c. A active sewage sludge unit shall be located 60 meters or more from a fault that has displacement in Holocene time.

   d. An active sewage sludge unit shall not be located in an unstable area.

   e. An active sewage sludge unit shall not be located in a wetland.

5. If the active sewage sludge unit is not covered daily, the permittee shall meet either Class A or Class B pathogen reduction utilizing one of the methods in Section 4, and one of the vector attraction reduction requirements in Section 5.

6. The permittee shall monitor the sewage sludge for the pollutants in Paragraph 2, the pathogen density, and the vector attraction reduction requirements at the following frequency:

Sampling Frequency Table

SEWAGE SLUDGE PRODUCED (metric tons per 365 day period)	**SAMPLING FREQUENCY**
0<Sludge(tons)<290	Once per Year
0≤Sludge(tons)<1500	Once Per Quarter (four times per year)
1500≤Sludge(tons)<15000	Once per 60 Days (six times per year)
Sludge(tons)≤15000	Once per Month (12 times per year)

7. When a daily cover is placed on an active sewage sludge unit, the air in the structures within a surface disposal site and at the property line of the surface disposal site shall be monitored continuously for methane gas during the time that the surface disposal site contains an active sewage sludge unit and for three years after the sewage sludge unit closes.

8. The permittee shall develop and retain the following information for five years:

   a. The following certification statement:

   "I, certify, under penalty of law, that the information that will be used to determine compliance with the pathogen requirements in [insert §503.32(a), §503.32(b)(2), §503.32(b)(4) when one of those requirements is met] and the vector attraction reduction requirements in [insert one of the vector attraction reduction requirements in §503.33(b)(1) through §503.33(b)(8) when one of those requirements is met] was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine or imprisonment."

   b. A description of how the pathogen requirements are met.

   c. When the permittee is responsible for the vector attraction reduction requirements, description of how the vector attraction reduction requirements are met.

9. The owner/operator of the surface disposal site shall develop and retain the following information for five years:

   a. The concentration of each pollutant listed in Paragraph 2a.

   b. The following certification statement:

   "I certify, under penalty of law, that the information that will be used to determine compliance with the management practices in §503.24 and the vector attraction reduction requirement in [insert one of the requirements in §503.33(b)(9) through (b)(11) if one of those requirements is met] was prepared under my direct supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

   c. A description of how the management practices in Paragraphs 3a through 3i are met.

d. Documentation that the requirements in Paragraphs 4a through 4e are met.

e. A description of how the vector attraction reduction requirements are met, if the owner/operator is responsible for vector attraction reduction requirements.

10. The permittee shall report the information in Paragraphs 7a through 7d annually on February 19. Reports shall be submitted to EPA at the address in the Monitoring and Reporting section of the permit.

11. All sewage sludge sampling and analysis procedures shall be in accordance with the procedures detailed in Section 7.

12. If the permittee is not the owner/operator of the surface disposal site, the permittee shall notify the owner/operator of the following:

a. The requirements in Paragraphs 1a through 1c;
b. The management practices in Paragraphs 3a through 3i;
c. The requirements in Paragraphs 4a through 4e;
d. The requirement in Paragraph 7; and
e. The record keeping requirements in Paragraph 9a through 9e.

2.3.3. Scenario No.3

This applies to an active sewage sludge unit with a liner and a leachate collection system.

SLUDGE CONDITIONS

1. The permittee and the owner/operator of an active sewage sludge unit shall comply with the following requirements:

a. Sewage sludge shall not be placed in an active sewage sludge unless the requirement of 40 CFR Part 503, Subpart C are met.

b. An active sewage sludge unit located within 60 meters of a fault that has had displacement in Holocene time; located in an unstable area; or located in a wetland, except as provided in a permit issued pursuant to Section 402 or 404 of the Clean Water Act, shall close by March 22, 1994, unless, in the case of an active sewage sludge unit located within 60 meters of fault that has displacement in Holocene time, otherwise specified by the permitting authority.

i. The owner/operator of an active sewage sludge unit shall submit a written closure and post closure plan to EPA 180 days prior to the

date an active sewage sludge unit closes.

ii. The closure plan shall consider the elements outlined in Section 6. If an element is not applicable, the owner/operator shall state the reasons in the plan.

c. The owner of a surface disposal site shall provide written notification to the subsequent owner of the site that sewage sludge was placed on the site. The notice should include elements outlined in Section 7. A copy of the notification shall be submitted to the EPA.

2. The permittee shall comply with the following management practices:

a. The sewage sludge shall not be placed on an active sewage sludge unit if it is likely to adversely affect a threatened or endangered species listed under Section 4 of the Endangered Species Act or its designated critical habitat.

b. The run-off from an active sewage sludge unit shall be collected and disposed in accordance with applicable stormwater regulations.

c. The run-off collection system for an active sewage sludge unit shall have the capacity to handle run-off from a 24 hour - 25 year storm event.

d. The leachate collection system for an active sewage sludge unit shall be operated and maintained during the period the sewage sludge unit is active and for three years the sewage sludge unit closes.

e. The leachate shall be collected and disposed of in accordance with applicable regulations during the period the sewage sludge unit is active and for three years after it closes.

f. i. When a daily cover is placed on an active sewage sludge unit, the concentration of methane gas in air in any structure within the surface disposal site shall not exceed 25 percent of the lower explosive limit, 1.25 percent by volume, for methane gas during the period that the sewage sludge unit is active.

ii. The concentration of methane gas in air at the property line of the surface disposal site shall not exceed the lower explosive limit, 5 percent by volume, for methane gas during the period that the sewage sludge unit is active.

g. i. When a final cover is placed on a sewage sludge unit at closure, and for three years after closure, the concentration of methane gas in air in any structure within the surface disposal site shall not exceed 25 percent of the lower explosive limit, 1.25 percent by volume, for methane gas.

ii The concentration of methane gas in air at the property line of the surface disposal site shall not exceed the lower explosive limit, 5 percent by volume, for methane gas for three years after the sewage sludge unit closes.

h. A food crop, a feed crop, or fiber crop shall not be grown on an active sewage sludge unit. The owner/operator of the sewage sludge unit must demonstrate to EPA that public health and the environment are protected from reasonably anticipated adverse effects of pollutants in sewage sludge when crops are grown on a sewage sludge unit.

i. Animals shall not be grazed on an active sewage sludge unit. The owner/operator of the sewage sludge unit must demonstrate to EPA that public health and the environment are protected from reasonably anticipated adverse effects of pollutants in sewage sludge when animals are grazed on a sewage sludge unit.

j. Public access to a surface disposal site shall be restricted for the period that the surface disposal site contains an active sewage sludge unit and for three years the last sewage sludge unit closes.

k. i. Sewage sludge placed in an active sewage sludge unit shall not contaminate an aquifer.

ii The permittee shall demonstrate that sewage sludge place in an active sewage sludge unit does not contaminate an aquifer by either (1) submission of results of a groundwater monitoring program developed by a qualified groundwater scientist; or (2) submission of a certification by a qualified groundwater scientist that the sewage sludge does not contaminate an aquifer.

3. The following conditions must be documented by the permittee and owner/operator:

a. An active sewage sludge unit shall not restrict the flow of a base flood.

b. If a surface disposal site is located in a seismic impact zone, an active sewage sludge unit shall be designed to withstand the maximum recorded horizontal ground level acceleration.

c. A active sewage sludge unit shall be located 60 meters or more from a fault that has displacement in Holocene time.

d. An active sewage sludge unit shall not be located in an unstable area.

e. An active sewage sludge unit shall not be located in a wetland.

4. If the active sewage sludge unit is not covered daily, the permittee shall meet either Class A or Class B pathogen reduction utilizing one of the methods in Section 4, and one of the vector attraction reduction requirements in Section 5.

5. The permittee shall monitor the sewage sludge for the pollutants in Paragraph 2, the pathogen density, and the vector attraction reduction requirements at the following frequency:

Sampling Frequency Table

SEWAGE SLUDGE PRODUCED (metric tons per 365 day period)	**SAMPLING FREQUENCY**
0<Sludge(tons)<290	Once per Year
0<Sludge(tons)<1500	Once Per Quarter (four times per year)
1500<Sludge(tons)<15000	Once per 60 Days (six times per year)
Sludge(tons)<15000	Once per Month (12 times per year)

6. When a daily cover is placed on an active sewage sludge unit, the air in the structures within a surface disposal site and at the property line of the surface disposal site shall be monitored continuously for methane gas during the time that the surface disposal site contains an active sewage sludge unit and for three years after the sewage sludge unit closes.

7. The permittee shall develop and retain the following information for five years:

a. The following certification statement:

"I, certify, under penalty of law, that the information that will be used to determine compliance with the pathogen requirements in [insert §503.32(a), §503.32(b)(2), §503.32(b)(3) or §503.32(b)(4) when one of those requirements is

met] and the vector attraction reduction requirements in [insert one of the vector attraction reduction requirements in §503.33(b)(1) through §503.33(b)(8) when one of those requirements is met] was prepared under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine or imprisonment."

b. A description of how the pathogen requirements are met.

c. When the permittee is responsible for the vector attraction reduction requirements, a description of how the vector attraction reduction requirements are met.

8. The owner/operator of the surface disposal site shall develop and retain the following information for five years:

a. The following certification statement:

"I certify, under penalty of law, that the information that will be used to determine compliance with management practices in §503.24 and the vector attraction reduction requirement in [insert one of the requirements in §503.33(b)(9) through (b)(11) if one of those requirements is met] was prepared under my direct supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate this information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

b. A description of how the management practices in Paragraphs 2a through 2k are met.

c. Documentation that the requirements in Paragraphs 3a through e are met.

d. A description of how the vector attraction reduction requirements are met, if the owner/operator is responsible for vector attraction reduction requirements.

9. The permittee shall report the information in Paragraphs 8a through c annually on February 19. Reports shall be submitted to EPA at the address in the Monitoring and Reporting section of the permit.

10. All sewage sludge sampling and analysis procedures shall be in accordance with the procedures detailed in Section 7.

11. If the permittee is not the owner/operator of the surface disposal site, the permittee shall notify the owner/operator of the following:

    a. The requirements in Paragraphs 1a through e;
    b. The management practices in Paragraphs 2a through k;
    c. The requirements in Paragraph 3a through e;
    d. The requirement in Paragraph 6; and
    e. The record keeping requirements in Paragraphs 8a through d.

2.3.4. Scenario No.4

A permittee who dispose of their sludge in a municipal solid waste land fill are regulated under 40 CFR Part 258.

SLUDGE CONDITIONS

1. The permittee must dispose of the sewage sludge in a landfill which is in compliance with 40 CFR Part 258.

2. Sewage sludge disposed of in a municipal solid waste landfill shall not be hazardous. The Toxicity Characterization Leachate Protocol (TCLP) shall be used as demonstration that the sludge is non-hazardous.

3. The sewage sludge must not be liquid as determined by the Paint Filter Liquids Test method (Method 9095 as described in “Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, EPA publication No. SW-846).

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3. Incineration

Each facility that incinerates sewage sludge is still subject to 40 CFR Part 503 regulations. Implementation of these regulations are site specific. A facility which incinerates sewage sludge will have specific conditions for that incineration process included in the facility's NPDES permit.

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4. Pathogens Reduction

Allowable pathogen reduction alternatives are listed in this section. The corresponding reference to the regulation is listed in parenthesis.

4.1 Class A Pathogen Reduction

4.1.1. Class A – Alternative 1 (503.32(a)(3))

i. Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of Salmonella sp. bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10(b), §5.3.10(c), §503.10(e) or §503.10(f).

ii. The temperature of the sewage sludge that is used or disposed shall be maintained at a specific value for a period of time.

a. When the percent solids of the sewage sludge is seven percent or higher, the temperature of the sewage sludge shall be 50 degrees Celsius or higher; the time period shall be 20 minutes or longer; and the temperature and time period shall be determined using equation (3), except when small particles of sewage sludge are heated by either warmed gases or an immiscible liquid.

$$D = \frac{13{,}700{,}000}{10^{0.1400t}} \qquad (3)$$

Where,

D = time in days
T = temperature in degrees Celsius

b. When the percent solids of the sewage sludge is seven percent or higher and small particles of sewage sludge are heated by either warmed gases or an immiscible liquid, the temperature of the sewage sludge shall be 50 degrees Celsius or higher; the time period shall be 15 seconds or longer; and the temperature and time period shall be determined using equation (3).

c. When the percent solids of the sewage sludge is less than seven percent and the time period is at least 15 seconds, but less than 30 minutes, the temperature and time period shall be determined using equation (3).

d. When the percent solids of the sewage sludge is less than seven percent; the temperature of the sewage sludge is 50 degrees Celsius or higher; and the time period is 30 minutes or longer, the temperature and time period shall be determined using equation (4).

$$D = \frac{50{,}070{,}000}{10^{0.1400t}} \qquad (4)$$

Where,

D = time in days.
t = temperature in degrees Celsius.

4.1.2. Class A - Alternative 2 (503.32(a)(4))

i. Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of Salmonella sp. bacteria in the sewage sludge shall be less than Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10(b), §503.10(c), §503.10(e) or §503.10(f).

ii a.. The pH of the sewage sludge that is used or disposal shall be raised to above 12 and shall remain above 12 for 72 hours.

b. The temperature of the sewage sludge shall be above 52 degrees Celsius for 12 hours or longer during the period that the pH of the sewage sludge is above 12.

c. At the end of the 72 hour period during which the pH of the sewage sludge is above 12, the sewage sludge shall be air dried to achieve a percent solids in the sewage sludge greater than 50 percent.

4.1.3. Class A - Alternative 3 (503.32(a)(5))

i. Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of Salmonella sp. bacteria in sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10(b), §503.10(c), §503.10(e) or §503.10(f).

ii a. The sewage sludge shall be analyzed prior to pathogen treatment to determine whether the sewage sludge contains enteric viruses.

b. When the density of enteric values in the sewage sludge prior to pathogen treatment is less than one Plaque-forming Unit per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to enteric viruses until the next monitoring episode for the sewage sludge.

c. When the density of enteric viruses in the sewage sludge prior to pathogen treatment is equal to or greater than one Plaque-forming Unit per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to enteric viruses in the sewage sludge after pathogen treatment is less than one Plaque-forming Unit per four grams of total solids (dry weight basis) and when the values or ranges of values for the operating parameters for the pathogen treatment process that produces the sewage sludge that meets the enteric virus density requirement are documented.

d. After the enteric virus reduction in ii.c. of this subsection is demonstrated for the pathogen treatment process, the sewage sludge continues to be Class A with respect to enteric viruses when the values for the pathogen treatment process operating parameters are consistent with the values or ranges of values documented in ii.c. of this subsection.

iii. a. The sewage sludge shall be analyzed prior to pathogen treatment to determine Whether the sewage sludge contains viable helminth ova.

b. When the density of viable helminth ova in the sewage sludge prior to pathogen treatment is less than one per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to viable helminth ova until the next monitoring episode for the sewage sludge.

c. When the density of viable helminth ova in the sewage sludge prior to pathogen treatment is equal to or greater than one per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to viable helminth ova when the density of viable helminth ova in the sewage sludge after pathogen treatment is less than one per four grams of total solids (dry weight basis) and when the values or ranges of values for the operating parameters for the pathogen treatment process that produces the sewage sludge that meet the viable helminth ova density requirement are documented.

d. After the viable helminth ova reduction in iii.c. of this subsection is demonstrated for the pathogen treatment process, the sewage sludge continues to be Class A with respect to viable helminth ova when the values for the pathogen

treatment process operating parameters are consistent with the values of ranges of values documented in (iii)(c) of this subsection.

4.1.4. Class A - Alternative 4 (503.32(a)(6))

i. Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of Salmonella sp. bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10 (b), §503.10(c), §503.10(f).

ii. The density of enteric viruses in the sewage sludge shall be less than one Plaque-forming Unit per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10(b), §503.10(c), §503.10(e) or §503.10(f), unless otherwise specified by the permitting authority.

iii. The density of viable helminth ova in the sewage sludge shall be less than one per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10(b),§503.10(c), §503.10(e) or §503.10(f), unless otherwise specified by the permitting authority.

4.1.5. Class A - Alternative 5 (503.32(a) (8))

i. Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the sludge shall be less than three Most Probable Number per four grams of total (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10(b), §503.10(c), §503.10(e) or §503.10(f).

ii. Sewage sludge that is used or disposed shall be treated in one of the Processes to Further Reduce Pathogens described in Section 4.3.

4.1.6. Class A - Alternative 6 (503.32(a)(8)

i. Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of Salmonella, sp. bacteria in the sewage sludge shall be less than three Most Probable number per four grams of total solids (dry weight basis) at the time the sewage sludge is used or disposed; at the time the sewage sludge is prepared for sale or give away in a bag or other container for application to the land; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10(b), §503.10(c), §503.10(e) or §503.10(f).

ii. Sewage sludge that is used or disposed shall be treated in a process that is equivalent to a Process to Further Reduce Pathogens, as determined by the permitting authority.

4.2 Class B Pathogen Reduction

4.2.1. Class B - Alternative 1 (503.32(b)(2))

i. Seven representative samples of the sewage sludge that is used or disposed shall be collected.

ii. The geometric mean of the density of fecal coliform in the samples collected in (2) (i) of this subsection shall be less than either 2,000,000 Most Probable Number per gram of total solids (dry weight basis) or 2,000,000 Colony Forming Units per gram of total solids (dry weight basis).

4.2.2. Class B - Alternative 2 (503.32 (b)(3))

Sewage sludge that is used or diagnosed shall be treated in one of the Processes to Significantly Reduce Pathogens described in Section 4.3.

4.2.3. Class B - Alternative 3 (503.32(b)(4))

Sewage sludge that is used or disposed shall be treated in a process that is equivalent to a Process to Significantly Reduce Pathogens, as determined by the permitting authority.

4.3 Pathogen Reduction Processes

4.3.1. Process to Significantly Reduce Pathogens

1. Aerobic Digestion - Sewage sludge is agitated with air or oxygen to maintain aerobic conditions for a specific mean cell residence time at a specific temperature. Values for

the mean cell residence time and temperature shall be between 40 days at 20 degrees Celsius and 60 days at 15 degrees Celsius.

2. Air Drying - Sewage sludge is dried on sand beds or on paved or unpaved basins. The sewage sludge dries for a minimum of three months. During two of the three months, the ambient average daily temperature is above zero degrees Celsius.

3. Anaerobic Digestion - Sewage sludge is treated in the absence of air for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 15 days at 35 to 55 degrees Celsius and 60 days at 20 degrees Celsius.

4. Composting - Using either the within vessel, static aerated pile, or window composting methods, the temperature of the sewage sludge is raised to 40 degrees Celsius or higher and remains at 40 degrees Celsius or higher for five days. For four hours during the five days, the temperature in the compost pile exceeds 55 degrees Celsius.

5. Lime Stabilization - Sufficient lime is added to the sewage sludge to raise the pH of the sewage sludge to 12 after two hours of contact.

4.3.2. Process to Further Reduce Pathogens

1. Composting - Using either the within vessel composting method or the static aerated pile composting method, the temperature of the sewage sludge is maintained at 55 degrees Celsius or higher for three days.

Using the windrow composting method, the temperature of the sewage sludge is maintained at 55 degrees or higher for 15 days or longer. During the period when the compost is maintained at 55 degrees or higher, there shall be a minimum of five turnings of the window.

2. Heat Drying - Sewage sludge is dried by direct or indirect contact with hot gases to reduce the moisture content of the sewage sludge to 10 percent or lower. Either the temperature of the sewage sludge particles exceeds 80 degrees Celsius or the wet bulb temperature of the gas in contact with sewage sludge as the sewage sludge leaves the dryer exceeds 80 degrees Celsius.

3. Heat Treatment - Liquid sewage sludge is heated to temperature of 180 degrees Celsius or higher for 30 minutes.

4. Thermophilic Aerobic Digestion - Liquid sewage sludge is agitated with air or oxygen to maintain aerobic conditions and the mean cell residence time of the sewage

sludge is 10 days at 55 to 60 degrees Celsius.

5. Beta Ray Irradiation - Sewage sludge is irradiated with beta rays from an accelerator at dosages of at least 1.0 megarad at room temperature (ca. 20 degrees Celsius).

6. Gamma Ray Irradiation - Sewage sludge is irradiated with gamma rays for certain isotopes, such as ^{60}Cobalt and ^{137}Cesium, at dosages of at least 1.0 megarad at room temperature (ca. 20 degrees Celsius).

7. Pasteurization - The temperature of the sewage sludge is maintained at 70 degrees Celsius or higher for 30 minutes or longer.

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5. Vector Attraction Reduction

The various vector attraction reduction means are listed in this section. The 40 CFR Part 503 section from with each reduction was excerpted is referenced in parenthesis.

5.1. Alternative 1 (503.33(b)(1))

The mass of volatile solids in the sewage sludge shall be reduced by a minimum of 38 percent.

5.2. Alternative 2 (503.33(b)(2))

When the 38 percent volatile solids reduction requirement in §503.33(b)(1) cannot be met for an anaerobically digested sewage sludge, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge anaerobically in the laboratory in a bench-scale unit for 40 additional days at a temperature between 30 and 37 degrees Celsius. When at the end of the 40 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 17 percent, vector attraction reduction is achieved.

5.3. Alternative 3 (503.33(b)(3)

When the 38 percent volatile solids reduction requirement in §503.33(b)(1) cannot be met for an aerobically digested sewage sludge, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge that has a percent solids of two percent or less aerobically in the laboratory in a bench-scale unit for 30 additional days at 20 degrees Celsius. When at the end 30 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 15 percent, vector attraction reduction is achieved.

5.4. Alternative 4 (503.33(b)(4)

The specific oxygen uptake rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5 milligrams of oxygen per hour per gram of total solids (dry weight basis) at a temperature of 20 degrees Celsius.

5.5. Alternative 5 (503.33(b)(5))

Sewage sludge shall be treated in an aerobic process for 14 days or longer. During time, the temperature of the sewage sludge shall be higher than 40 degrees Celsius and the average temperature of the sewage sludge shall be higher than 45 degrees Celsius.

5.6. Alternative 6 (503.33(b)(6))

The pH of sewage sludge shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for two hours and then at 11.5 or higher for an additional 22 hours.

5.7. Alternative 7 (503.33(b)(7))

The percent solids of sewage sludge that does not contain unstabilized solids generated in a primary wastewater treatment process shall be equal to or greater than 75 percent based on the moisture content and total solids prior to mixing with other materials.

5.8. Alternative 8 (503.33 (b)(8)

The percent solids of sewage sludge that contains unstabilized solids generated in a primary wastewater treatment process shall be equal to or greater than 90 percent based on the moisture content and total solids prior to mixing with other materials.

5.9. Alternative 9 (503.33(b)(9))

i. Sewage sludge shall be injected below the surface of the land.

ii. No significant amount of the sewage sludge shall be present on the land surface within one hour after the sewage sludge is injected.

5.10. Alternative 10 (503.33(b)(10))

i. Sewage sludge applied to the land surface or placed on an active sewage sludge unit shall be incorporated into the soil within six hours after application to or placement on the land unless otherwise specified by the permitting authority.

ii. When sewage sludge that is incorporated into the soil is Class A with respect to pathogens, the sewage sludge shall be applied to or place on the land within eight hours after being discharged from the pathogen treatment program.

5.11. Alternative 11 (503.33(b)(11))

Sewage sludge placed on an active sewage sludge unit shall be covered with soil or other material at the end of each operating day.

6. CLOSURE AND POST CLOSURE PLAN

The closure and post closure plan shall describe how the sewage sludge unit will close and how it will be maintained for three years after closure.

6.1. Minimum Elements

The following items are the minimum elements that should be addressed in the closure plan.

6.1.1. General Information

a. Name, address, and telephone number of the owner/operator
b. Location of the site including size
c. Schedule for final closure

6.1.2. Leachate collection system

a. How the system will be operated and maintained for three years after closure
b. Treatment and disposal of the leachate

6.1.3. Methane Monitoring

a.. Description of the system to monitor methane within the structures at the property line
b. Maintenance of the system

6.1.4. Restriction of Public Access

a. Describe method of restricting public access for three years after the last surface disposal unit closes

6.1.5. Other Activities

a. Groundwater monitoring
b. Maintenance and inspection schedules
c. Discussion of land use after cover
d. Copy of notification to subsequent land owner

6.2. Notification to Land Owner

The notification to the subsequent land owner shall include the following information:

a. Name, address, and telephone number of the owner/operator of the owner/operator of the surface disposal site.

b. A map and description of the surface disposal site including locations of surface disposal units.

c. An estimate of the amount of sewage sludge placed on the site and a description of the quality of the sludge.

d. Results of the methane gas monitoring and groundwater monitoring

e. Discussion of the leachate collection system, if appropriate

f. Demonstration that the site was closed in accordance with closure plan

7. SAMPLING AND ANALYSIS

7.1 Sampling

Representatives samples of sewage sludge that is applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator shall be collected and analyzed.

7.2 Analytical Methods

The following methods shall be used to analyze samples of sewage sludge.

a. Enteric Viruses

ASTM Method D 499-89, "Standard Practice for Recovery of Viruses from Wastewater Sludge", Annual Book of ASTM Standards: Section 11, Water and Environmental Technology, 1992.

b. Fecal Coliform

Part 9221 E or Part 9222 D, "Standard Methods for the Examination of Water and Wastewater", 18th edition, American Public Health Association, Washington, D.C., 1992.

c. Helminth Ova

Yanko, W.A., "Occurrence of Pathogens in Distribution and Marketing Municipal Sludges", EPA 600/1-87-014, 1987. NTIS PB 88-154273/AS, National Technical Information Service, Springfield, Virginia.

d. Inorganic Pollutants

Method SW-846 in "Test Methods for Evaluating Solid Waste" U.S. Environmental Protection Agency, November 1986.

e. Salmonella sp. bacteria

Part 9260 D.1, "Standard Methods for the Examination of Water and Wastewater", 18th edition, American Public Health Association, Washington, D.C., 1992; or Kenner, B.B. and H.A. Clark, "Determination and Enumeration of Salmonella and Pseudomonas aeruginosa", J. Water Pollution Control Federation, 46 (9): 2163-2171, 1974.

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f. Specific Oxygen Uptake Rate

Part 2710 B, "Standard Methods for the Examination of Water and Wastewater", 18th edition, American Public Health Association, Washington, D.C., 1992.

g. Total Solids, Fixed Solids, and Volatile Solids

Part 2540 G, Standard Methods for the Examination of Water and Wastewater", 18th edition, American Public Health Association, Washington, D.C., 1992.

7.3 Percent Volatile Solids Reduction

Percent volatile solids reduction shall be calculated using a procedure in "Environmental Regulations and Technology - Control of Pathogens and Vectors in Sewage Sludge", EPA 625/R-92/013, U.S. Environmental Protection Agency, Cincinnati, Ohio, 1992.

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NPDES PART II STANDARD CONDITIONS
(January, 2007)

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PART II. A. GENERAL REQUIREMENTS

1. Duty to Comply

   The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

   a. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirements.

   b. The CWA provides that any person who violates Section 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any of such sections in a permit issued under Section 402, or any requirement imposed in a pretreatment program approved under Section 402 (a)(3) or 402 (b)(8) of the CWA is subject to a civil penalty not to exceed $25,000 per day for each violation. Any person who negligently violates such requirements is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than 1 year, or both. Any person who knowingly violates such requirements is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or both.

   c. Any person may be assessed an administrative penalty by the Administrator for violating Section 301, 302, 306, 307, 308, 318, or 405 of the CWA, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the CWA. Administrative penalties for Class I violations are not to exceed $10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $25,000. Penalties for Class II violations are not to exceed $10,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $125,000.

   Note: See 40 CFR §122.41(a)(2) for complete “Duty to Comply” regulations.

2. Permit Actions

   This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or notifications of planned changes or anticipated noncompliance does not stay any permit condition.

3. Duty to Provide Information

   The permittee shall furnish to the Regional Administrator, within a reasonable time, any information which the Regional Administrator may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Regional Administrator, upon request, copies of records required to be kept by this permit.

4. Reopener Clause

The Regional Administrator reserves the right to make appropriate revisions to this permit in order to establish any appropriate effluent limitations, schedules of compliance, or other provisions which may be authorized under the CWA in order to bring all discharges into compliance with the CWA.

For any permit issued to a treatment works treating domestic sewage (including "sludge-only facilities"), the Regional Administrator or Director shall include a reopener clause to incorporate any applicable standard for sewage sludge use or disposal promulgated under Section 405 (d) of the CWA. The Regional Administrator or Director may promptly modify or revoke and reissue any permit containing the reopener clause required by this paragraph if the standard for sewage sludge use or disposal is more stringent than any requirements for sludge use or disposal in the permit, or contains a pollutant or practice not limited in the permit.

Federal regulations pertaining to permit modification, revocation and reissuance, and termination are found at 40 CFR §122.62, 122.63, 122.64, and 124.5.

5. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from responsibilities, liabilities or penalties to which the permittee is or may be subject under Section 311 of the CWA, or Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

6. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges.

7. Confidentiality of Information

a. In accordance with 40 CFR Part 2, any information submitted to EPA pursuant to these regulations may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission in the manner prescribed on the application form or instructions or, in the case of other submissions, by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the information will be treated in accordance with the procedures in 40 CFR Part 2 (Public Information).

b. Claims of confidentiality for the following information will be denied:

(1) The name and address of any permit applicant or permittee;
(2) Permit applications, permits, and effluent data as defined in 40 CFR §2.302(a)(2).

c. Information required by NPDES application forms provided by the Regional Administrator under 40 CFR §122.21 may not be claimed confidential. This includes information submitted on the forms themselves and any attachments used to supply information required by the forms.

8. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee must apply for and obtain a new permit. The permittee shall submit a new application at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Regional Administrator. (The Regional Administrator shall not grant permission for applications to be submitted later than the expiration date of the existing permit.)

9. State Authorities

Nothing in Part 122, 123, or 124 precludes more stringent State regulation of any activity covered by these regulations, whether or not under an approved State program.

10. Other Laws

The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, nor does it relieve the permittee of its obligation to comply with any other applicable Federal, State, or local laws and regulations.

PART II. B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of storm water pollution prevention plans. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Need to Halt or Reduce Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

4. Bypass

a. Definitions

(1) *Bypass* means the intentional diversion of waste streams from any portion of a treatment facility.

(2) *Severe property damage* means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can be reasonably expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of Paragraphs B.4.c. and 4.d. of this section.

c. Notice

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.
(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in paragraph D.1.e. of this part (Twenty-four hour reporting).

d. Prohibition of bypass

Bypass is prohibited, and the Regional Administrator may take enforcement action against a permittee for bypass, unless:

(1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and
(3) i) The permittee submitted notices as required under Paragraph 4.c. of this section.
ii) The Regional Administrator may approve an anticipated bypass, after considering its adverse effects, if the Regional Administrator determines that it will meet the three conditions listed above in paragraph 4.d. of this section.

5. <u>Upset</u>

a. Definition. *Upset* means an exceptional incident in which there is an unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph B.5.c. of this section are met. No determination made during

administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the cause(s) of the upset;
(2) The permitted facility was at the time being properly operated;
(3) The permittee submitted notice of the upset as required in paragraphs D.1.a. and 1.e. (Twenty-four hour notice); and
(4) The permittee complied with any remedial measures required under B.3. above.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

PART II. C. MONITORING REQUIREMENTS

1. Monitoring and Records

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

b. Except for records for monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application except for the information concerning storm water discharges which must be retained for a total of 6 years. This retention period may be extended by request of the Regional Administrator at any time.

c. Records of monitoring information shall include:

(1) The date, exact place, and time of sampling or measurements;
(2) The individual(s) who performed the sampling or measurements;
(3) The date(s) analyses were performed;
(4) The individual(s) who performed the analyses;
(5) The analytical techniques or methods used; and
(6) The results of such analyses.

d. Monitoring results must be conducted according to test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, unless other test procedures have been specified in the permit.

e. The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by

imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

2. Inspection and Entry

The permittee shall allow the Regional Administrator or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon presentation of credentials and other documents as may be required by law, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the CWA, any substances or parameters at any location.

PART II. D. REPORTING REQUIREMENTS

1. Reporting Requirements

a. Planned Changes. The permittee shall give notice to the Regional Administrator as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is only required when:

(1) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR§122.29(b); or
(2) The alteration or addition could significantly change the nature or increase the quantities of the pollutants discharged. This notification applies to pollutants which are subject neither to the effluent limitations in the permit, nor to the notification requirements at 40 CFR§122.42(a)(1).
(3) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition or change may justify the application of permit conditions different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

b. Anticipated noncompliance. The permittee shall give advance notice to the Regional Administrator of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

c. Transfers. This permit is not transferable to any person except after notice to the Regional Administrator. The Regional Administrator may require modification or revocation and reissuance of the permit to change the name of the permittee and

incorporate such other requirements as may be necessary under the CWA. (See 40 CFR Part 122.61; in some cases, modification or revocation and reissuance is mandatory.)

d. Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(1) Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the Director for reporting results of monitoring of sludge use or disposal practices.

(2) If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, or as specified in the permit, the results of the monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Director.

(3) Calculations for all limitations which require averaging or measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

e. Twenty-four hour reporting.

(1) The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances.

A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

(2) The following shall be included as information which must be reported within 24 hours under this paragraph.

(a) Any unanticipated bypass which exceeds any effluent limitation in the permit. (See 40 CFR §122.41(g).)
(b) Any upset which exceeds any effluent limitation in the permit.
(c) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Regional Administrator in the permit to be reported within 24 hours. (See 40 CFR §122.44(g).)

(3) The Regional Administrator may waive the written report on a case-by-case basis for reports under Paragraph D.1.e. if the oral report has been received within 24 hours.

f. Compliance Schedules. Reports of compliance or noncompliance with, any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

g. Other noncompliance. The permittee shall report all instances of noncompliance not reported under Paragraphs D.1.d., D.1.e., and D.1.f. of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in Paragraph D.1.e. of this section.

h. Other information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Administrator, it shall promptly submit such facts or information.

2. Signatory Requirement

a. All applications, reports, or information submitted to the Regional Administrator shall be signed and certified. (See 40 CFR §122.22)

b. The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 2 years per violation, or by both.

3. Availability of Reports.

Except for data determined to be confidential under Paragraph A.8. above, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the CWA, effluent data shall not be considered confidential. Knowingly making any false statements on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the CWA.

PART II. E. DEFINITIONS AND ABBREVIATIONS

1. Definitions for Individual NPDES Permits including Storm Water Requirements

Administrator means the Administrator of the United States Environmental Protection Agency, or an authorized representative.

Applicable standards and limitations means all, State, interstate, and Federal standards and limitations to which a “discharge”, a “sewage sludge use or disposal practice”, or a related activity is subject to, including “effluent limitations”, water quality standards, standards of performance, toxic effluent standards or prohibitions, “best management practices”, pretreatment standards, and “standards for sewage sludge use and disposal” under Sections 301, 302, 303, 304, 306, 307, 308, 403, and 405 of the CWA.

Application means the EPA standard national forms for applying for a permit, including any additions, revisions, or modifications to the forms; or forms approved by EPA for use in "approved States", including any approved modifications or revisions.

Average means the arithmetic mean of values taken at the frequency required for each parameter over the specified period. For total and/or fecal coliforms and Escherichia coli, the average shall be the geometric mean.

Average monthly discharge limitation means the highest allowable average of "daily discharges" over a calendar month calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

Average weekly discharge limitation means the highest allowable average of "daily discharges" measured during the calendar week divided by the number of "daily discharges" measured during the week.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of "waters of the United States." BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Best Professional Judgment (BPJ) means a case-by-case determination of Best Practicable Treatment (BPT), Best Available Treatment (BAT), or other appropriate technology-based standard based on an evaluation of the available technology to achieve a particular pollutant reduction and other factors set forth in 40 CFR §125.3 (d).

Coal Pile Runoff means the rainfall runoff from or through any coal storage pile.

Composite Sample means a sample consisting of a minimum of eight grab samples of equal volume collected at equal intervals during a 24-hour period (or lesser period as specified in the section on Monitoring and Reporting) and combined proportional to flow, or a sample consisting of the same number of grab samples, or greater, collected proportionally to flow over that same time period.

Construction Activities - The following definitions apply to construction activities:

(a) Commencement of Construction is the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

(b) Dedicated portable asphalt plant is a portable asphalt plant located on or contiguous to a construction site and that provides asphalt only to the construction site that the plant is located on or adjacent to. The term dedicated portable asphalt plant does not include facilities that are subject to the asphalt emulsion effluent limitation guideline at 40 CFR Part 443.

(c) Dedicated portable concrete plant is a portable concrete plant located on or contiguous to a construction site and that provides concrete only to the construction site that the plant is located on or adjacent to.

(d) Final Stabilization means that all soil disturbing activities at the site have been complete, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.

(e) Runoff coefficient means the fraction of total rainfall that will appear at the conveyance as runoff.

Contiguous zone means the entire zone established by the United States under Article 24 of the Convention on the Territorial Sea and the Contiguous Zone.

Continuous discharge means a "discharge" which occurs without interruption throughout the operating hours of the facility except for infrequent shutdowns for maintenance, process changes, or similar activities.

CWA means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended by Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, and Pub. L. 97-117; 33 USC §§1251 et seq.

Daily Discharge means the discharge of a pollutant measured during the calendar day or any other 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

Director normally means the person authorized to sign NPDES permits by EPA or the State or an authorized representative. Conversely, it also could mean the Regional Administrator or the State Director as the context requires.

Discharge Monitoring Report Form (DMR) means the EPA standard national form, including any subsequent additions, revisions, or modifications for the reporting of self-monitoring results by permittees. DMRs must be used by "approved States" as well as by EPA. EPA will supply DMRs to any approved State upon request. The EPA national forms may be modified to substitute the State Agency name, address, logo, and other similar information, as appropriate, in place of EPA's.

Discharge of a pollutant means:

(a) Any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source", or

(b) Any addition of any pollutant or combination of pollutants to the waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation (See "Point Source" definition).

This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead

to a treatment works; and discharges through pipes, sewers, or other conveyances leading into privately owned treatment works.

This term does not include an addition of pollutants by any "indirect discharger."

Effluent limitation means any restriction imposed by the Regional Administrator on quantities, discharge rates, and concentrations of "pollutants" which are "discharged" from "point sources" into "waters of the United States", the waters of the "contiguous zone", or the ocean.

Effluent limitation guidelines means a regulation published by the Administrator under Section 304(b) of CWA to adopt or revise "effluent limitations".

EPA means the United States "Environmental Protection Agency".

Flow-weighted composite sample means a composite sample consisting of a mixture of aliquots where the volume of each aliquot is proportional to the flow rate of the discharge.

Grab Sample – An individual sample collected in a period of less than 15 minutes.

Hazardous Substance means any substance designated under 40 CFR Part 116 pursuant to Section 311 of the CWA.

Indirect Discharger means a non-domestic discharger introducing pollutants to a publicly owned treatment works.

Interference means a discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

(a) Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

(b) Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act (CWA), the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resources Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to Subtitle D of the SDWA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection Research and Sanctuaries Act.

Landfill means an area of land or an excavation in which wastes are placed for permanent disposal, and which is not a land application unit, surface impoundment, injection well, or waste pile.

Land application unit means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for treatment or disposal.

Large and Medium municipal separate storm sewer system means all municipal separate storm sewers that are either: (i) located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (these cities are listed in Appendices F and 40 CFR Part 122); or (ii) located in the counties with unincorporated urbanized

populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships, or towns within such counties (these counties are listed in Appendices H and I of 40 CFR 122); or (iii) owned or operated by a municipality other than those described in Paragraph (i) or (ii) and that are designated by the Regional Administrator as part of the large or medium municipal separate storm sewer system.

Maximum daily discharge limitation means the highest allowable "daily discharge" concentration that occurs only during a normal day (24-hour duration).

Maximum daily discharge limitation (as defined for the Steam Electric Power Plants only) when applied to Total Residual Chlorine (TRC) or Total Residual Oxidant (TRO) is defined as "maximum concentration" or "Instantaneous Maximum Concentration" during the two hours of a chlorination cycle (or fraction thereof) prescribed in the Steam Electric Guidelines, 40 CFR Part 423. These three synonymous terms all mean "a value that shall not be exceeded" during the two-hour chlorination cycle. This interpretation differs from the specified NPDES Permit requirement, 40 CFR § 122.2, where the two terms of "Maximum Daily Discharge" and "Average Daily Discharge" concentrations are specifically limited to the daily (24-hour duration) values.

Municipality means a city, town, borough, county, parish, district, association, or other public body created by or under State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or an Indian tribe or an authorized Indian tribe organization, or a designated and approved management agency under Section 208 of the CWA.

National Pollutant Discharge Elimination System means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318, and 405 of the CWA. The term includes an "approved program".

New Discharger means any building, structure, facility, or installation:

(a) From which there is or may be a "discharge of pollutants";

(b) That did not commence the "discharge of pollutants" at a particular "site" prior to August 13, 1979;

(c) Which is not a "new source"; and

(d) Which has never received a finally effective NPDES permit for discharges at that "site".

This definition includes an "indirect discharger" which commences discharging into "waters of the United States" after August 13, 1979. It also includes any existing mobile point source (other than an offshore or coastal oil and gas exploratory drilling rig or a coastal oil and gas exploratory drilling rig or a coastal oil and gas developmental drilling rig) such as a seafood processing rig, seafood processing vessel, or aggregate plant, that begins discharging at a "site" for which it does not have a permit; and any offshore rig or coastal mobile oil and gas exploratory drilling rig or coastal mobile oil and gas developmental drilling rig that commences the discharge of pollutants after August 13, 1979, at a "site" under EPA's permitting jurisdiction for which it is not covered by an individual or general permit and which is located in an area determined by the Regional Administrator in the issuance of a final permit to be in an area of biological concern. In determining whether an area is an area of biological concern, the Regional Administrator shall consider the factors specified in 40 CFR §§125.122 (a) (1) through (10).

An offshore or coastal mobile exploratory drilling rig or coastal mobile developmental drilling rig will be considered a "new discharger" only for the duration of its discharge in an area of biological concern.

New source means any building, structure, facility, or installation from which there is or may be a "discharge of pollutants", the construction of which commenced:

(a) After promulgation of standards of performance under Section 306 of CWA which are applicable to such source, or

(b) After proposal of standards of performance in accordance with Section 306 of CWA which are applicable to such source, but only if the standards are promulgated in accordance with Section 306 within 120 days of their proposal.

NPDES means "National Pollutant Discharge Elimination System".

Owner or operator means the owner or operator of any "facility or activity" subject to regulation under the NPDES programs.

Pass through means a Discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation).

Permit means an authorization, license, or equivalent control document issued by EPA or an "approved" State.

Person means an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

Point Source means any discernible, confined, and discrete conveyance, including but not limited to any pipe ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff (see 40 CFR §122.2).

Pollutant means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. §§2011 et seq.)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean:

(a) Sewage from vessels; or

(b) Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well is used either to facilitate production or for disposal purposes is approved by the authority of the State in which the well is located, and if the State determines that the injection or disposal will not result in the degradation of ground or surface water resources.

Primary industry category means any industry category listed in the NRDC settlement agreement (Natural Resources Defense Council et al. v. Train, 8 E.R.C. 2120 (D.D.C. 1976), modified 12 E.R.C. 1833 (D. D.C. 1979)); also listed in Appendix A of 40 CFR Part 122.

Privately owned treatment works means any device or system which is (a) used to treat wastes from any facility whose operation is not the operator of the treatment works or (b) not a "POTW".

Process wastewater means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

Publicly Owned Treatment Works (POTW) means any facility or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature which is owned by a "State" or "municipality".

This definition includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.

Regional Administrator means the Regional Administrator, EPA, Region I, Boston, Massachusetts.

Secondary Industry Category means any industry which is not a "primary industry category".

Section 313 water priority chemical means a chemical or chemical category which:

(1) is listed at 40 CFR §372.65 pursuant to Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) (also known as Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986);

(2) is present at or above threshold levels at a facility subject to EPCRA Section 313 reporting requirements; and

(3) satisfies at least one of the following criteria:

(i) are listed in Appendix D of 40 CFR Part 122 on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols), or Table V (certain toxic pollutants and hazardous substances);
(ii) are listed as a hazardous substance pursuant to Section 311(b)(2)(A) of the CWA at 40 CFR §116.4; or
(iii) are pollutants for which EPA has published acute or chronic water quality criteria.

Septage means the liquid and solid material pumped from a septic tank, cesspool, or similar domestic sewage treatment system, or a holding tank when the system is cleaned or maintained.

Sewage Sludge means any solid, semisolid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced wastewater treatment, scum, septage, portable toilet pumpings, Type III Marine Sanitation Device pumpings (33 CFR Part 159), and sewage sludge products. Sewage sludge does not include grit or screenings, or ash generated during the incineration of sewage sludge.

Sewage sludge use or disposal practice means the collection, storage, treatment, transportation, processing, monitoring, use, or disposal of sewage sludge.

Significant materials includes, but is not limited to: raw materials, fuels, materials such as solvents, detergents, and plastic pellets, raw materials used in food processing or production, hazardous substance designated under section 101(14) of CERCLA, any chemical the facility is required to report pursuant to EPCRA Section 313, fertilizers, pesticides, and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

Significant spills includes, but is not limited to, releases of oil or hazardous substances in excess of reportable quantities under Section 311 of the CWA (see 40 CFR §110.10 and §117.21) or Section 102 of CERCLA (see 40 CFR § 302.4).

Sludge-only facility means any "treatment works treating domestic sewage" whose methods of sewage sludge use or disposal are subject to regulations promulgated pursuant to Section 405(d) of the CWA, and is required to obtain a permit under 40 CFR §122.1(b)(3).

State means any of the 50 States, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, the Trust Territory of the Pacific Islands.

Storm Water means storm water runoff, snow melt runoff, and surface runoff and drainage.

Storm water discharge associated with industrial activity means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant. (See 40 CFR §122.26 (b)(14) for specifics of this definition.

Time-weighted composite means a composite sample consisting of a mixture of equal volume aliquots collected at a constant time interval.

Toxic pollutants means any pollutant listed as toxic under Section 307 (a)(1) or, in the case of "sludge use or disposal practices" any pollutant identified in regulations implementing Section 405(d) of the CWA.

Treatment works treating domestic sewage means a POTW or any other sewage sludge or wastewater treatment devices or systems, regardless of ownership (including federal facilities), used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge. This definition does not include septic tanks or similar devices.

For purposes of this definition, "domestic sewage" includes waste and wastewater from humans or household operations that are discharged to or otherwise enter a treatment works. In States where there is no approved State sludge management program under Section 405(f) of the CWA, the Regional Administrator may designate any person subject to the standards for sewage sludge use and disposal in 40 CFR Part 503 as a "treatment works treating domestic sewage", where he or she finds that there is a potential for adverse effects on public health and the environment from poor sludge quality or poor sludge handling, use or disposal practices, or where he or she finds that such designation is necessary to ensure that such person is in compliance with 40 CFR Part 503.

Waste Pile means any non-containerized accumulation of solid, non-flowing waste that is used for treatment or storage.

Waters of the United States means:

(a) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of tide;

(b) All interstate waters, including interstate "wetlands";

(c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands", sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

(1) Which are or could be used by interstate or foreign travelers for recreational or other purpose;

(2) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

(3) Which are used or could be used for industrial purposes by industries in interstate commerce;

(d) All impoundments of waters otherwise defined as waters of the United States under this definition;

(e) Tributaries of waters identified in Paragraphs (a) through (d) of this definition;

(f) The territorial sea; and

(g) "Wetlands" adjacent to waters (other than waters that are themselves wetlands) identified in Paragraphs (a) through (f) of this definition.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the CWA (other than cooling ponds as defined in 40 CFR §423.11(m) which also meet the criteria of this definition) are not waters of the United States.

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Whole Effluent Toxicity (WET) means the aggregate toxic effect of an effluent measured directly by a toxicity test. (See Abbreviations Section, following, for additional information.)

2. Definitions for NPDES Permit Sludge Use and Disposal Requirements.

Active sewage sludge unit is a sewage sludge unit that has not closed.

Aerobic Digestion is the biochemical decomposition of organic matter in sewage sludge into carbon dioxide and water by microorganisms in the presence of air.

Agricultural Land is land on which a food crop, a feed crop, or a fiber crop is grown. This includes range land and land used as pasture.

Agronomic rate is the whole sludge application rate (dry weight basis) designed:

(1) To provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land; and

(2) To minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.

Air pollution control device is one or more processes used to treat the exit gas from a sewage sludge incinerator stack.

Anaerobic digestion is the biochemical decomposition of organic matter in sewage sludge into methane gas and carbon dioxide by microorganisms in the absence of air.

Annual pollutant loading rate is the maximum amount of a pollutant that can be applied to a unit area of land during a 365 day period.

Annual whole sludge application rate is the maximum amount of sewage sludge (dry weight basis) that can be applied to a unit area of land during a 365 day period.

Apply sewage sludge or sewage sludge applied to the land means land application of sewage sludge.

Aquifer is a geologic formation, group of geologic formations, or a portion of a geologic formation capable of yielding ground water to wells or springs.

Auxiliary fuel is fuel used to augment the fuel value of sewage sludge. This includes, but is not limited to, natural gas, fuel oil, coal, gas generated during anaerobic digestion of sewage sludge, and municipal solid waste (not to exceed 30 percent of the dry weight of the sewage sludge and auxiliary fuel together). Hazardous wastes are not auxiliary fuel.

Base flood is a flood that has a one percent chance of occurring in any given year (i.e. a flood with a magnitude equaled once in 100 years).

Bulk sewage sludge is sewage sludge that is not sold or given away in a bag or other container for application to the land.

Contaminate an aquifer means to introduce a substance that causes the maximum contaminant level for nitrate in 40 CFR §141.11 to be exceeded in ground water or that causes the existing concentration of nitrate in the ground water to increase when the existing concentration of nitrate in the ground water exceeds the maximum contaminant level for nitrate in 40 CFR §141.11.

Class I sludge management facility is any publicly owned treatment works (POTW), as defined in 40 CFR §501.2, required to have an approved pretreatment program under 40 CFR §403.8 (a) (including any POTW located in a state that has elected to assume local program responsibilities pursuant to 40 CFR §403.10 (e) and any treatment works treating domestic sewage, as defined in 40 CFR § 122.2,

classified as a Class I sludge management facility by the EPA Regional Administrator, or, in the case of approved state programs, the Regional Administrator in conjunction with the State Director, because of the potential for sewage sludge use or disposal practice to affect public health and the environment adversely.

Control efficiency is the mass of a pollutant in the sewage sludge fed to an incinerator minus the mass of that pollutant in the exit gas from the incinerator stack divided by the mass of the pollutant in the sewage sludge fed to the incinerator.

Cover is soil or other material used to cover sewage sludge placed on an active sewage sludge unit.

Cover crop is a small grain crop, such as oats, wheat, or barley, not grown for harvest.

Cumulative pollutant loading rate is the maximum amount of inorganic pollutant that can be applied to an area of land.

Density of microorganisms is the number of microorganisms per unit mass of total solids (dry weight) in the sewage sludge.

Dispersion factor is the ratio of the increase in the ground level ambient air concentration for a pollutant at or beyond the property line of the site where the sewage sludge incinerator is located to the mass emission rate for the pollutant from the incinerator stack.

Displacement is the relative movement of any two sides of a fault measured in any direction.

Domestic septage is either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant.

Domestic sewage is waste and wastewater from humans or household operations that is discharged to or otherwise enters a treatment works.

Dry weight basis means calculated on the basis of having been dried at 105 degrees Celsius (°C) until reaching a constant mass (i.e. essentially 100 percent solids content).

Fault is a fracture or zone of fractures in any materials along which strata on one side are displaced with respect to the strata on the other side.

Feed crops are crops produced primarily for consumption by animals.

Fiber crops are crops such as flax and cotton.

Final cover is the last layer of soil or other material placed on a sewage sludge unit at closure.

Fluidized bed incinerator is an enclosed device in which organic matter and inorganic matter in sewage sludge are combusted in a bed of particles suspended in the combustion chamber gas.

Food crops are crops consumed by humans. These include, but are not limited to, fruits, vegetables, and tobacco.

Forest is a tract of land thick with trees and underbrush.

Ground water is water below the land surface in the saturated zone.

Holocene time is the most recent epoch of the Quaternary period, extending from the end of the Pleistocene epoch to the present.

Hourly average is the arithmetic mean of all the measurements taken during an hour. At least two measurements must be taken during the hour.

Incineration is the combustion of organic matter and inorganic matter in sewage sludge by high temperatures in an enclosed device.

Industrial wastewater is wastewater generated in a commercial or industrial process.

Land application is the spraying or spreading of sewage sludge onto the land surface; the injection of sewage sludge below the land surface; or the incorporation of sewage sludge into the soil so that the sewage sludge can either condition the soil or fertilize crops or vegetation grown in the soil.

Land with a high potential for public exposure is land that the public uses frequently. This includes, but is not limited to, a public contact site and reclamation site located in a populated area (e.g., a construction site located in a city).

Land with low potential for public exposure is land that the public uses infrequently. This includes, but is not limited to, agricultural land, forest and a reclamation site located in an unpopulated area (e.g., a strip mine located in a rural area).

Leachate collection system is a system or device installed immediately above a liner that is designed, constructed, maintained, and operated to collect and remove leachate from a sewage sludge unit.

Liner is soil or synthetic material that has a hydraulic conductivity of 1×10^{-7} centimeters per second or less.

Lower explosive limit for methane gas is the lowest percentage of methane gas in air, by volume, that propagates a flame at 25 degrees Celsius and atmospheric pressure.

Monthly average (Incineration) is the arithmetic mean of the hourly averages for the hours a sewage sludge incinerator operates during the month.

Monthly average (Land Application) is the arithmetic mean of all measurements taken during the month.

Municipality means a city, town, borough, county, parish, district, association, or other public body (including an intermunicipal agency of two or more of the foregoing entities) created by or under State law; an Indian tribe or an authorized Indian tribal organization having jurisdiction over sewage sludge management; or a designated and approved management agency under section 208 of the CWA, as amended. The definition includes a special district created under state law, such as a water district, sewer district, sanitary district, utility district, drainage district, or similar entity, or an integrated waste management facility as defined in section 201 (e) of the CWA, as amended, that has as one of its principal responsibilities the treatment, transport, use or disposal of sewage sludge.

Other container is either an open or closed receptacle. This includes, but is not limited to, a bucket, a box, a carton, and a vehicle or trailer with a load capacity of one metric ton or less.

Pasture is land on which animals feed directly on feed crops such as legumes, grasses, grain stubble, or stover.

Pathogenic organisms are disease-causing organisms. These include, but are not limited to, certain bacteria, protozoa, viruses, and viable helminth ova.

Permitting authority is either EPA or a State with an EPA-approved sludge management program.

Person is an individual, association, partnership, corporation, municipality, State or Federal Agency, or an agent or employee thereof.

Person who prepares sewage sludge is either the person who generates sewage sludge during the treatment of domestic sewage in a treatment works or the person who derives a material from sewage sludge.

pH means the logarithm of the reciprocal of the hydrogen ion concentration; a measure of the acidity or alkalinity of a liquid or solid material.

Place sewage sludge or sewage sludge placed means disposal of sewage sludge on a surface disposal site.

Pollutant (as defined in sludge disposal requirements) is an organic substance, an inorganic substance, a combination or organic and inorganic substances, or pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could on the basis on information available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction) or physical deformations in either organisms or offspring of the organisms.

Pollutant limit (for sludge disposal requirements) is a numerical value that describes the amount of a pollutant allowed per unit amount of sewage sludge (e.g., milligrams per kilogram of total solids); the amount of pollutant that can be applied to a unit of land (e.g., kilograms per hectare); or the volume of the material that can be applied to the land (e.g., gallons per acre).

Public contact site is a land with a high potential for contact by the public. This includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses.

Qualified ground water scientist is an individual with a baccalaureate or post-graduate degree in the natural sciences or engineering who has sufficient training and experience in ground water hydrology and related fields, as may be demonstrated by State registration, professional certification, or completion of accredited university programs, to make sound professional judgments regarding ground water monitoring, pollutant fate and transport, and corrective action.

Range land is open land with indigenous vegetation.

Reclamation site is drastically disturbed land that is reclaimed using sewage sludge. This includes, but is not limited to, strip mines and construction sites.

Risk specific concentration is the allowable increase in the average daily ground level ambient air concentration for a pollutant from the incineration of sewage sludge at or beyond the property line of a site where the sewage sludge incinerator is located.

Runoff is rainwater, leachate, or other liquid that drains overland on any part of a land surface and runs off the land surface.

Seismic impact zone is an area that has 10 percent or greater probability that the horizontal ground level acceleration to the rock in the area exceeds 0.10 gravity once in 250 years.

Sewage sludge is a solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to:, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in treatment works.

Sewage sludge feed rate is either the average daily amount of sewage sludge fired in all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located for the number of days in a 365 day period that each sewage sludge incinerator operates, or the average daily design capacity for all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located.

Sewage sludge incinerator is an enclosed device in which only sewage sludge and auxiliary fuel are fired.

Sewage sludge unit is land on which only sewage sludge is placed for final disposal. This does not include land on which sewage sludge is either stored or treated. Land does not include waters of the United States, as defined in 40 CFR §122.2.

Sewage sludge unit boundary is the outermost perimeter of an active sewage sludge unit.

Specific oxygen uptake rate (SOUR) is the mass of oxygen consumed per unit time per unit mass of total solids (dry weight basis) in sewage sludge.

Stack height is the difference between the elevation of the top of a sewage sludge incinerator stack and the elevation of the ground at the base of the stack when the difference is equal to or less than 65 meters. When the difference is greater than 65 meters, stack height is the creditable stack height determined in accordance with 40 CFR §51.100 (ii).

State is one of the United States of America, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Trust Territory of the Pacific Islands, the Commonwealth of the Northern Mariana Islands, and an Indian tribe eligible for treatment as a State pursuant to regulations promulgated under the authority of section 518(e) of the CWA.

Store or storage of sewage sludge is the placement of sewage sludge on land on which the sewage sludge remains for two years or less. This does not include the placement of sewage sludge on land for treatment.

Surface disposal site is an area of land that contains one or more active sewage sludge units.

Total hydrocarbons means the organic compounds in the exit gas from a sewage sludge incinerator stack measured using a flame ionization detection instrument referenced to propane.

Total solids are the materials in sewage sludge that remain as residue when the sewage sludge is dried at 103 to 105 degrees Celsius.

Treat or treatment of sewage sludge is the preparation of sewage sludge for final use or disposal. This includes, but is not limited to, thickening, stabilization, and dewatering of sewage sludge. This does not include storage of sewage sludge.

Treatment works is either a federally owned, publicly owned, or privately owned device or system used to treat (including recycle and reclaim) either domestic sewage or a combination of domestic sewage and industrial waste of a liquid nature.

Unstable area is land subject to natural or human-induced forces that may damage the structural components of an active sewage sludge unit. This includes, but is not limited to, land on which the soils are subject to mass movement.

Unstabilized solids are organic materials in sewage sludge that have not been treated in either an aerobic or anaerobic treatment process.

Vector attraction is the characteristic of sewage sludge that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents.

Volatile solids is the amount of the total solids in sewage sludge lost when the sewage sludge is combusted at 550 degrees Celsius in the presence of excess air.

Wet electrostatic precipitator is an air pollution control device that uses both electrical forces and water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

Wet scrubber is an air pollution control device that uses water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

3. Commonly Used Abbreviations

BOD	Five-day biochemical oxygen demand unless otherwise specified
CBOD	Carbonaceous BOD
CFS	Cubic feet per second
COD	Chemical oxygen demand
Chlorine	
Cl_2	Total residual chlorine
TRC	Total residual chlorine which is a combination of free available chlorine (FAC, see below) and combined chlorine (chloramines, etc.)

TRO	Total residual chlorine in marine waters where halogen compounds are present
FAC	Free available chlorine (aqueous molecular chlorine, hypochlorous acid, and hypochlorite ion)
Coliform	
Coliform, Fecal	Total fecal coliform bacteria
Coliform, Total	Total coliform bacteria
Cont. (Continuous)	Continuous recording of the parameter being monitored, i.e. flow, temperature, pH, etc.
Cu. M/day or M^3/day	Cubic meters per day
DO	Dissolved oxygen
kg/day	Kilograms per day
lbs/day	Pounds per day
mg/l	Milligram(s) per liter
ml/l	Milliliters per liter
MGD	Million gallons per day
Nitrogen	
Total N	Total nitrogen
NH_3-N	Ammonia nitrogen as nitrogen
NO_3-N	Nitrate as nitrogen
NO_2-N	Nitrite as nitrogen
NO_3-NO_2	Combined nitrate and nitrite nitrogen as nitrogen
TKN	Total Kjeldahl nitrogen as nitrogen
Oil & Grease	Freon extractable material
PCB	Polychlorinated biphenyl
pH	A measure of the hydrogen ion concentration. A measure of the acidity or alkalinity of a liquid or material
Surfactant	Surface-active agent

Temp. °C	Temperature in degrees Centigrade
Temp. °F	Temperature in degrees Fahrenheit
TOC	Total organic carbon
Total P	Total phosphorus
TSS or NFR	Total suspended solids or total nonfilterable residue
Turb. or Turbidity	Turbidity measured by the Nephelometric Method (NTU)
ug/l	Microgram(s) per liter
WET	"Whole effluent toxicity" is the total effect of an effluent measured directly with a toxicity test.
C-NOEC	"Chronic (Long-term Exposure Test) – No Observed Effect Concentration". The highest tested concentration of an effluent or a toxicant at which no adverse effects are observed on the aquatic test organisms at a specified time of observation.
A-NOEC	"Acute (Short-term Exposure Test) – No Observed Effect Concentration" (see C-NOEC definition).
LC_{50}	LC_{50} is the concentration of a sample that causes mortality of 50% of the test population at a specific time of observation. The LC_{50} = 100% is defined as a sample of undiluted effluent.
ZID	Zone of Initial Dilution means the region of initial mixing surrounding or adjacent to the end of the outfall pipe or diffuser ports.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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PARTIALLY REVISED FACT SHEET

PARTIALLY REVISED DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES

Comment Period: March 25, 2011 – July 22, 2011

NPDES PERMIT N0.: NH0100871

NAME AND ADDRESS OF APPLICANT:

Town of Exeter
Exeter Wastewater Treatment Plant
10 Front Street
Exeter, New Hampshire 03833-2792

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Town of Exeter
Exeter Wastewater Treatment Plant
13 Newfields Road
Exeter, New Hampshire 03833

RECEIVING WATER: Squamscott River (Hydrologic Unit Code: 01060003)

CLASSIFICATION: B

I. Proposed action

a. Decision to Partially Reopen the Permit for Public Comment

In response to a timely application by the Town of Exeter, New Hampshire, for the reissuance of National Pollutant Discharge Elimination System (NPDES) permit number NH0100871, the U.S. Environmental Protection Agency (EPA) and the New Hampshire Department of Environmental Services (NHDES) made a draft permit and fact sheet available for public notice and comment from October 25, 2007 until November 23, 2007. EPA received comments from the Town of Exeter and the Conservation Law Foundation (CLF).

In its comments on the draft permit, CLF contended that, among other things, the permit failed to ensure compliance with applicable state water quality standards and relevant provisions of the Clean Water Act because it lacked an effluent limitation for total nitrogen (TN).[1] Relying on reports and data indicating that the receiving waters had reached their assimilative capacity for nutrients (e.g., New Hampshire Estuary Project State of Estuaries Report for 2003 and 2006), and citing evidence of existing impairments associated with dissolved oxygen and chlorophyll-a, CLF argued that the permit would result in violations of New Hampshire's narrative nutrient water quality criterion; the state's biological and aquatic community integrity criterion; and its antidegradation policy. CLF, therefore, recommended "nitrogen limits achievable with the most protective limits of technology."

Upon review, EPA has concluded that CLF's comments raise substantial new questions regarding the need to establish an effluent limit for total nitrogen under Clean Water Act Section 301(b)(1)(C), which requires, among other things, the imposition of effluent limitations to ensure that the discharge will not cause or contribute to a violation of state water quality standards, including narrative criteria for water quality. Based on an analysis of these comments and other relevant information, EPA has determined to make certain material changes to the permit. EPA has, in its discretion, decided to reopen the public comment period on the draft permit pursuant to 40 C.F.R. § 124.14(b), because the new permit conditions involve the interpretation and analysis of a significant body of technical and scientific literature not previously discussed on the record. The permittee will, furthermore, need to upgrade its treatment facility in order to comply with the new limits. In light of these facts, EPA has concluded that an opportunity for interested persons to comment on the specific changes to the October 2007 draft permit will assist the agency in its deliberations, provide for greater public participation, and ultimately improve the quality of the final permit decision.

b. Scope of Reopening

In accordance with 40 C.F.R. § 124.14(c), comments filed on this permit during the reopened comment period are limited to the "substantial new questions that caused its reopening," which in this case pertain only to the newly-added effluent limitations and conditions for the control of total nitrogen from the facility (i.e., Parts I.A.1 and I.A.4). Specifically, EPA has determined that a monthly average total nitrogen discharge limit of 3.0 mg/l for the months of April through October and a mass limit of 75 lbs/day based on the concentration limit and the design flow of the treatment facility are necessary to comply with CWA Section 301. In addition to this seasonally-applied numeric limit, the permit requires the permittee to optimize the treatment facility operations for the removal of total nitrogen during the months of November through March using all available treatment equipment at the facility. Because the revised draft permit now contains an effluent limitation for total nitrogen of 3.0 mg/l, the ammonia nitrogen as N summer time

[1] Letter from Thomas F. Irwin, Conservation Law Foundation (CLF) to Dan Arsenault, EPA, and Harry Stewart, New Hampshire Department of Environmental Services (NHDES), re Draft NPDES Permit for Town of Exeter, NH Wastewater Treatment Facility (NPDES Permit No. NH0100871; Public Notice No. NH-001-08), dated November 21, 2007.

limit of 20.5 mg/l has been deleted from the draft permit. In all other respects, the original draft permit and the original Fact Sheet remain in place and are not subject to re-opened comment. All comments received during this notice and the earlier notice will be addressed in the response to comments document prepared as part of the final decision on this permit.

This revised Fact Sheet sets forth the record basis for the new total nitrogen effluent limits. A section entitled "Total Nitrogen" has been added to Section IV.e. (Permit Basis and Explanation of Effluent Limitation Derivation – Non-Conventional Pollutants") of the original Fact Sheet that accompanied the 2007 draft permit (included as Attachment I to this Partially Revised Fact Sheet).

IV. Permit Basis and Explanation of Effluent Limit Derivation

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e. Non-Conventional and Toxic Pollutants

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D. Total Nitrogen

EPA has concluded that at existing levels, nitrogen in the Exeter facility's discharge contribute to water quality violations at the point of discharge in the Squamscott River, as well as further downstream in Great Bay. The analysis of available information by EPA, 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 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. Also, in accordance with 40 CFR 122.45(f), EPA is imposing a monthly average mass limit of 75 lbs/day, also applicable during the months of April through October. This mass limit is based on the monthly average concentration limit and the design flow of the facility, and represents the highest load that the facility can discharge consistent with achieving water quality standards. The concentration limit will ensure that the treatment facility is operated as efficiently as possible, thus producing a mass discharge load less than the mass limit at flows less than design flow. This is especially important in this watershed, since controls on point source loading alone will not be sufficient to ensure attainment of water quality standards, and controls on nonpoint sources may lag behind treatment plant construction.

While the NHDES nitrogen loading reduction analysis is a year round analysis, EPA has opted not to include nitrogen limits for the timeframe of November through March because these months are not the most critical period for phytoplankton and macro algae growth. As noted earlier, EPA is imposing a condition requiring the permittee to

optimize nitrogen removal during the wintertime. The summer limits and the winter optimization requirements will serve to keep the annual discharge load low. In combination, the numeric limitations and the optimization requirements are designed to ensure that the discharge does not cause or contribute to violations of 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.

a. Background

1. Ecological Setting: Estuarine Systems Generally; Great Bay; Squamscott River

The Great Bay Estuary is composed of a network of tidal rivers, inland bays, and coastal harbors. The Estuary extends inland from the mouth of the Piscataqua River between Kittery, Maine and New Castle, New Hampshire to Great Bay proper. In all, estuarine tidal waters cover 17 square miles with 144 miles of tidal shoreline. Over forty New Hampshire communities are entirely or partially located within the coastal watershed. The estuary receives treated wastewater effluent from 18 publicly owned treatment works (14 in New Hampshire and 4 in Maine). Great Bay is one of only 28 "estuaries of national significance" under the National Estuary Program (NEP), which was established in 1987 by amendments to the Clean Water Act to identify, restore and protect estuaries along the coasts of the United States. The centerpieces of the estuary are Great Bay and Little Bay. Great Bay proper is a tidally-dominated, complex embayment on the New Hampshire-Maine border. Great Bay is unusual because of its inland location, more than five miles up the Piscataqua River from the ocean**.** It is a popular location for kayaking, birdwatching, commercial lobstering, recreational oyster harvesting, and sportfishing for rainbow smelt, striped bass, and winter flounder. Five tidal rivers discharge into Great Bay and Little Bay: the Winnicut, Squamscott (called the Exeter River above the tidal dam), Lamprey, Oyster, and Bellamy Rivers. Other parts of the Great Bay Estuary include the Upper Piscataqua River (fed by the Cocheco, Salmon Falls, and Great Works Rivers), the Lower Piscataqua River, Portsmouth Harbor, and Little Harbor/Back Channel.

The Great Bay Estuary is a tidally dominated embayment with estuarine waters covering approximately 17 square miles with 144 miles of shoreline. Tidal height ranges from 2.7 meters at the mouth of the estuary to 2.1 meters at the mouth of the Squamscott River. Because of strong tidal currents and mixing, vertical stratification of the estuary is limited. However partial stratification may occur during periods of intense freshwater runoff particularly at the upper tidal reaches of rivers entering the estuary. Observed flushing time for water entering the head of the estuary is 36 tidal cycles (18 days) during high river flow. (Jones, 2000)

The Squamscott River (called the Exeter River above the tidal dam) is one of five tidal rivers that discharge directly into Great Bay. The Squamscott River (below the tidal dam) drains a watershed covering approximately 20 square miles (NHDES(c), 2009) and includes all or portions of the towns of Exeter, Stratham, Newfields, and Newmarket. The Exeter River (above the tidal dam) drains a watershed covering approximately 107

square miles (NHDES, 2010) and includes the towns of Exeter, Hampton Falls, Kensington, East Kingston, Kingston, Hampstead, Sandown, Derry, Candia, Chester, Raymond, Fremont, Danville, and Brentwood.

The Exeter/Squamscott River watershed receives nitrogen loading from "non-point" sources (unregulated stormwater runoff and septic discharges entering surface waters through groundwater) and atmospheric deposition. Additionally, there are two wastewater treatment plants in the towns of Exeter and Newfields which discharge in the lower portion of the watershed and another in Brentwood that discharges seasonally into the upper watershed. The portion of the river which receives effluent from the Exeter and Newfields wastewater treatment plants is tidal.

Estuaries, especially large, productive ones like Great Bay, are extremely significant aquatic resources. An estuary is a partially enclosed coastal body of water located between freshwater ecosystems (lakes, rivers, and streams; freshwater and coastal wetlands; and groundwater systems) and coastal shelf systems where freshwater from the land measurably dilutes saltwater from the ocean. This mixture of water types creates a unique transitional environment that is critical for the survival of many species of fish, birds, and other wildlife. Estuarine environments are among the most productive on earth, creating more organic matter each year than comparably sized areas of forest, grassland, or agricultural land (EPA, 2001).

Maintaining water quality within an estuary is important for many reasons. Estuaries provide a variety of habitats such as shallow open waters, freshwater and saltwater marshes, sandy beaches, mud and sand flats, rocky shores, oyster reefs, tidal pools, and seagrass beds. Tens of thousands of birds, mammals, fish, and other wildlife depend on estuarine habitats as places to live, feed, and reproduce. Many species of fish and shellfish rely on the sheltered waters of estuaries as protected places to spawn. Moreover, estuaries also provide a number of recreational values such as swimming, boating, fishing, and bird watching. In addition, estuaries have an important commercial value since they serve as nursery grounds for two thirds of the nation's commercial fish and shellfish, and support tourism drawing on the natural resources that estuaries supply. (EPA, 1998). Consequently, EPA believes sound environmental policy reasons favor a pollution control approach that is both protective and undertaken expeditiously to prevent degradation of these critical natural resources.

Because estuaries are the intermediary between oceans and land, both of these geographic features influence their physical, chemical, and biological properties. In the course of flowing downstream through a watershed to an estuary, tributaries pick up materials that wash off the land or are discharged directly into the water by land-based activities. Eventually, the materials that accumulate in the tributaries are delivered to estuaries. The types of materials that eventually enter an estuary largely depend on how the land is used. Undisturbed land, for example, will discharge considerably fewer pollutants than an urban center or areas with large amounts of impervious cover. Accordingly, an estuary's overall health can be heavily impacted by surrounding land uses.

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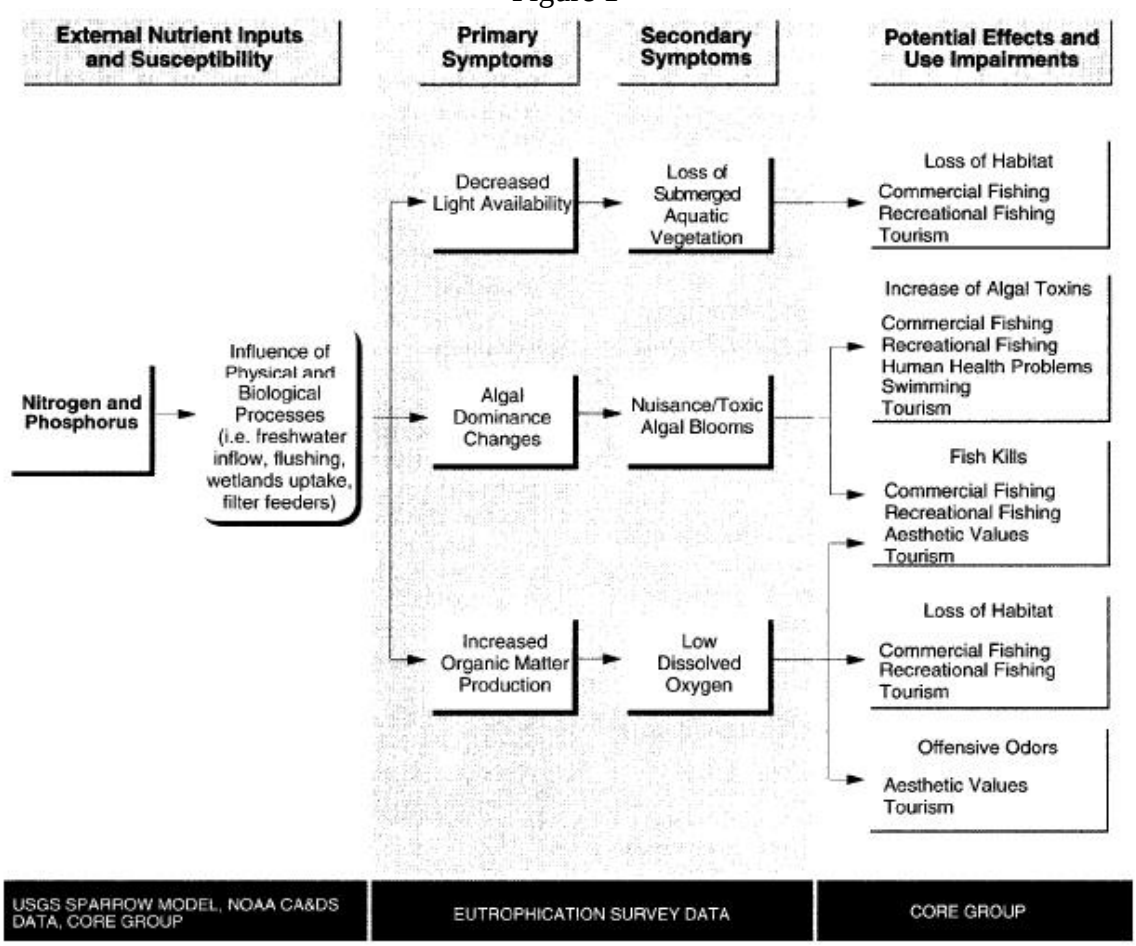
Unlike free-flowing rivers, which tend to flush out sediments and pollutants relatively quickly, an estuary will often have a lengthy retention period as up-estuary saltwater movement interacts with down-estuary freshwater flow (EPA, 2001). Estuaries are particle-rich relative to coastal systems and have physical mechanisms that tend to retain particles. These suspended particles mediate a number of activities (e.g., absorbing and scattering light, or absorbing hydroscopic materials such as phosphate and toxic contaminants). New particles enter with river flow and may be resuspended from the bottom by tidal currents and wind-wave activity. Many estuaries are naturally nutrient-rich because of inputs from the land surface and geochemical and biological processes that act as "filters" to retain nutrients within estuaries (EPA, 2001). Consequently, waterborne pollutants, along with contaminated sediment, may remain in the estuary for a long time, magnifying their potential to adversely affect the estuary's plants and animals.

2. Effects of Nutrients on Estuarine Water Quality

The basic cause of nutrient problems in estuaries and nearshore coastal waters is the enrichment of freshwater with nitrogen (N) and phosphorus (P) on its way to the sea and by direct inputs within tidal systems (EPA, 2001). EPA defines nutrient overenrichment as the anthropogenic addition of nutrients, in addition to any natural processes, causing adverse effects or impairments to beneficial uses of a waterbody. (EPA, 2001). Eutrophication is an aspect of nutrient overenrichment and is defined as an increase in the rate of supply of organic matter to a waterbody (EPA, 2001). Cultural eutrophication has been defined as the human-induced addition of wastes containing nutrients to surface waters that results in excessive plant growth and/or a decrease in dissolved oxygen. (Env-Wq 1702.15).

Increased nutrient inputs promote a progression of symptoms beginning with excessive growth of phytoplankton and macroalgae to the point where grazers cannot control growth (NOAA, 2007). Phytoplankton is microscopic algae growing in the water column and is measured by chlorophyll *a*. Macroalgae are large algae, commonly referred to as "seaweed." The primary symptoms of nutrient overenrichment include an increase in the rate of organic matter supply, changes in algal dominance, and loss of water clarity and are followed by one or more secondary symptoms such as loss of submerged aquatic vegetation, nuisance/toxic algal blooms and low dissolved oxygen. (EPA, 2001). In U.S. coastal waters, nutrient overenrichment is a common thread that ties together a diverse suite of coastal problems such as red tides, fish kills, some marine mammal deaths, outbreaks of shellfish poisonings, loss of seagrass and bottom shellfish habitats, coral reef destruction, and hypoxia and anoxia now experienced as the Gulf of Mexico's "dead zone." (EPA, 2001). Figure 1 shows the progression of nutrient impacts on a water body.

Figure 1



Source: EPA, 2001

Estuarine nutrient dynamics are complex and are influenced by flushing time, freshwater inflow and stratification, among other factors. The deleterious physical, chemical, and biological responses in surface water resulting from excessive plant growth impair designated uses in both receiving and downstream waterbodies. Excessive plant growth can result in a loss of diversity and other changes in the aquatic plant, invertebrate, and fish community structure and habitat. For example, losses of submerged aquatic vegetation (SAV), such as eelgrass, occur when light is decreased due to turbid water associated with overgrowth of algae or as a result of epiphyte growth on leaves (NOAA, 2007 and EPA, 2001). Excess nitrogen and phosphorus cause an increased growth of phytoplankton and epiphytes (plants that grow on other plants). Phytoplankton growth leads to increased turbidity, blocking light penetration, and epiphytic growth further blocks sunlight from reaching the SAV surface. When sunlight cannot reach SAV, photosynthesis decreases and eventually the submerged plants die. (State-EPA Nutrient Innovations Task Group, 2009). The loss of SAV can have negative effects on the

ecological functioning of an estuary and may impact some fisheries because the SAV beds serve as important habitat. Because SAV responds rapidly to water quality changes, its health can be an indicator of the overall health of the coastal ecosystem.

Nutrient-driven impacts on aquatic life and habitat are felt throughout the eutrophic cycle of plant growth and decomposition. Nutrient-laden plant detritus can settle to the bottom of a water body. In addition to physically altering the benthic environment and aquatic habitat, organic materials (*i.e.*, nutrients) in the sediments can become available for future uptake by aquatic plant growth, further perpetuating and potentially intensifying the eutrophic cycle.

Excessive aquatic plant growth, in addition, degrades aesthetic and recreational uses. Unsightly algal growth is unappealing to swimmers and other stream users and reduces water clarity. Decomposing plant matter also produces unpleasant sights and strong odors. Heavy growths of algae on rocks can make streambeds slippery and difficult or dangerous to walk on. Algae and macrophytes can interfere with angling by fouling fishing lures and equipment. Boat propellers and oars may also get tangled by aquatic vegetation.

When nutrients exceed the assimilative capacity of a water body, the ensuing eutrophic cycle can negatively impact in-stream dissolved oxygen levels. Through respiration, and the decomposition of dead plant matter, excessive algae and plant growth can reduce in-stream dissolved oxygen concentrations to levels that could negatively impact aquatic life. During the day, primary producers (*e.g.*, algae, plants) provide oxygen to the water as a by-product of photosynthesis. At night, however, when photosynthesis ceases but respiration continues, dissolved oxygen concentrations decline. Furthermore, as primary producers die, they are decomposed by bacteria that consume oxygen, and large populations of decomposers can consume large amounts of dissolved oxygen. Many aquatic insects, fish, and other organisms become stressed and may even die when dissolved oxygen levels drop below a particular threshold level.

Nutrient overenrichment of estuaries and nearshore coastal waters from human-based causes is now recognized as a national problem on the basis of Clean Water Act Section 305(b) reports from coastal States (EPA, 2001). Most of the nation's estuarine and coastal waters are moderately to severely polluted by excessive nutrients, especially nitrogen and phosphorus (NOAA, 2007; NOAA, 1999, EPA, 2006; EPA, 2004, EPA; and EPA, 2001).

3. Water Quality Standards Applicable to Squamscott River and Great Bay Estuary

Under New Hampshire Surface Water Quality Regulations, Chapter Env-Wq 1700 et seq. (NH Standards), surface waters are divided into water "use" classifications: Class A and B. RSA 485-A: 8; Env-Wq 1702.11. Great Bay and its tributaries have a water quality classification of B. Class B waters are designated as a habitat for fish, other aquatic life and wildlife and for primary (e.g., swimming) and secondary contact (e.g., fishing and boating) recreation. RSA 485-A: 8, II. Waters in this classification "shall have no

objectionable physical characteristics." *Id.* NH Standards also provide that the discharge of sewage or waste "shall not be inimical to aquatic life or to the maintenance of aquatic life in said waters." *Id.* All surface waters shall be restored to meet the water quality criteria for their designated classification including existing and designated uses, and to maintain the chemical, physical, and biological integrity of surface waters (Env-Wq 1703.01(b)).

Class B waters are subject to class-specific narrative and/or numeric water quality criteria. Env-Wq 1703.01 and 1703.04. With respect to nutrients, Env-Ws 1703.14(b) sets forth a class-specific criterion that prohibits in-stream concentrations of phosphorus or nitrogen in waters that would impair any existing or designated uses. Meanwhile, Env-Wq 1703.14(c) establishes a minimum level of treatment for phosphorus or nitrogen discharges that "encourage cultural eutrophication." Cultural eutrophication is, in turn, defined as "human-induced addition of wastes containing nutrients to surface waters which result in excessive plant growth and/or a decrease in dissolved oxygen." Env-Wq 1702.15. Such discharges must be treated to remove phosphorus or nitrogen to the extent required to ensure and maintain water quality standards. Env-Wq 1703.14(c).

Unless naturally occurring, Class B waters are also prohibited from containing benthic deposits that have a detrimental effect on the benthic community (Env-Wq 1703.08), as well as from having slicks, odors, or surface floating solids (Env-Wq 1703.12) or color in concentrations (Env-Wq 1703.10) that will impair any existing or designated uses. Class B waters also shall not contain turbidity more than 10 NTUs (nephelometric turbidity units) above naturally occurring conditions. See Env-Wq 1703.11. Class B waters, in addition, have a minimum dissolved oxygen saturation requirement of 75% (daily average), and an instantaneous minimum concentration requirement of at least 5 mg/l. See Env-Wq 1703.07(b).

Regardless of classification, NH Standards furthermore require that all surface waters meet certain general water quality criteria. See Env-Wq 1703.03 and 1703.04. All surface waters shall provide, wherever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters (Env-Wq 1703.01(c)). Furthermore, all surface waters must be "free of substances in kind or quantity" that:

a. Settle to form harmful deposits;
b. Float as foam, debris, scum, or other visible substances;
c. Produce odor, color, taste or turbidity which is not naturally occurring and would render it unsuitable for designated uses;
d. Result in dominance of nuisance species; or
e. Interfere with recreational activities.

Env-Wq 1703.03(c)(1)(a)-(e).

Finally, the 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. Differences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function. Env-Wq 1703.19(a), (b).

4. Receiving Water Quality Violations

Great Bay and many of the rivers that feed it are approaching, or in the case of the Squamscott River, have reached, their assimilative capacity for nitrogen and are suffering from the adverse water quality impacts of nutrient overenrichment, including cultural eutrophication. They are, consequently, failing to attain the many water quality standards described above. The impacts of excessive nutrients are evident throughout the Great Bay Estuary and the Squamscott River.

Section 303(d) of the Clean Water Act requires states to identify those waterbodies that are not expected to meet surface water quality standards after implementation of technology-based controls. As a result of the documented water quality impairments, portions of the Great Bay Estuary, including its tributaries, have been included on the State of New Hampshire's Section 303(d) list. According to "Amendment to the New Hampshire 2008 Section 303(d) List Related to Nitrogen and Eelgrass in the Great Bay Estuary" (NHDES(a), 2009), the Squamscott 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 assessments for dissolved oxygen, dissolved oxygen saturation, total nitrogen, and chlorophyll-a. All of these indicators except for the dissolved oxygen saturation indicator were categorized as impaired (Non Support) based on their individual criteria. The dissolved oxygen saturation indicator met the criteria for Fully Supporting. This discrepancy is explained by the large diurnal swings in dissolved oxygen that occur in the Squamscott River. These daily fluctuations cause violations of the daily minimum standard but not necessarily the daily average saturation. Such large diurnal swings are another indicator of eutrophication which is consistent with a Non Supporting classification for nitrogen for the Squamscott River. Therefore, following the decision matrix in Table 2 of the NHDES report, nitrogen concentrations in the Squamscott River were categorized as Non Supporting (Category 5-P) relative to preventing violations of the dissolved oxygen standard. (NHDES(a), 2009)

Relative to the Biological and Aquatic Community Integrity criteria as manifested by significant eelgrass loss (Env-Wq 1703.19), the Amendment to the Section 303(d) list explains that sufficient data were available for assessments for eelgrass assessments, total nitrogen, and water clarity. All of these indicators were categorized as impaired (Non Support) based on their individual criteria. There were no conflicting results between the

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indicators. Therefore, following the decision matrix in Table 2 of the NHDES report, nitrogen concentrations in the Squamscott River were categorized as Not Supporting (Category 5-P) relative to preventing significant eelgrass loss. (NHDES(a), 2009)

There can be only one category assigned to nitrogen for the Aquatic Life designated use. The lower (i.e., worse) category of the two was used in the Assessment Database. For this assessment zone, the lower category for nitrogen was the one for the protection of Biological and Aquatic Community Integrity. (NHDES(a), 2009)

Finally, the Amendment to the Section 303(d) list explains that the historic maps of eelgrass in the Squamscott River show 42.1 acres of habitat in 1948. Median eelgrass cover for the 2006-2008 period was 0 acres. Therefore, 100% of the eelgrass cover in this area has been lost. According to the Amendment, the exact date and cause of the eelgrass loss is unknown. Dredging is not a possible cause as the last channel dredge occurred in 1911 (USACE, 2005). There are no major mooring fields in this assessment zone. Per the assessment methodology, the Squamscott River should be considered impaired for significant eelgrass loss. The previous assessment by NHDES (NHDES, 2008b) came to the same conclusion. (NHDES(a), 2009)

These regulatory findings are consistent with a growing body of technical and scientific literature pointing toward an estuary in environmental decline as a result of nutrient overloading. In 1999, NOAA released the "National Estuarine Eutrophication Assessment: Effects of Nutrient Enrichment in the Nation's Estuaries," which undertook to comprehensively assess the scale, scope, and characteristics of nutrient enrichment and eutrophic conditions in the nation's estuaries. The assessment was based primarily on the results of the National Estuarine Eutrophication Survey, conducted by NOAA from 1992 to 1997, but was supplemented by information on nutrient inputs, population projections, and land use drawn from a variety of sources. It covers 138 estuaries, representing over 90 percent of the estuarine surface area of the coterminous United States. That report concluded that "By the year 2020, eutrophication symptoms are expected to worsen in about one-third of the systems, primarily due to increased nutrient inputs from population increases and the growth of the aquaculture industry. Of these estuaries, St. Croix River/Cobscook Bay, Great Bay, and Plum Island Sound are expected to worsen the most."(NOAA, 1999)

Additionally, NOAA's 1997 Estuarine Eutrophication Survey. Volume 3: North Atlantic Region noted, "In Great Bay, chlorophyll a concentrations range from low to high and turbidity from low to medium. Nuisance and toxic algal blooms have an impact on biological resources in subareas of the mixing and seawater zones. Nitrogen and phosphorus concentrations are medium. There are no observations of anoxia, however hypoxia is reported in small subarea of the mixing zone. SAV coverage ranges from very low to high." (NOAA, 1997). A decade later, NOAA concluded "In Great Bay, increases in dissolved inorganic nitrogen have occurred over the past 20 years. Increases in chlorophyll a and turbidity have been identified with augmented eutrophication in the inner estuary. As a result, eelgrass biomass has declined by 70% in the last 10 years and the occurrence of nuisance macroalgae is becoming more evident. Primary symptoms are

high but problems with more serious secondary symptoms are still not being expressed. Nutrient related symptoms observed in the estuary are likely to substantially worsen." (NOAA 2007).

In addition to federal agencies, individual NEPs, including the Piscataqua Region Estuaries Partnership, have collected, compiled and analyzed monitoring data to produce a "State of the Bay" report (typically issued every 3-5 years). These NEP "State of the Bay" reports are critical because they depict status and trends in the estuaries' environmental conditions. To gauge an estuary's health, each NEP develops environmental indicators — "specific, measurable markers that help assess the condition of the environment and how it changes over time." (NHEP, 2003) The environmental indicators relating to excessive levels of nutrients include dissolved oxygen, total nitrogen, and eelgrass.

The Piscataqua Region Estuaries Partnership has released three State of the Estuary Reports, each of which detail, a trend of increasingly concerning nitrogen impairments in Great Bay Estuary.

In its 2003 report, the Partnership noted, "Despite the increasing concentrations of nitrate+nitrite in the estuary, there have not been any significant trends for the typical indicators of eutrophication: dissolved oxygen and chlorophyll-a concentrations. Therefore, the load of nitrate+nitrite to the bay appears to have not yet reached the level at which the undesirable effects of eutrophication occur."[2]

The 2006 report concluded that "more indicators suggest that the ecological integrity of the estuaries is under stress or may soon be heading toward a decline." It observed that "Dissolved oxygen concentrations consistently fail to meet state water quality standards in the tidal tributaries to the Great Bay Estuary." Additionally, the report cautioned, "Nitrogen concentrations in Great Bay have increased by 59 percent in the past 25 years. Negative effects of excessive nitrogen, such as algae blooms and low dissolved oxygen levels, are not evident. However, the estuary cannot continue to receive increasing nitrogen levels indefinitely without experiencing a lowering of water quality and ecosystem changes."

Most recently, in its 2009 report, eleven of 12 environmental indicators show negative or cautionary trends – up from seven indicators classified this way in 2006. According to the 2009 report, total nitrogen is increasing and eelgrass is decreasing within the estuary. The total nitrogen load to the Great Bay Estuary has increased by 42% in the last five years. In Great Bay, the concentrations of dissolved inorganic nitrogen, a major component of total nitrogen, have increased by 44 percent in the past 28 years. Eelgrass

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[2] An earlier report—The State of New Hampshire's Estuaries (New Hampshire Estuary Project, 2000) indicates that declining water quality, in part due to nutrient overloading, has been a concerning trend for a decade or more.

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cover in Great Bay has declined by 37% between 1990 and 2008 and has disappeared from the tidal rivers, Little Bay, and the Piscataqua River. Dissolved oxygen is currently exhibiting a cautionary trend. While dissolved oxygen standards are rarely violated in the bays and harbors they are often violated in the tidal rivers. The negative effects of the increasing nutrient loads on the estuary system are evident in the decline of water clarity, eelgrass habitat loss, and failure to meet water quality standards for dissolved oxygen concentrations in tidal rivers (PREP, 2009).

According to the report, the most pressing threats to the estuaries relate to population growth and the associated increases in nutrient loads and non-point source pollution (PREP, 2009). Watershed-wide development has created new impervious surfaces at an average rate of nearly 1,500 acres per year. In 2005, there were 50,351 acres of impervious surfaces in the watershed, which is 7.5 percent of the watershed's land area. Nine of the 40 sub watersheds contained over 10 percent impervious cover, indicating the potential for degraded water quality and altered storm water flow. Land consumption per person, a measure of sprawling growth patterns, continues to increase. (PREP, 2009)

Studies by NHDES have also reported evidence of eutrophication due to excessive nitrogen input, including elevated levels of chlorophyll *a* and low levels of dissolved oxygen (NHDES(a), 2009), as well as evidence of increases in nuisance seaweeds and macro-algae (NHDES(b), 2009). As illustrated in the figures below, nitrogen concentrations have increased, water clarity has declined, and substantial quantities of eelgrass have been lost.

Figure 2 shows the gradient of total nitrogen concentrations in Great Bay. Total nitrogen concentrations are highest in the upper parts of the estuary and decline towards the mouth. Corresponding to the trend of total nitrogen concentrations, the greatest losses of eelgrass are being found in the upper parts of the estuary, with decreasing impacts towards the lower portions. Also, the highest levels of chlorophyll *a* and the greatest number of dissolved oxygen criteria violations are experienced in the upper reaches of the estuary where the highest levels of total nitrogen are present.

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FIGURE 2: GRADIENT OF NITROGEN CONCENTRATIONS

(Bars indicate range of 10th-90th percentile of samples; dark line indicates median value)

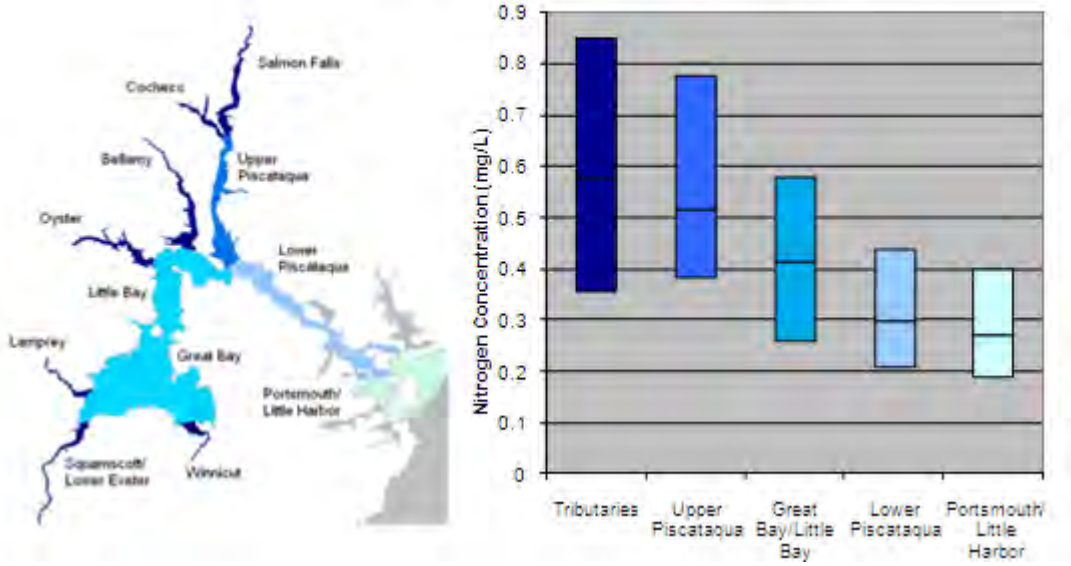
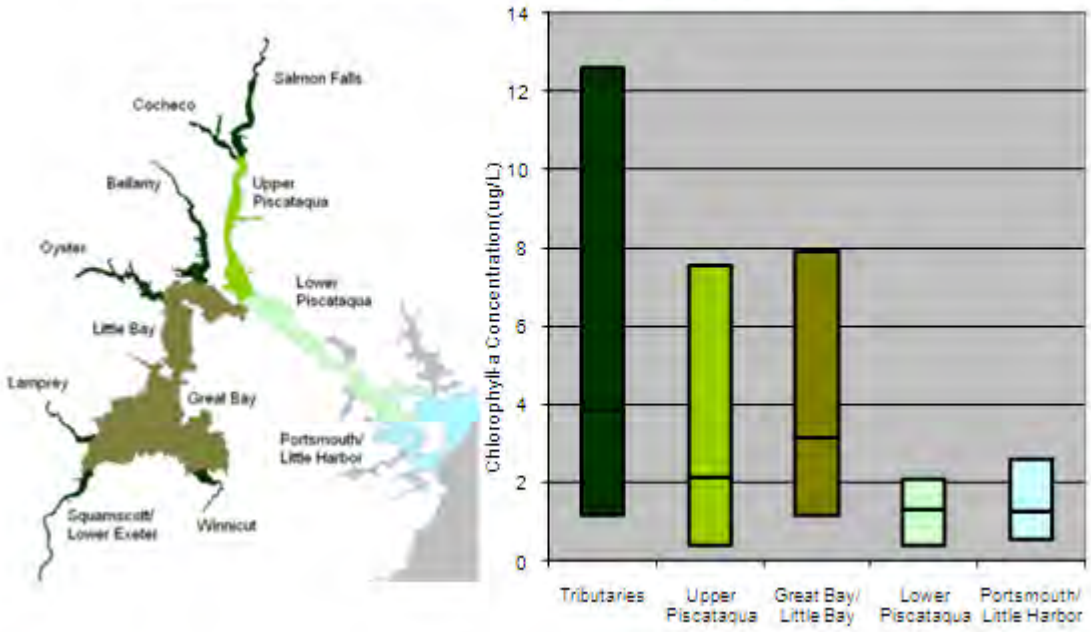


Figure 3 shows the gradient of chloroplyll *a* concentrations in Great Bay. With increasing algal blooms the clarity of the water decreases and this can promote the growth of epiphytes and macroalgae species on and around eelgrass (Burkholder, et al, 2007). Increased levels of algae can also have effects on dissolved oxygen concentrations in the water column. During the day, algae produce oxygen, however in the evenings respiration takes place and depletes dissolved oxygen levels.

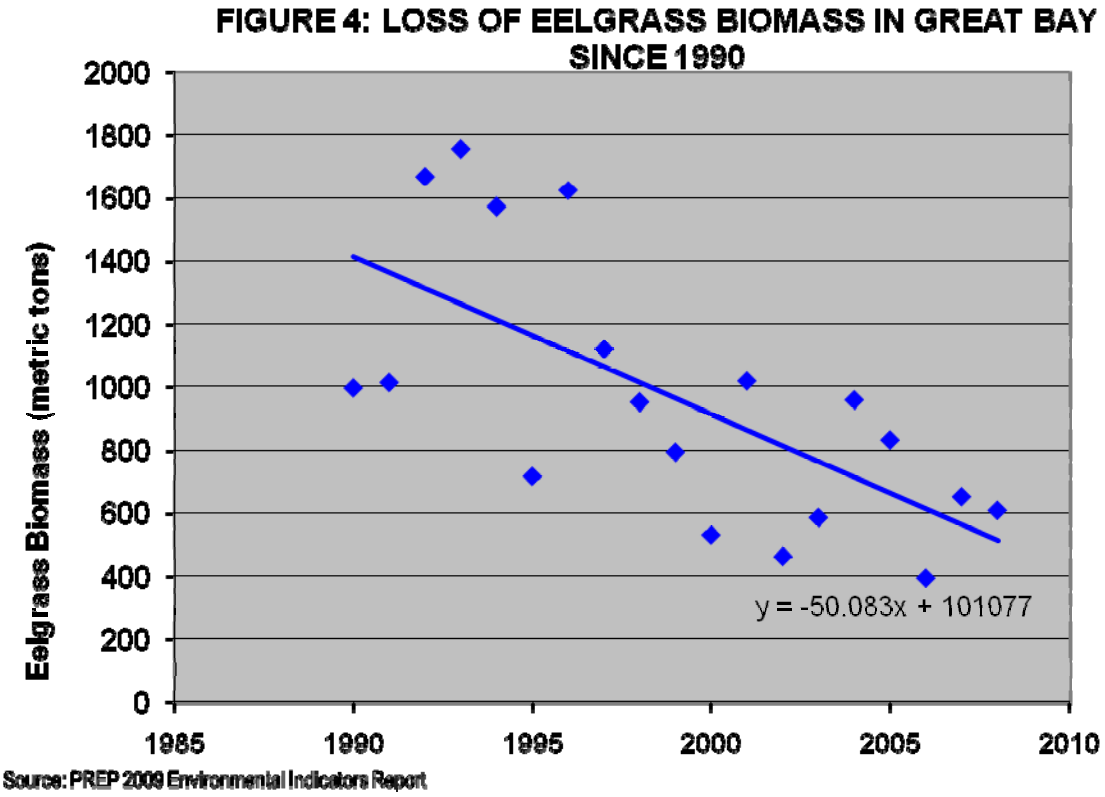
FIGURE 3: GRADIENT OF CHLOROPHYLL-A CONCENTRATIONS

(Bars indicate range of 10th-90th percentile of samples; dark line indicates median value)



Elevated nitrogen concentrations can negatively affect seagrasses in direct and indirect ways. Elevated concentrations of nitrate and ammonia have been shown to have direct impacts by disrupting the normal physiology of eelgrass. This disruption of normal physiology leads to reduced growth, reduced disease resistance and mortality (Short and Burdick, 1996, Burkholder et al. 2007). Eelgrass has evolved over time in an environment of low nitrogen availability. Thus, it never developed a positive feedback mechanism to stop or reduce the absorption of available nitrogen. The plants will continually absorb nitrogen and use the molecules to build proteins. Protein synthesis requires carbon and without an off switch for this process, plants exposed to elevated concentrations of nitrogen can exhaust their carbon reserves. The exhaustion of carbon reserves results in plant mortality. Burkholder et al. (2007) reported significant mortality rates (75-95% shoot die-off compared to controls) in plants exposed to nitrate concentrations of <0.05 mg/l nitrate-N. Nitrate concentrations currently exceed this threshold concentration that can cause direct adverse impacts to eelgrass. For example, the median concentration of nitrate at Chapman's Landing in the Squamcott River is 0.165 mg/l nitrate – N (NHDES(b), 2009).

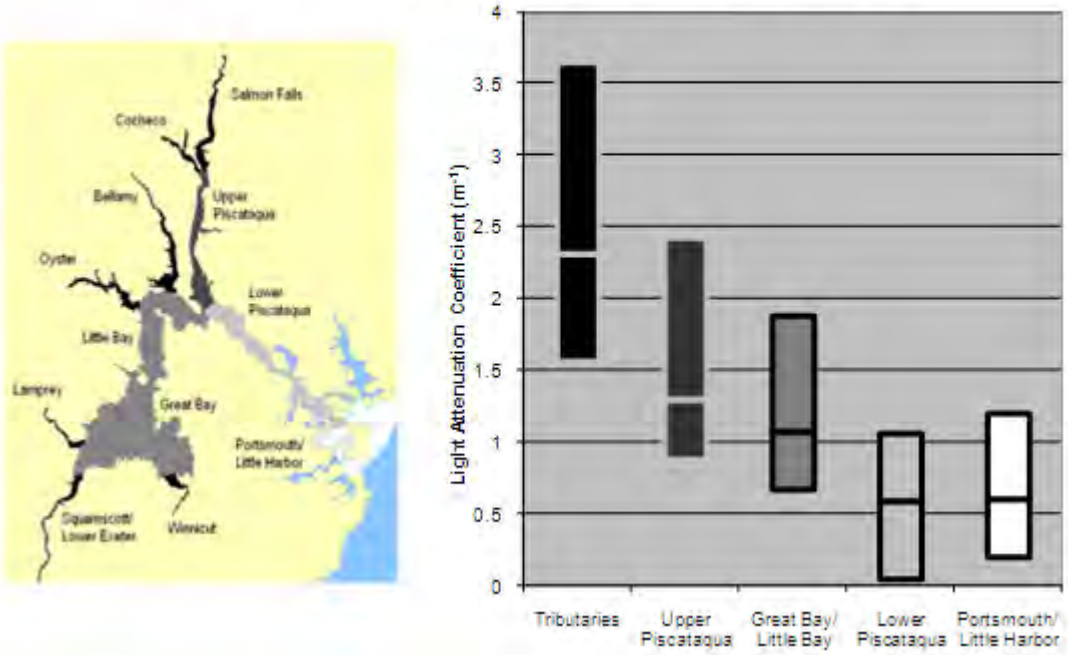
Nitrogen and eelgrass trends in the Great Bay Estuary appear to bear out this relationship. As nitrogen levels have been increasing throughout the estuary for a number of years, eel grass has been also declining (both total acreage and biomass). Dissolved inorganic nitrogen concentrations have increased by 44 percent in the last 28 years (PREP, 2009). See Figure 4.



Nitrogen can indirectly affect eelgrass by negatively impacting light transmission through the water column. Elevated nitrogen concentrations have been implicated in many locations with increased phytoplankton concentrations, proliferation of macroalgae and increased epiphytic load on the plants themselves. All of these outcomes reduce the amount of light making it to the plants, resulting in reduced shoot density, production, growth, depth penetration and mortality. The specific concentrations that trigger these impacts are somewhat waterbody specific, but generally range from 0.2-0.5 mg/l total nitrogen (Burkholder et al. 2007, MADEP/SMAST, 2003). Figure 5 shows the gradient of light attenuation in Great Bay.

FIGURE 5: GRADIENT OF LIGHT ATTENUATION

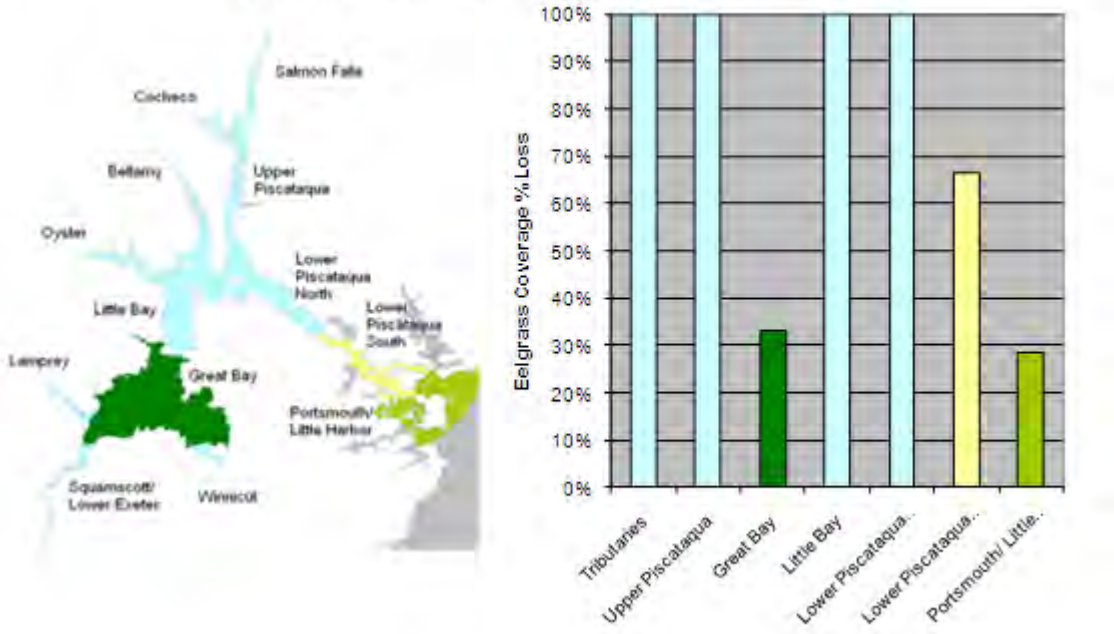
(Bars indicate range of 90th-10th percentile of samples; dark line indicates median value)



* The light attenuation coefficient quantifies the rate at which light intensity is lost per meter of depth as a result of all absorbing and scattering components of the water column. The light attenuation of clear water is 0.1 meter.

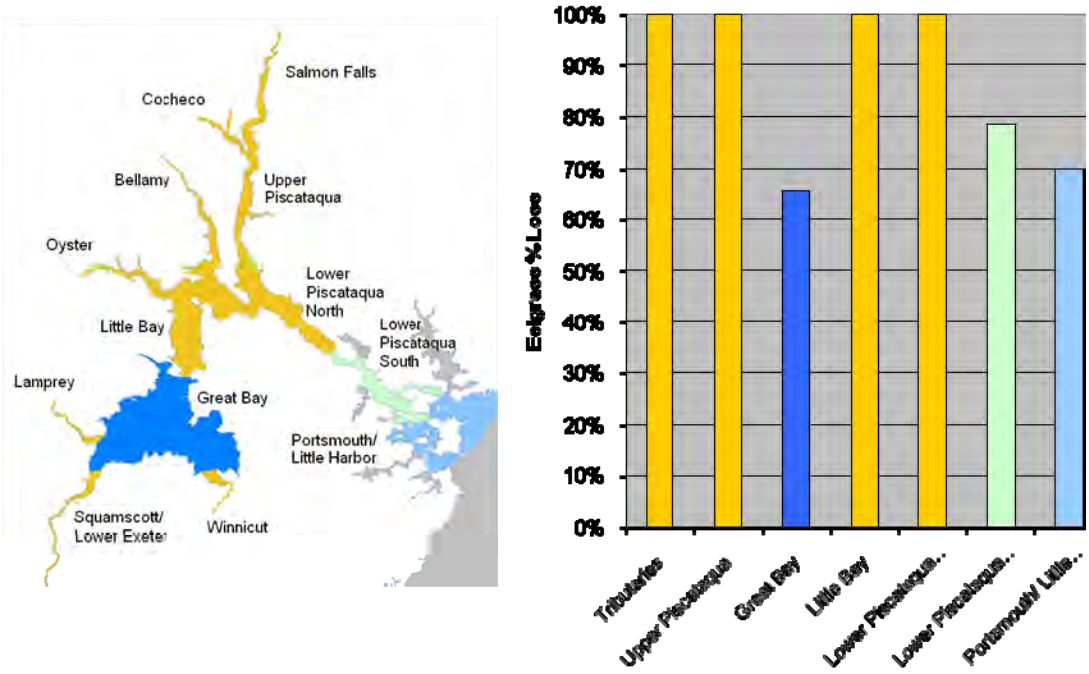
The Great Bay Estuary and its tributaries have experienced dramatic declines in eelgrass coverage in combination with rising water column concentrations of nitrogen and suspended solids. The Squamscott, Lamprey, Oyster, Bellamy and upper Piscataqua rivers in addition to Little Bay have lost 100% of their historical eelgrass habitats (NHDES(a), 2009). Eelgrass cover in Great Bay has declined by 37 % between 1990 and 2008 (PREP, 2009). Figure 6 shows the loss of eelgrass coverage in Great Bay.

FIGURE 6: LOSS OF EELGRASS COVERAGE IN THE GREAT BAY ESTUARY
(Percent loss from peak annual values from 1990 to 2008 values)



Great Bay eelgrass biomass has experienced an even more significant decline than eelgrass cover. Biomass is simply a measurement of the weight of eelgrass per unit area and is one parameter that scientists use to assess the health of a given eelgrass meadow. Between 1990 and 2008, the eelgrass biomass in Great Bay has declined by 64 percent (PREP, 2009). Healthy eelgrass beds perform a wide range of ecological functions including providing critical spawning and nursery habitat for a wide range of fish and shellfish, eelgrass roots and rhizomes stabilize sediments, the meadows reduce coastal erosion, and the plants are important primary producers contributing significant quantities of carbon to the estuarine food web (Thayer, et. al. 1984). The loss of eelgrass biomass results in the impairment of the functions that are provided by healthy eelgrass beds (Evans and Short, 2005; Fonseca, et. al. 1990). Figure 7 shows the loss of eelgrass biomass in Great Bay.

FIGURE 7: LOSS OF EELGRASS BIOMASS IN THE GREAT BAY ESTUARY
(Percent loss from peak annual values from 1990 to 2008 values)



Source: PREP 2009 Environmental Indicators Report

With respect to dissolved oxygen, the bays and harbors within the Great Bay Estuary generally meet the minimum dissolved oxygen standard of 5 mg/l. However, this standard is often violated in the tidal rivers (PREP 2009). For the "Amendment to the New Hampshire 2008 Section 303(d) List Related to Nitrogen and Eelgrass in the Great Bay Estuary" produced by the NHDES, dissolved oxygen measurements from the Squamscott River were analyzed for 530 days. The minimum dissolved oxygen criteria of 5.0 mg/l was violated on 52 days (9.8% of the time) (NHDES(a), 2009).

The Squamscott River has lost 100% of its eelgrass cover. The last documented amount of eelgrass cover in the Squamscott was 42.1 acres in 1948 (NHDES(a), 2009). An aerial survey for eelgrass conducted in 1981 did not detect any eelgrass in the Squamscott River.

5. Reasonable Potential Analysis and Effluent Limit Derivation

Pursuant to 40 C.F.R. § 122.44(d)(1), NPDES permits must contain any requirements in addition to technology-based limits necessary to achieve water quality standards established under Section 303 of the CWA, including state narrative criteria for water quality. In addition, limitations "must control any pollutant or pollutant parameter (conventional, non-conventional, or toxic) that the Director has determined are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any water quality standard, including State narrative criteria for water quality" (40 C.F.R. § 122.44(d)(1)(i)). An excursion occurs if the actual or projected instream data exceeds any numeric or narrative water quality criterion.

In determining whether a discharge causes or has the reasonable potential to cause or contribute to an excursion above a narrative or numeric criterion within a State water quality standard, EPA considers: (1) existing controls on point and non-point sources of pollution; (2) the variability of the pollutant or pollutant parameter in the effluent; (3) the sensitivity of the species to toxicity testing; (4) where appropriate, the dilution of the effluent in the receiving water; and (5) the statistical approach outlined in the *Technical Support Document for Water Quality-based Toxics Control, Section 3* (USEPA, March 1991 [EPA/505/2-90-001]) (see also 40 CFR § 122.44(d)(1)(ii)). In accordance with New Hampshire's Water Quality Standards (RSA 485-A:8 VI, Env-Wq 1705.02(c)), available dilution for tidal waters is equivalent to the conditions that result in a dilution that is exceeded 99% of the time.

Numeric total nitrogen criteria have not yet been adopted into the State of New Hampshire Water Quality Standards. EPA relies therefore on existing narrative criteria to establish effluent permit limitations. When developing an effluent limitation to implement a narrative water quality standard, EPA regulations direct the Agency (in relevant part) to use one or more of the following methodologies:

A. Establish 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. Such criterion may be derived using a proposed State criterion, or an explicit policy or regulation interpreting its narrative water quality criterion, supplemented with other relevant information which may include: EPA's Water Quality Standards Handbook, October 1983, risk assessment data, exposure data, information about the pollutant from the Food and Drug Administration, and current EPA criteria documents; or

B. Establish effluent limits on a case-by-case basis, using EPA's water quality criteria, published under Section 304(a) of the CWA, supplemented where necessary by other relevant information[.]

40 C.F.R. §§ 122.44(d)(1)(vi)(A), (B). EPA is authorized to base its permitting decision on a wide range of relevant material, including EPA technical guidance, state policies applicable to the narrative water quality criterion, and site-specific studies.

EPA's Nutrient Criteria Technical Guidance Manual – Estuarine and Coastal Marine Waters (EPA, 2001) indicates that dissolved inorganic nitrogen should be less than 0.15 mg/l in order to protect submerged aquatic vegetation. The guidance also explains that 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 Massachusetts Department of Environmental Protection (MADEP) 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 (MADEP/SMAST, 2003). For selected waterbodies, the State of Delaware has adopted a dissolved inorganic nitrogen criteria of 0.14 mg/l as N. This criterion is for the protection of submerged aquatic vegetation and is applicable from March 1 through October 31 (State of Delaware, 2004).

The aquatic life use support criteria proposed by NHDES are consistent with EPA, Massachusetts', and Delaware's guidance. The New Hampshire Department of Environmental Services recently completed a report recommending numeric nitrogen criteria for the Great Bay Estuary (Numeric Nutrient Criteria for the Great Bay Estuary, June 2009). The recommended criteria are for the designated uses of Primary Contact Recreation and Aquatic Life Use Support. As explained in the Amendment to the New Hampshire 2008 Section 303(d) List Related to Nitrogen and Eelgrass in the Great Bay Estuary (NHDES(a), 2009), the numeric nutrient criteria developed by NHDES are "considered numeric translators for the narrative criteria." For the Squamscott River, for aquatic life use support, the proposed total nitrogen criterion for maintaining dissolved oxygen levels is 0.45 mg/l and for maintaining eelgrass habitats is 0.30 mg/l.

Discharges from the Exeter POTW clearly have the reasonable potential to contribute to water quality standards violations based on existing receiving water conditions (accounting for background and available dilution) and the foregoing in-stream targets.

The Squamscott River and the Great Bay Estuary have reached their assimilative capacity for nutrients. Nitrogen enrichment has reached a level where it is adversely affecting the chemical, physical, and biological integrity of the receiving waters. As mentioned, according to "Amendment to the New Hampshire 2008 Section 303(d) List Related to Nitrogen and Eelgrass in the Great Bay Estuary" (NHDES(a), 2009), the Squamscott River is impaired for dissolved oxygen, as indicated by chlorophyll *a*, nitrogen, and instream dissolved oxygen monitoring, and is impaired for biological and aquatic community integrity, as indicated by estuarine bioassessments for eelgrass, light attenuation coefficient, and nitrogen.

The nitrogen and chlorophyll *a* values measured in the Squamscott River are among the highest seen in the Great Bay Estuary. In Great Bay and Little Bay the median total nitrogen levels are 0.42 and 0.41 mg/l, respectively. The median chlorophyll *a* levels are 3.36 and 2.96 ug/l, respectively (chlorophyll *a* ranges are 0.17 – 24.66 ug/l for Great Bay and 0.11 – 13.69 ug/l for Little Bay) (NHDES(b), 2009). By contrast, Portsmouth Harbor, Little Harbor/Back Channel and Sagamore Creek, located in the lower portion of the estuary, have median total nitrogen levels of 0.29, 0.25, and 0.19 mg/l, respectively. The median chlorophyll *a* levels are 1.53, 0.98, and 0.80 ug/l, respectively (chlorophyll *a* ranges are 0.20 – 5.25 ug/l for Portsmouth Harbor, 0.08 – 10.00 ug/l for Little Harbor/Back Channel, and 0.63 – 1.60 ug/l for Sagamore Creek) (NHDES(b), 2009).

For the development of *Numeric Nutrient Criteria for the Great Bay Estuary* report (NHDES(b), 2009), all available water quality data for the Squamscott River collected between 2000 and 2008 were analyzed by NHDES. The median total nitrogen

concentration in the river was 0.75 mg/l. The median chlorophyll *a* was 6.8 ug/l with range of 0.20 - 106 ug/l.

A summary of median total nitrogen and chlorophyll *a* data for Squamscott River, Great Bay, Little Bay, Portsmouth Harbor, Little Harbor/Back Channel, and Sagamore Creek is provided below in Table 1. Each of these areas with the exception of Portsmouth Harbor has been placed on the 303(d) list due to significant eelgrass loss. Eelgrass in Portsmouth Harbor has been experiencing a declining trend and is currently classified on the 303(d) list as threatened.

Additionally, Portsmouth Harbor is on the 303(d) list for light attenuation coefficient and nitrogen affecting the biological and aquatic community integrity. Great Bay, Little Bay, and Little Harbor Back Channel are on the 303(d) list for light attenuation coefficient and total nitrogen affecting the biological and aquatic community integrity, and Great Bay also is also on the 303(d) list for dissolved oxygen concentration impairments.

TABLE 1				
Location	Total Nitrogen (mg/l)	Total Nitrogen Range (mg/l)	Chlorophyll *a* (ug/l)	Chlorophyll *a* Range (ug/l)
Squamscott River	0.75	0.35 – 1.9	6.75	0.20 – 106
Great Bay	0.42	0.20 – 1.06	3.36	0.17 – 24.66
Little Bay	0.41	0.15 – 1.09	2.96	0.11 – 13.69
Portsmouth Harbor	0.29	0.15 – 0.49	1.53	0.20 – 5.25
Little Harbor/Back Channel	0.25	0.15 – 0.94	0.98	0.08 – 10.00
Sagamore Creek	0.19	0.17 – 1.50	0.80	0.63 – 1.60

The average total nitrogen concentration from the Exeter discharge from February – November 2008 was 14.434 mg/l. The average discharge flow for this time period was 2.11 mgd resulting in an average total nitrogen discharge load of 254 lbs/day (46 tons/yr) (New Hampshire Estuaries Project, 2008). At the design flow of 3.0 mgd the total nitrogen discharge load would be 361 lbs/day (66 tons/yr).

The increase in receiving water total nitrogen concentration currently caused by the Exeter treatment plant at the point of discharge can be estimated by dividing the effluent concentration by the dilution factor. At a discharge concentration of 14.434 mg/l and a dilution factor of 25.2 (see the basis for the dilution factor in the original fact sheet) the resulting receiving water concentration after initial mixing is 0.57 mg/l, which exceeds the target instream concentration of 0.3 mg/l. Since this value only represents the <u>increase</u> in receiving water total nitrogen concentration due to the discharge, the actual receiving water concentration at the point of discharge would be the sum of the existing background plus the increase caused by the discharge. Instream data collected upstream

of the tidal dam on the Exeter River, upstream of and uninfluenced by the Exeter discharge, shows that median total nitrogen concentration in the Exeter River is 0.46 mg/l (PREP, 2010 and 2009) which also exceeds the target instream concentration of 0.3 mg/l.

At the proposed total nitrogen effluent limit of 3 mg/l, the estimated increase in receiving water concentration at the point of discharge would be 0.12 mg/l (3/25.2), which is less than the proposed total nitrogen instream target of 0.3 mg/l. However, in order to achieve the target of 0.3 mg/l at the point of discharge significant reductions of nonpoint source loadings of total nitrogen would need to occur.

Significant nitrogen loading reductions from municipal wastewater treatment facilities, in addition to large reductions in non-point sources, are clearly necessary to reverse the trend of declining water quality in the Great Bay Estuary and achieve the ambient nitrogen level targets for protection of aquatic life, including eelgrass habitats.

The permit contains a monthly average total nitrogen discharge limit of 3.0 mg/l for April through October and a mass limit of 75 lbs/day based on the concentration limit and the design flow of the treatment facility. Consistent with the commenter's recommendation, EPA has determined that an initial effluent limitation equal to the limit of technology is appropriate. Additionally, because of the considerable non-point source loads to the Great Bay Estuary watershed, EPA will track efforts to reduce these sources as described later in the fact sheet. (Technology thresholds for nitrogen treatment are typically considered to be 8.0 mg/l total nitrogen for a basic denitrification process, 5.0 mg/l for intermediate levels of denitrification and 3.0 mg/l for advanced levels of denitrification (Chesapeake Bay Program, 2002); the limit of technology for nitrogen treatment is often considered to be 3.0 mg/l. (EPA, 2008)). Additionally, the permit requires that the treatment facility be operated to optimize the removal of total nitrogen during the months of November through March, using all available treatment equipment at the facility. The addition of a carbon source that may be necessary in order to meet the total nitrogen limit during the months of April through October is not required during the months of November through March.

The 3.0 mg/l total nitrogen limit will not cause or contribute to a water quality standards violation, including those parameters identified in the approved Section 303(d) list related to dissolved oxygen and aquatic habitat (eelgrass), in the Great Bay Estuary, provided achievement of the 3.0 mg/1 effluent limitation occurs in conjunction with non-point source and storm water point source reductions within the subwatershed. As previously stated, the total nitrogen criteria proposed by NHDES for aquatic life use support are 0.45 mg/l for maintaining dissolved oxygen and 0.30 mg/l for maintaining eelgrass habitats (NHDES(b), 2009). Since eelgrass was present in the Squamscott River, the applicable total nitrogen criteria to ensure its recovery is 0.30 mg/l. From 2000 to 2008, the median total nitrogen concentration in the Squamscott River was 0.75 mg/l (NHDES(b), 2009) which is significantly higher than the recommended criterion of 0.30 mg/l for the protection of eelgrass habitats. The total nitrogen level for the protection of eelgrass of 0.39 mg/l TN used by the MADEP is exceeded. Additionally, the dissolved inorganic nitrogen threshold of 0.15 mg/l cited in EPA's Nutrient Criteria Technical Guidance

Manual – Estuarine and Coastal Marine Waters and the dissolved inorganic nitrogen water quality standard for the State of Delaware of 0.14 mg/l are also exceeded (the median dissolved organic nitrogen concentration at Chapman's Landing from 2000 – 2008 is 0.29 mg/l (NHDES(b), 2009)).

The necessary magnitude of non-point source and storm water point source reductions has been estimated by the NHDES on an aggregate basis in its report entitled "Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed" (NHDES, 2010). For each of the watersheds draining to the Great Bay Estuary, NHDES has proposed watershed nitrogen loading thresholds and percent reduction targets that are expected to result in attainment of water quality standards. The thresholds are based on an analytical, steady state watershed nitrogen loading model that predicts the flushing effect of freshwater and ocean water and thus the total nitrogen load that could be discharged and meet criteria. The average nitrogen loading threshold for the Exeter/Squamscott River watershed that protects all designated uses is a total nitrogen load of 87.8 tons per year while the current total nitrogen load is estimated to be 211.5 tons per year on average (44.3 tons per year point source and 167.3 tons per year non-point source). A 58% reduction in the total load is required to meet applicable criteria in the Exeter/Squamscott River watershed.

Achieving the necessary non-point source and storm water point source reductions will require collaboration between the State of New Hampshire and numerous public, private and commercial watershed stakeholders to: (1) complete total maximum daily load analyses, (2) complete analyses of the costs for controlling these sources, and (3) develop control plans that include:

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

Following issuance of the final permit, EPA will review the status of the activities described in (1), (2), and (3) above at 12-month intervals from the date of issuance. In the event the activities described above are not carried out in accordance with this section within the timeframe of the permit (5 years), EPA will reopen the permit and incorporate any more stringent total nitrogen limit required to assure compliance with applicable water quality standards.

VI. State Certification Requirements

The staff of the New Hampshire Department of Environmental Services has reviewed the partially revised draft permit. EPA has requested permit certification by the State pursuant to CWA §401(a)(1) and 40 CFR § 124.53 and expects that the draft permit, as revised, will be certified.

VII. Comment Period, Public Hearing Requests, and Procedures for Final Decisions

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period to:

Dan Arsenault
U.S. Environmental Protection Agency
5 Post Office Square, Suite 100-CMP
Boston, MA 02109-3912
Phone: (617) 918-1562
Fax: (617) 918-0562

In accordance with 40 CFR § 124.14(c), comments filed during the reopened comment period shall be limited to the "substantial new questions that caused its reopening," which in this case pertains only to the implementation of effluent limitations and conditions for the control of total nitrogen from the facility.

The Regional Administrator has determined, pursuant to 40 CFR § 124.12, that a significant degree of public interest exists in the proposed permit and that a public hearing should be held. In reaching a final decision on the draft permit, the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the comment period, and after the public hearing, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice. Permits may be appealed to the Environmental Appeals Board in the manner described at 40 CFR § 124.19.

VIII. EPA Contact

Additional information concerning the draft permit may be obtained between the hours of 9:00 A.M. and 5:00 P.M., Monday through Friday, excluding holidays from:

Dan Arsenault
U.S. Environmental Protection Agency
5 Post Office Square, Suite 100-CMP
Boston, MA 02109-3912
Phone: (617) 918-1562
Fax: (617) 918-0562

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3/22/2011

Date:

Stephen S. Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

References

Burkholder, JA, D.A. Tomasko, and B.W. Touchettte. 2007. Seagrasses and eutrophication. *Journal of Experimental Maine Biology and Ecology*. 350:47-72.

Chesapeake Bay Program – The Nutrient Reduction Technology Task Force, A Stakeholder Group of the Chesapeake Bay Program. 2002. Nutrient Reduction Technology Cost Estimations for Point Sources in the Chesapeake Bay Watershed. Chesapeake Bay Program. November 2002.

Environmental Protection Agency. 1998. Coastal Watershed Factsheets – Estuaries and Your Coastal Watershed. U.S. Environmental Protection Agency, Office of Water, EPA 842-F-98-009. July 1998.

Environmental Protection Agency. 2001. Nutrient Criteria Technical Guidance Manual, Estuarine and Coastal Marine Waters. U.S. Environmental Protection Agency, Office of Water, EPA 822-B-01-003. October 2001.

Environmental Protection Agency. 2006. National Estuary Program Coastal Condition Report. U.S. Environmental Protection Agency, Office of Water/Office of Research and Development. EPA 842/B-06/001. June 2007.

Environmental Protection Agency. 2004. National Coastal Condition Report II. U.S. Environmental Protection Agency, Office of Water/Office of Research and Development. EPA 620/R-03/002. December 2004.

Environmental Protection Agency. 2001. National Coastal Condition Report. U.S. Environmental Protection Agency, Office of Water/Office of Research and Development. EPA 620/R-01/005. September 2001.

Environmental Protection Agency. 2008. Municipal Nutrient Removal Technologies Reference Document, Volume 1 – Technical Report. U.S. Environmental Protection Agency, Office of Wastewater Management, Municipal Support Division, Municipal Technology Branch, EPA 832-R-08-006. September 2008.

Evans, N.T. and F.T. Short. 2005. Functional Trajectory Models for Assessment of Transplant Development of Seagrass, *Zostera marina* L., Beds in the Great Bay Estuary, NH, USA. Estuaries 28: 936-947.

Fonseca, M.S., W.J. Kenworthy, D.R. Colby, K.A. Rittmaster, and G.W. Thayer. Comparisons of Fauna Among Natural and Transplanted Eelgrass *Zostera marina* Meadows: Criteria for Mitigation. Mar. Ecol. Prog. Ser. 65: 251-264.

Jones, Stephen H. 2000. A Technical Characterization of Estuarine and Coastal New Hampshire. New Hampshire Estuaries Project. 2000.

Massachusetts Department of Environmental Protection, UMASS-Dartmouth School for Marine Science and Technology. 2003. Massachusetts Estuaries Project: Site-Specific Nitrogen Thresholds for Southeastern Massachusetts Embayments: Critical Indicators Interim Report. Massachusetts Department of Environmental Protection. July 21, 2003. Revised September 16, 2003 and December 22, 2003.

National Oceanic and Atmospheric Administration (NOAA). 2007. Effects of Nutrient Enrichment in the Nations Estuaries: A Decade of Change. NOAA Coastal Ocean Program Decision Analysis Series No. 26. National Centers for Coast Ocean Science, Silver Spring, MD. 2007

National Oceanic and Atmospheric Administration (NOAA). 1997. NOAA Estuarine Eutrophic Survey. Volume 3: North Atlantic Region. National Oceanic and Atmospheric Administration. 1997.

National Oceanic and Atmospheric Administration (NOAA). 1999. National Estuarine Eutrophication Assessment: Effects of Nutrient Enrichment in the Nation's Estuaries. National Oceanic and Atmospheric Administration. 1999.

New Hampshire Estuaries Project. 2000. The State of New Hampshire's Estuaries. New Hampshire Estuaries Project. February, 2000.

New Hampshire Estuaries Project. 2003. 2003 State of the Estuaries. New Hampshire Estuaries Project. 2003.

New Hampshire Estuaries Project. 2006. 2006 State of the Estuaries. New Hampshire Estuaries Project. 2006.

New Hampshire Estuaries Project. 2008. Total Nitrogen Concentrations in Wastewater Treatment Plant Effluent in the Great Bay Estuary Watershed in 2008. New Hampshire Estuaries Project. December 31, 2008.

New Hampshire Department of Environmental Services (a). 2009. Amendment to the New Hampshire 2008 Section 303(d) List Related to Nitrogen and Eelgrass in the Great Bay Estuary. NHDES-R-WD-09-14. New Hampshire Department of Environmental Services, Water Division, Watershed Management Bureau, Concord, NH. August 13, 2009.

New Hampshire Department of Environmental Services (b). 2009. Numeric Nutrient Criteria for the Great Bay Estuary. NHDES-R-WD-09-12. New Hampshire Department of Environmental Services, Water Division, Watershed Management Bureau. June 2009.

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New Hampshire Department of Environmental Services. 2010. Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed– Draft. New Hampshire Department of Environmental Services, Water Division, Watershed Management Bureau, Concord, NH. November 2010.

Piscataqua Region Estuaries Partnership. 2009. State of the Estuaries 2009. Piscataqua Region Estuaries Partnership, University of New Hampshire, Durham, NH. 2009.

Piscataqua Region Estuaries Partnership. 2009. Environmental Indicators Report 2009. Piscataqua Region Estuaries Partnership, University of New Hampshire, Durham, NH. June 2009.

Piscataqua Region Estuaries Partnership. 2009. Nitrogen, Phosphorus and Suspended Solids Concentrations in Tributaries to the Great Bay Estuary Watershed in 2008. Piscataqua Region Estuaries Partnership, University of New Hampshire, Durham, NH. March 31, 2009.

Piscataqua Region Estuaries Partnership. 2010. Nitrogen, Phosphorus, and Suspended Solids Concentrations in Tributaries to the Great Bay Estuary Watershed in 2009. Piscataqua Region Estuaries Partnership, University of New Hampshire, Durham, NH. June 25, 2010.

Short, Frederick T., Burdick, David M. 1996. Quantifying Eelgrass Habitat Loss in Relation to Housing Development and Nitrogen Loading in Waquoit Bay, Massachusetts. Estuarine Research Federation. Vol. 19, No. 3 p. 730 – 739. September 1996.

State-EPA Nutrient Innovations Task Group. 2009. An Urgent Call to Action, Report of the State – EPA Nutrient Innovations Task Group. State-EPA Nutrient Innovations Task Group. August 2009.

State of Delaware – Department of Natural Resources and Environmental Control. 2004. State of Delaware Surface Water Quality Standards. State of Delaware – Department of Natural Resources and Environmental Control. July 11, 2004.

Thayer, G.W., W.J. Kenworthy, and M.S. Fonseca. 1984. The ecology of eelgrass meadows of the Atlantic coast: a community profile. U.S. Fish and Wildlife Service. FWS/OBS-84/02. Reprinted September 1985.

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Attachment 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND REGION
ONE CONGRESS STREET
BOSTON, MASSACHUSETTS 02114-2023

FACT SHEET

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES

NPDES PERMIT NO.: NH0100871

PUBLIC NOTICE START/FINISH DATE: October 25, 2007 - November 23, 2007

NAME AND MAILING ADDRESS OF APPLICANT:

Town of Exeter
Exeter Wastewater Treatment Plant
10 Front Street
Exeter, New Hampshire 03833-2792

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Town of Exeter
Exeter Wastewater Treatment Plant
13 Newfields Road
Exeter, New Hampshire 03833

RECEIVING WATER: Squamscott River (Hydrologic Unit Code: 01060003)

CLASSIFICATION: B

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I. Proposed Action, Type of Facility, and Discharge Location.

The above named applicant has applied to the U.S. Environmental Protection Agency (EPA) for reissuance of its NPDES permit to discharge treated effluent into the designated receiving water. The facility is engaged in the collection and treatment of domestic and industrial wastewaters. Secondary treatment is provided by three aerated lagoons. Prior to discharging to the Squamcott River through Outfall 001 the effluent is chlorinated and dechlorinated. The facility has a design flow of 3.0 mgd.

The previous permit was issued on July 5, 2000 and expired on September 25, 2005. The expired permit ("existing permit") has been administratively extended because the applicant filed a complete application for permit reissuance pursuant to 40 Code of Federal Regulations (C.F.R.) Section 122.6.

The location of the facility, outfalls, and the receiving waters are shown in Attachment A.

II. Description of Discharge.

A quantitative description of significant effluent parameters based on Discharge Monitoring Reports (DMRs) is shown in Attachment B. The data are from October 2000 through April 2006.

III. Limitations and Conditions.

Effluent limitations and monitoring requirements are found in PART I of the draft NPDES permit.

IV. Permit Basis and Explanation of Effluent Limitation Derivation.

a. General Regulatory Background

Congress enacted the Clean Water Act (CWA), "to restore and maintain the chemical physical, and biological integrity of the Nation's waters." CWA § 101(a). To achieve this objective, the CWA makes it unlawful for any person to discharge any pollutant into waters of the United States from any point source, except as authorized by specified permitting sections of the CWA, one of which is Section 402. See CWA §§ 301(a) and 402(a). Section 402 establishes one of the CWA's principal permitting programs, the National Pollutant Discharge Elimination System (NPDES). Under this section of the CWA, EPA may "issue a permit for the discharge of any pollutant, or combination of pollutants" in accordance with certain conditions. See CWA § 402(a). NPDES permits generally contain discharge limitations and establish related monitoring and reporting requirements. See CWA § 402(a)(1)-(2).

Section 301 of the CWA provides for two types of effluent limitations to be included in NPDES permits: "technology-based" limitations and "water quality-based" limitations. See CWA §§ 301, 303, 304(b); 40 C.F.R. Parts 122, 125, 131. Technology-based limitations, generally developed on an industry-by-industry basis, reflect a specified level of pollutant reducing technology available and economically achievable for the type of facility being permitted. See CWA § 301(b). As a class, POTWs must meet performance based requirements based on available wastewater treatment technology. CWA § 301(b)(1)(B). The performance level for POTWs is referred to as "secondary treatment". Secondary treatment is comprised of technology-based requirements expressed in terms of BOD_5, TSS, and pH. 40 C.F.R. Part 133.

Water quality-based effluent limits are designed to ensure that state water quality standards are met regardless of the decision made with respect to technology and economics in establishing technology-based limitations. In particular, Section 301(b)(1)(C) requires achievement of, "any more stringent limitation, including those necessary to meet water quality standards…established pursuant to any State law or regulation…" See 40 C.F.R. §§ 122.4(d), 122.44(d)(1) (providing that a permit must contain effluent limits as necessary to protect State water quality standards, "including State narrative criteria for water quality")(emphasis added) and 122.45(d)(5) (providing in part that a permit incorporate any more stringent limits required by Section 301(b)(1)(C) of the CWA).

The CWA requires that States develop water quality standards for all water bodies within the State. CWA § 303. These standards have three parts: (1) one or more "designated uses" for each water body or water body segment in the state; (2) water quality "criteria" consisting of numerical concentration levels and/or narrative statements specifying the amounts of various pollutants that may be present in each water body without impairing the designated uses of that water body; and (3) an antidegradation provision, focused on protecting high quality waters and protecting and maintaining water quality necessary to protect existing uses. CWA § 303(c)(2)(a); 40 C.F.R. § 131.12. The limits and conditions of the permit reflect the goal of the CWA and EPA to achieve and then to maintain water quality standards.

The applicable New Hampshire water quality standards can be found in Surface Water Quality Regulations, Chapter Env-Ws 1700 et seq. See generally, Title 50, Water Management and Protection, Chapter 485A, Water Pollution and Waste Disposal Section 485-A. Hereinafter, New Hampshire's Surface Water Quality Regulations are referred to as the NH standards.

Receiving stream requirements are established according to numerical and narrative standards adopted under state law for each stream classification. When using chemical-specific numeric criteria from a State's water quality standards to develop permit limits, both the acute and chronic aquatic life criteria are used and expressed in terms of maximum allowable in stream pollutant concentrations. Acute aquatic life criteria are generally implemented through maximum daily limits and chronic aquatic life criteria are generally implemented through average monthly limits. When a State has not established a numeric water quality criterion for a specific pollutant that is present in the effluent in a concentration that causes or has a reasonable

potential to cause a violation of narrative water quality standards, the permitting authority must establish effluent limits in one of three ways: 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"; on a "case-by-case basis" using CWA § 304(a) recommended water quality criteria, supplemented as necessary by other relevant information; or in certain circumstances, based on an "indicator parameter". 40 C.F.R. § 122.44(d)(1)(vi)(A-C).

All statutory deadlines for meeting various treatment technology-based effluent limitations established pursuant to the CWA have expired. When technology-based effluent limits are included in a permit, compliance with those limitations is from the date the issued permit becomes effective. See 40 C.F.R. § 125.3(a)(1). Compliance schedules and deadlines not in accordance with the statutory provisions of the CWA cannot be authorized by an NPDES permit. The regulations governing EPA's NPDES permit program are generally found in 40 C.F.R. Parts 122, 124, and 136.

b. Introduction

The permit must limit any pollutant or pollutant parameter (conventional, non-conventional, toxic, and whole effluent toxicity) that is or may be discharged at a level that causes or has "reasonable potential" to cause or contribute to an excursion above any water quality standard, including narrative water quality criteria. See 40 C.F.R. 122.44(d)(1). An excursion occurs if the projected or actual in-stream concentration exceeds the applicable criterion.

A. Reasonable Potential

In determining reasonable potential, EPA considers: (1) existing controls on point and non-point sources of pollution; (2) pollutant concentration and variability in the effluent and receiving water as determined from permit applications, monthly discharge monitoring reports, and State and Federal water quality reports; (3) sensitivity of the species to toxicity testing; (4) statistical approach outlined in *Technical Support Document for Water Quality-based Toxics Controls*, March 1991, EPA/505/2-90-001 in Section 3; and where appropriate, (5) dilution of the effluent in the receiving water. In accordance with New Hampshire Standards (RSA 485-A:8VI, Env-Ws 1705.02), available dilution for rivers and streams is based on a known or estimated value of the lowest average flow which occurs for seven (7) consecutive days with a recurrence interval of once in ten (10) years (7Q10) for aquatic life and human health criteria for non-carcinogens, or the long-term harmonic mean flow for human health (carcinogens only) in the receiving water at the point just upstream of the outfall. Furthermore, 10 percent of the receiving water's assimilative capacity is held in reserve for future needs in accordance with New Hampshire's Surface Water Quality Regulations Env-Ws 1705.01.

B. Anti-backsliding

Section 402(o) of the CWA generally provides that the effluent limitations of a renewed, reissued, or modified permit must be at least as stringent as the comparable effluent limitations in the previous permit. Except under certain limited circumstances, "backsliding" from effluent limitations contained in previously issued permits is prohibited. EPA has also promulgated anti-backsliding regulations which are found at 40 C.F.R. § 122.44(l).

C. State Certification

Section 401(a)(1) of the CWA requires all NPDES permit applicants to obtain a certification from the appropriate state agency stating that the permit will comply with all applicable federal effluent limitation and state water quality standards. See CWA § 401(a)(1). The regulatory provisions pertaining to state certification provide that EPA may not issue a permit until a certification is granted or waived by the state in which the discharge originates. 40 C.F.R. § 124.53(a). The regulations further provide that, "when certification is required…no final permit shall be issued…unless the final permit incorporated the requirements specified in the certification under § 124.53(e)." 40 C.F.R. § 124.55(a)(2). Section 124.53(e) in turn provides that the State certification shall include "any conditions more stringent than those in the draft permit which the State finds necessary" to assure compliance with, among other things, State water quality standards, see 40 C.F.R. 124.53(e)(2), and shall also include "[a] statement of the extent to which each condition of the draft permit can be made less stringent without violating the requirements of State law, including water quality standards," see 40 C.F.R. 124.53(e)(3).

However, when EPA reasonably believes that a State water quality standard requires a more stringent permit limitation than that reflected in a state certification, it has an independent duty under CWA §301(b)(1)(C) to include more stringent permit limitations. See 40 C.F.R. §§ 122.44(d)(1) and (5). It should be noted that under CWA § 401, EPA's duty to defer to considerations of State law is intended to prevent EPA from relaxing any requirements, limitations, or conditions imposed by State law. Therefore, "[a] State may not condition or deny a certification on the grounds that State law allows a less stringent permit condition." 40 C.F.R. § 124.55(c). In such an instance, the regulations provide that, "The Regional Administrator shall disregard any such certification conditions or denials as waivers of certification." Id. EPA regulations pertaining to permit limits based upon water quality standards and state requirements are contained in 40 C.F.R. § 122.4(d) and 40 C.F.R. § 122.44(d).

c. Flow

The Exeter Wastewater Treatment Plant has a design flow of 3.0 mgd. This flow rate is used to calculate available dilution and mass limits for BOD_5 and TSS as discussed below. If the effluent flow rate exceeds 80 percent of the 3.0 mgd design flow (2.4 mgd) for a period of three (3) consecutive months then the permittee must notify EPA and the NHDES-WD and implement a program to maintain satisfactory treatment levels.

d. Conventional Pollutants

A. BOD_5 and TSS

Average monthly and average weekly concentration (i.e. mg/l) effluent limits in the draft permit for Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) are based on requirements of Section 301(b)(1)(B) of the CWA as defined in 40 C.F.R. §133.102. The average monthly, average weekly and maximum daily concentration limits for BOD_5 and TSS are the same as the limits in the existing permit, consistent with the anti-backsliding requirement found in 40 C.F.R. §122.44.

The draft permit also contains average monthly, average weekly, and maximum daily mass (i.e. lbs/day) for BOD_5 and TSS. Mass limits are incorporated into the permit based on 40 C.F.R. §122.45(f). These mass limits were calculated using the appropriate concentration limits and the design flow of the facility. Refer to Attachment C for the calculation of these limits.

The percent removal requirements for the existing permit were based upon 40 C.F.R. §133.105 (Treatment Equivalent to Secondary Treatment). Presently, the permittee is required to maintain 70% removal for BOD_5 and 65% for TSS. These limits have been carried forward to the draft permit.

B. pH

The pH limit range of 6.5 – 8.0 S.U. in the draft permit remain unchanged from the existing permit. Language under State Permit Conditions (PART I.D.1.a.) allows for a change in the pH limit under certain conditions. A change would be considered if the applicant can demonstrate to the satisfaction of NHDES-WD that the pH standard of the receiving water will be protected when the discharge is outside the permitted range, then the applicant or NHDES-WD may request (in writing) that the permit limits be modified by EPA to incorporate the results of the demonstration. Anticipating the situation where NHDES-WD grants a formal approval changing the pH limit to outside 6.5 to 8.0 Standard Units (S.U.), EPA has added a provision to the draft permit (see SPECIAL CONDITIONS section). That provision will allow EPA to modify the pH limit using a certified letter approach. This change will be allowed only if it is demonstrated that the revised pH limit range does not alter the naturally occurring receiving water pH. However, the pH limit range cannot be less restrictive than 6.0 to 9.0 S.U. found in the applicable National Effluent Limitation Guideline (Secondary Treatment Regulations in 40 C.F.R. Part 133) for the facility.

C. Bacteria

New Hampshire State statue N.H. RSA 485-A:8,V, specifies that the bacteria standard shall be "...as recommended under the National Shellfish Program Manual of Operation, United States Department of Food and Drug Administration." This standard applies to facilities which discharge to tidal waters used for growing or taking of shellfish for human consumption, and therefore applies to the Exeter Wastewater Treatment Plant. The recommended criteria for fecal coliform bacteria is 14 colonies per 100 milliliters. Additionally, not more than 10 percent of the collected samples shall exceed a most probable number (MPN) of 43 per 100 milliliters for a 5-tube decimal dilution test. The NHDES-WD has determined that the fecal coliform value of 14 colonies per 100 milliliters applies to NPDES permits as an average monthly limit and that the permits should also contain a condition to report maximum daily values. The report-only requirement is needed to monitor the variation in data to properly assess compliance with the requirement that not more that 10 percent of the samples exceed the MPN of 43. The average monthly limit is determined by calculating the geometric mean of the daily sample values.

N.H RSA 485-A:8,V also requires enterococci bacteria limits for discharges to "tidal waters utilized for swimming purposes." However, EPA is not requiring numerical enterococci bacteria limits in the permit. Rather, EPA is imposing a report only enterococci requirement. EPA believes this is appropriate because there are no readily apparent swimming areas in the area of the discharge. Collecting bacteria data from the treatments plant's effluent will allow EPA and NHDES-WD to evaluate potential enterococci impacts on the receiving water.

e. Non-Conventional and Toxic Pollutants

Water quality based limits for specific toxic pollutants were determined from numeric chemical specific criteria derived from extensive scientific studies. The EPA has summarized and published specific toxic pollutants and their associated toxicity criteria in *Quality Criteria for Water*, 1986, EPA440/5-86-001 as amended, commonly known as the federal "Gold Book". Each pollutant generally includes an acute aquatic life criteria to protect against short term effects, such as death, and a chronic aquatic life criteria to protect against long term effects, such as poor reproduction or impaired growth. New Hampshire adopted these "Gold Book" criteria, with certain exceptions, and included them as part of the State's Surface Water Quality Regulations adopted on December 10, 1999. EPA uses these pollutant specific criteria along with available dilution in the receiving water to determine a pollutant specific draft permit limit.

A. Available Dilution

In February of 2002, the Town of Exeter extended Outfall 001 to the middle of the Squamscott River. The end of the outfall extension consists of a 40 foot multiport diffuser consisting of eight ports. This project was completed on February 12, 2002. The NHDES-WD performed modeling

of the new outfall configuration using CORMIX-GI and determined the dilution factor to be 25.2. Water quality based limits for the existing permit and the draft permit have been calculated using this dilution factor.

B. Total Chlorine Residual

The New Hampshire water quality standards specify the chronic and acute aquatic-life criterion for chlorine at 0.011 mg/l and 0.019 mg/l, respectively, for freshwater; and 0.0075 mg/l and 0.013 mg/l, respectively, for marine water. The Exeter WWTP discharges to a tidal river, thus the marine standards apply. Based upon available dilution, applicable total residual chlorine limits are a monthly average limit of 0.19 mg/l (0.0075 mg/l * 25.2) and a daily maximum limit of 0.33 mg/l (0.013 mg/l * 25.2).

C. Ammonia Nitrogen as N

The existing permit based the ammonia limitations on New Hampshire standards found at Env-Ws 1703.26 through 1703.31. The salt water ammonia criteria are a function of temperature, pH, and salinity. Based upon data from the Jackson Estuarine Laboratory, values of 20° C, 8.0 S.U., and 15 g/kg and 5° C, 8.0 S.U., and 10 g/kg were used for the summer and winter periods, respectively. Based upon this information, the acute and chronic ammonia criteria (in terms of NH_3 per liter) for the summer period are 6.6 and 0.99 mg/l and for the winter period are 19 and 2.9 mg/l. In order to convert the ammonia criteria (in terms of NH_3 per liter) to ammonia nitrogen as N criteria, the ammonia criteria is multiplied by 0.822. Based upon a dilution of 25.2 applicable permit limits would be:

Summer Chronic => (25.2)*(0.99 mg/l)*(0.822) = 20.5 mg/l

Summer Acute => (25.2)*(6.6 mg/l)*(0.822) = 136.7 mg/l

Winter Chronic => (25.2)*(2.9 mg/l)*(0.822) = 60.1 mg/l

Winter Acute => (25.2)*(19 mg/l)*(0.822) = 393.6 mg/l

Consistent with the existing permit, the draft permit contains a monthly average summer limit of 20.5 mg/l and a reporting requirement for the summer daily maximum, winter monthly average, and winter daily maximum.

f. Whole Effluent Toxicity

EPA's **Technical Support Document for Water Quality Based Toxics Control,** EPA/505/2-90-001, March 1991, recommends using an "integrated strategy" containing both pollutant (chemical) specific approaches and whole effluent (biological) toxicity approaches to control toxic pollutants in effluent discharges from entering waters of the U.S.. EPA-New England

adopted this "integrated strategy" on July 1, 1991, for used in permit development and issuance. These approaches are designed to protect aquatic life and human health. Pollutant specific approaches such as those in the Gold Book and State Regulations address individual chemicals, whereas whole effluent toxicity (WET) approaches evaluate interactions between pollutants thus rendering and "overall" or "aggregate" toxicity assessment of the effluent. Furthermore, WET measures the "additive" and/or "antagonistic" effects of individual chemical pollutants which pollutant specific approaches do not, thus the need for both approaches. In addition, the presence of an unknown toxic pollutant can be discovered and addressed through this process.

Section 101(a)(3) of the CWA specifically prohibits the discharge of toxic pollutants in toxic amounts and New Hampshire law states that, "all waters shall be free from toxic substances or chemical constituents in concentrations or combination that injure or are inimical to plants, animals, humans, or aquatic life; ...." (NH RSA 485-A:8, VI and the NH Code of Administrative Rules, PART Env-Ws 1703.21). The federal NPDES regulations at 40 CFR §122.44(d)(1)(v) require whole effluent toxicity limits in a permit when a discharge has a "reasonable potential" to cause or contribute to an excursion above the State's narrative criteria for toxicity. Inclusion of the whole effluent toxicity limit in the draft permit will demonstrate the compliance with narrative water quality criteria of "no toxics in toxics amounts" found in both the CWA and State of New Hampshire regulations.

The previous permit (effective date April 1, 2001) required toxicity testing four times a year with an LC50 limit of 100%. The required test species are mysid shrimp (*Mysidopsis bahia*) and inland silverside (*Menidia beryllina*). On August 23, 2002, the Town requested a reduction in toxicity test frequency to two per year because the Town had four consecutive test results in compliance with the permit limits. In a letter dated September 11, 2003, EPA reduced the toxicity testing frequency to two per year. Testing is required for the calendar quarters ending March 31st and September 30th. The existing toxicity testing requirement has been carried forward to the current draft permit.

Toxicity testing frequency may be reduced, to not less than once per year, after the completion of a minimum of the most recent four successive toxicity tests of effluent, all of which must be valid tests and demonstrate compliance with the permit limits for whole effluent toxicity. Any requests for toxicity testing frequency reduction must be made to EPA-New England in writing. If toxicity persists in the effluent, monitoring frequency and testing requirements may be increased. The permit may also be modified, or alternatively revoked and reissued, to incorporate additional toxicity testing requirements or chemical specific limits. These actions will occur if the Regional Administrator determines the NH standards are not adequately enforced and users of the receiving water are not adequately protected during the remaining life of the permit. Results of these toxicity tests are considered "new information not available at the permit development", therefore, the permitting authority is allowed to use said information to modify and issued permit under authority in 40 C.F.R. §122.62(a)(2).

g. Combined Sewer Overflows (CSOs)

One CSO remains active (Outfall 003). The location of this CSO discharge into Clemson Pond is shown on Attachment A. The previous permit established CSO Outfall 003 (discharge to Clemson Pond) and eliminated Outfall 002 (outlet from Clemson Pond). This change was made because it was determined that Clemson Pond should be classified as a "Water of the United States". The draft permit carries forward this determination and authorizes discharges from CSO Outfall 003 into Clemson Pond under certain conditions. The permit also includes a condition to monitor the CSO flow into Clemson Pond and at the outlet of Clemson Pond once per quarter for the first year of the permit. Parameters to be sampled include Fecal Coliform Bacteria, Enterococci Bacteria, salinity, and temperature. This monitoring is necessary to ensure that designated used of the receiving waters are maintained. If the monitoring data reveals the need to add additional limits or conditions, the permit may be modified or alternatively revoked and reissued.

The following discussion explains the final EPA National CSO Policy, published in April 19, 1994 in the Federal Register (59 FR 18688). Specific requirements in the draft permit include: dry-weather overflow prohibition, nine minimum controls, and documentation of the implementation of these nine minimum controls, and compliance with water quality standards.

General

CSOs are discharges from a combined storm water and wastewater sewer system into a receiving water without first going to the headworks of a publicly owned treatment works (POTW). CSOs occur when the flow in the combined sewer system exceeds interceptor or regulator capacity. CSOs are distinguished from bypasses which are "intentional diversions of waste streams from any portion of a treatment facility" (40 C.F.R. §122.41(m)).

Flows in combined sewers can be classified into two categories: wet-weather flow and dry-weather flow. Wet-weather flow is a combination of domestic and industrial sewage, infiltration from groundwater, and storm water flow including snow melt. Dry-weather flow is a combined sewer that results from domestic sewage, groundwater infiltration, and industrial wastes, with no contribution from storm water runoff or storm water induced infiltration. Dry-weather overflows from CSOs are illegal. They must be reported immediately to EPA and eliminated as expeditiously as possible.

The objectives of the National CSO Control Policy are to: (1) Ensure that if the CSO discharges occur, they are only as a result of wet-weather, (2) Bring all wet-weather CSO discharge points into compliance with the technology-based requirements of the CWA and applicable Federal and State water quality standards, and (3) Minimize water quality, aquatic biota, and human health impacts from wet-weather flows.

Effluent Standards

CSOs are point sources subject to both water quality-based and technology-based NPDES permit requirements. However, they are not subject to secondary treatment regulations. Section 301(b)(1)(C) of the CWA of 1977 mandates compliance with Federal and State water quality standards by July 1, 1977. Technology-based permit limits must be established for BPT, BCT, and BAT based on BPJ in accordance with Section 301(b) and Section 402(a) of the Water Quality Act Amendments of 1987.

Conditions for Discharge

The draft permit prohibits dry-weather discharges from CSO outfalls. During wet-weather, the discharges must not cause violations of Federal and State water quality standards. Dry-weather discharges must be reported immediately to EPA and the NHDES-WD. Wet-weather discharges must be monitored and reported as specified in the permit.

Nine Minimum Controls (NMC)

The permittee must comply with BPJ-derived BCT/BAT controls, which at a minimum include the following: (1) Proper operation and maintenance of the sewer system and outfalls; (2) Maximum use of the collection systems for storage; (3) Review of pretreatment programs to assure CSO impacts are minimized; (4) Maximization of flow to the POTW for treatment; (5) Prohibition of dry-weather flows; (6) Control of solid and floatable materials in the discharge; (7) Pollution prevention programs which focus on contaminant reduction activities; (8) Public notification to ensure that the public receives adequate notification of CSO occurrences and CSO impacts; and (9) Monitoring to effectively characterize CSO impacts and the efficacy of CSO controls.

Documentation

Exeter prepared a report in April, 1997 documenting compliance with the nine minimum controls. The permit requires this report to be updated to reflect updates to the system and any changes (if applicable) to the nine minimum controls. Approvable documentation must demonstrate implementation of the nine minimum controls, including schedules for completing minor construction activities. This documentation must include a detailed analysis of specific activities the permittee has undertaken and will undertake to implement the nine minimum controls and additional controls beyond the nine minimum controls the permittee can feasibly implement. The specific activities included in the documentation must include minimum requirements set forth in Part I.F.1. of the draft permit and additional activities the permittee can feasibly undertake. This documentation will constitute the specific activities and levels of control required under this permit along with any revisions that may be required.

Documentation may include operation and maintenance plans, revised sewer use ordinances for industrial users, sewer system inspection reports, infiltration/inflow studies, pollution prevention programs, public notification plans and facility plans for maximizing the capacities of the existing collection system, as well as contracts and schedules for minor construction programs for improving the existing systems operation. This documentation shall also include information which indicates the degree to which the controls achieve compliance with water quality standards.

h. Industrial Users

The permittee is presently not required to administer a pretreatment program based on the authority granted under 40 C.F.R. §122.44(j), 40 C.F.R. §403 and Section 307 of the CWA. However, the draft permit contains conditions which are necessary to allow EPA and NHDES-WD to ensure that pollutants from industrial users will not pass through the facility and cause water quality standards violations and/or sludge use and disposal difficulties or cause interference with the operation of the treatment facility.

The permittee is required to notify EPA and NHDES-WD whenever a process wastewater discharge to the facility from a primary industrial category (see 40 C.F.R. §122 Appendix A for list) is planned or if there is any substantial change in the volume or character of pollutants being discharged into the facility by a source that was discharging at the time of issuance of the permit. The permit also contains the requirements to: 1) report to EPA and NHDES-WD the name(s) of all industrial users subject to Categorical Pretreatment Standards (see 40 C.F.R. §403 Appendix C as amended) pursuant to 40 C.F.R. §403.6 and 40 C.F.R. Chapter I, Subchapter N (Parts 405-415, 417-436, 439-440, 443, 446-447, 454-455, 457-461, 463-469, and 471 as amended) and/or New Hampshire Pretreatment Standards (ENV-Ws 904) who commence discharge to the POTW after the effective date of the finally issued permit; and 2) submit two EPA and NHDES-WD copies of Baseline Monitoring Reports and other pretreatment reports submitted by industrial users.

i. Operation and Maintenance

Regulations regarding proper operation and maintenance are found at 40 C.F.R. § 122.41(e). These regulations require, "that the permittee shall at all times operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of the permit." The treatment plant and the collection system are included in the definition "facilities and systems of treatment and control" and are therefore subject to proper operation and maintenance requirements.

Similarly, a permittee has a "duty to mitigate" pursuant to 40 C.F.R. § 122.41(d), which requires the permittee to "take all reasonable steps to minimize or prevent any discharge in violations of the permit which has a reasonable likelihood of adversely affecting human health or the environment."

General requirements for proper operation and maintenance, and mitigation have been included in Part II of the permit. Specific permit conditions have also been included in Part I.B., I.C., and I.D. of the draft permit. These requirements include mapping of the wastewater collection system, reporting of unauthorized discharges including SSOs, maintaining an adequate maintenance staff, performing preventative maintenance, controlling inflow and infiltration to the extent necessary to prevent SSOs and I/I related effluent violations at the wastewater treatment plant, and maintaining alternate power where necessary.

j. Sludge

Section 405(d) of the CWA requires that EPA develop technical standards regulating the use and disposal of sewage sludge. These regulations were signed on November 25, 1992, published in the Federal Register on February 19, 1993, and became effective on March 22, 1993. Domestic sludge which is land applied, disposed of in a surface disposal unit, or fired in a sewage sludge incinerator are subject to Part 503 technical standards. Part 503 regulations have a self implementing provision, however, the CWA requires implementation through permits. Domestic sludge which is disposed of in a municipal solid waste landfill is in compliance with Part 503 regulations provided that the sludge meets the quality criteria of the landfill and the landfill meets the requirements of 40 C.F.R. Part 258.

The draft permit requires that sewage sludge use and disposal practices meet Section 405(d) Technical Standards of the CWA. In addition, the EPA Region I – NPDES Permit Sludge Compliance Guidance document dated November 4, 1999 is included with the draft permit for use by the permittee in determining their appropriate sludge conditions for their chosen method of sludge disposal. The permittee is required to submit to EPA and to NHDES-WD annually, by February 19th, the various sludge reporting requirements as specified in the guidance document for the chosen method of sludge disposal.

Sludge generated by the Exeter Wastewater Treatment Plant is placed in an on-site sludge storage lagoon.

k. Essential Fish Habitat and Endangered Species

A. Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104267), established a new requirement to describe and identify (designate) "essential fish habitat" (EFH) in each federal fishery management plan. Only species managed under a federal fishery management plan are covered. Fishery Management Councils determine which area will be designated as EFH. The Councils have prepared written descriptions and maps of EFH, and include them in fishery management plans or their amendments. EFH designations for New England were approved by the Secretary of Commerce on March 3, 1999.

The 1996 Sustainable Fisheries Act broadly defined EFH as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Waters include aquatic areas and their associated physical, chemical, and biological properties. Substrate includes sediment, hard bottom, and structures underlying the waters. Necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem. Spawning, breeding, feeding, or growth to maturity covers all habitat types utilized by a species throughout its life cycle. Adversely affect means any impact which reduces the quality and/or quantity of EFH. Adverse impacts may include direct (i.e. contamination, physical disruption), indirect (i.e. loss of prey), site specific or habitat wide impacts including individual, cumulative, or synergistic consequences of actions.

According to the Guide to Essential Fish Habitat Designations in the Northeastern United States; Volume I: Maine and New Hampshire, March 1999, Great Bay, into which the Squamscott River flows, has been designated as EFH for the species listed in Attachment D.

EPA has concluded that the limits and conditions contained in this draft permit minimize adverse effects to EFH for the following reasons:

- The permit requires twice per year toxicity testing using mysid shrimp and inland silversides to ensure that the discharge does not present toxicity problems;
- The permit prohibits the discharge to cause a violation of state water quality standards;
- The permit contains water quality base limits for ammonia and total residual chlorine.

EPA believes the draft permit adequately protects EFH and therefore additional mitigation is not warranted. NMFS will be notified and an EFH consultation will be reinitiated if adverse impacts to EFH are detected as a result of this permit action or if new information is received that changes the basis for these conclusions.

B. Endangered Species

The Endangered Species Act (16 U.S.C. 1451 et seq), Section 7, requires the EPA to ensure, in consultation with the U.S. Fish and Wildlife Service (USFWS) and/or NMFS, as appropriate, that any action authorized by EPA is not likely to jeopardize the continued existence of any endangered or threatened species, or adversely affect its critical habitat.

EPA believes that the authorized discharge from this facility is not likely to adversely affect and federally listed species or their habitats. EPA is informally consulting with USFWS and NMFS to confirm this determination.

V. Antidegradation.

This draft permit is being reissued with limitations that are the same as those in the existing permit. There is no change in the outfall locations. Since the State of New Hampshire has indication there will be no lowering of water quality and no loss of existing uses, no additional antidegradation review is needed.

VI. State Certification Requirements.

EPA may not issue a permit unless the State Water Pollution Control Agency with jurisdiction over the receiving water(s) either certifies that the effluent limitations and/or conditions contained in the permit are stringent enough to assure, among other things, that the discharge will not cause the receiving water to violation NH standards or waives its right to certify as set forth in 40 C.F.R. §124.53.

Upon public noticing of the draft permit, EPA is formally requesting that the State's certifying authority make a written determination concerning certification. The State will be deemed to have waived its right to certify unless certification is received within 60 days of receipt of this request.

The NHDES-WD, Wastewater Engineering Bureau is the certifying authority. EPA has discussed this draft permit with the staff of the Wastewater Engineering Bureau and expects that the draft permit will be certified. Regulations governing state certification are set forth in 40 C.F.R. §§ 124.53 and 124.55.

The State's certification should include the specific conditions necessary to assure compliance with applicable provisions of the CWA, Sections 208(e), 301, 302, 303, 306, and 307 and with appropriate requirements of State law. In addition, the State should provide a statement of the extent to which each condition of the draft permit can be made less stringent without violating the requirements of State law. Since the State's certification is provided prior to permit issuance, any failure by the State to provide this statement waives the State's right to certify or object to any less stringent condition. These less stringent conditions may be established by EPA during the permit issuance process based on information received following the public notice of the draft permit. If the State believes that any conditions more stringent than those contained in the draft permit are necessary to meet the requirements of either the CWA or State law, the State should include such conditions and, in each case, cite the CWA or State law reference upon which that condition is based. Failure to provide such a citation waives the right to certify as to that condition.

Reviews and appeals of limitations and conditions attributable to State Certification shall be made through the applicable procedures of the State and may not be made through the applicable procedures set forth in 40 C.F.R. Part 124.

VII. Comment Period, Hearing Requests, and Procedures for Final Decisions.

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period to:

Dan Arsenault
U.S. Environmental Protection Agency
One Congress Street
Suite 1100 (Mail Code CMP)
Boston, Massachusetts 02114-2023
Telephone: (617) 918-1562
Fax: (617) 918-1505

Any person, prior to such date, may submit a request in writing for a public hearing to consider the draft permit to EPA and the State Agency. Such Requests shall state the nature of the issue proposed to be raised at the hearing. A public hearing may be held after at least thirty (30) days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on the draft permit, the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the comment period, and after a public hearing (if applicable), the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice. Within 30 days following the notice of the final permit decision, any interested person may submit a request for a formal hearing to reconsider or contest the final decision. Requests for a formal hearing must satisfy the requirement of 40 C.F.R. §124.74.

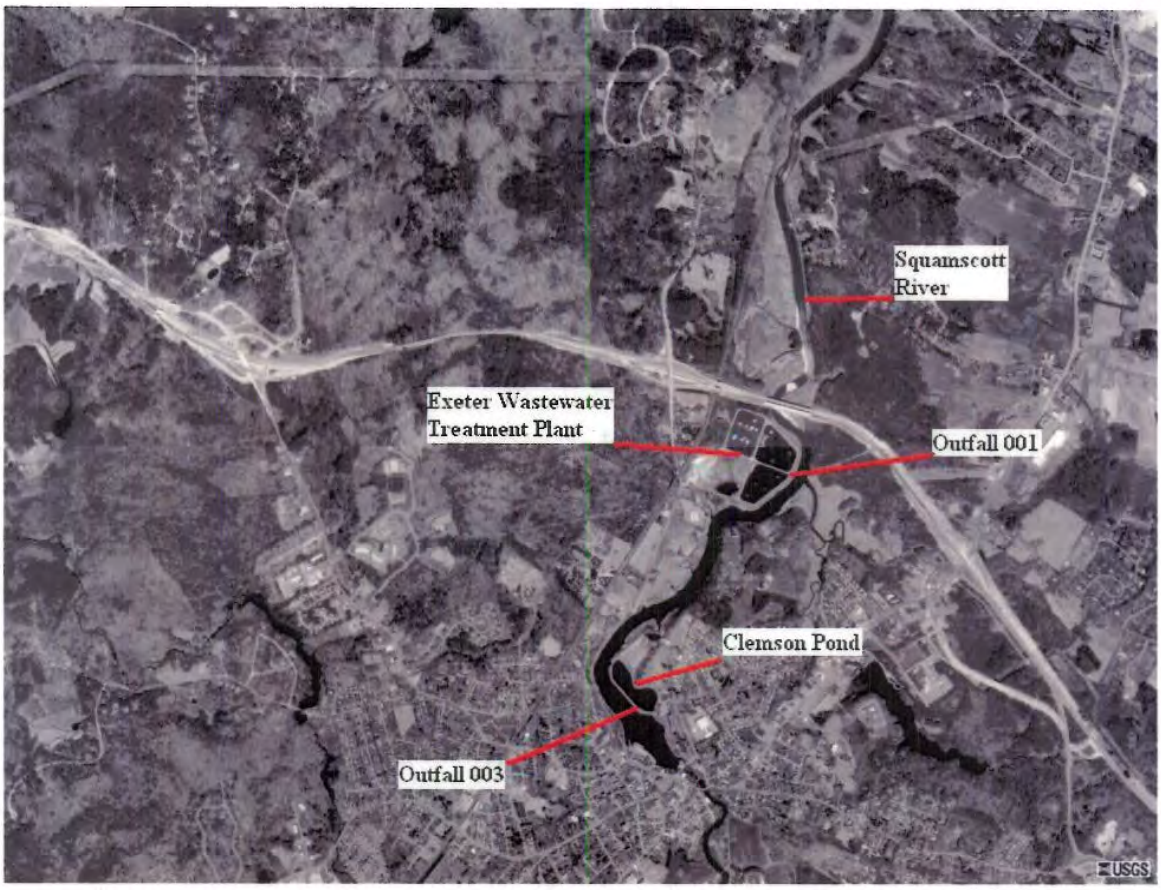
Information concerning the draft permit may be obtained between the hours of 9:00 am and 5:00 pm, Monday through Friday, excluding holidays.

10/9/07
Date

Stephen S. Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

ATTACHMENT A

EXETER WASTEWATER TREATMENT PLANT LOCATION



* Aerial photo obtained from www.terraserver.microsoft.com. Photo taken April 11, 1998.

ATTACHMENT B

SUMMARY OF EFFLUENT CHARACTERISTICS AT OUTFALL 001

The following effluent characteristics were derived from analysis of discharge monitoring data collected from Outfall 001 from October 2000 through April 2006. All data taken from the monthly Discharge Monitoring Reports as retrieved from EPA's Permit Compliance System (PCS) data base. These effluent values characterize the treated wastewater discharged from this facility.

Effluent Parameter	Average of Monthly Averages	Range of Monthly Averages	Maximum of Daily Maximums[1]
Effluent Flow (mgd)	2.0	0.9 – 3.5	7.7, 5.9, 5.1
BOD_5 (mg/l)	10	3 - 23	43, 28, 25
BOD_5 (lb/day)	181	22 - 499	1434, 1083, 841
TSS (mg/l)	15	4 - 29	38, 36, 32
TSS (lb/day)	264	30 - 777	951, 921, 841
pH (standard units)[2]	---	6.5 – 7.9	---
Fecal coliform (colonies/100ml)	1.6	0 - 8	41, 43, 32
Total Residual Chlorine (mg/l)	0.006	0 – 0.024	0.055, 0.045, 0.035
BOD_5 Removal (percent)	92	78 – 97	78, 82, 83[3]
TSS Removal (percent)	89	75 – 97	75, 78, 80[3]
LC50 (percent effluent) *Mysidopsis bahia*	---	---	64.5, 74.7, >100[3]
LC50 (percent effluent) *Menidia beryllina*	---	---	>100[3]
Ammonia Nitrogen as Nitrogen (mg/l) (May through October)	7.42	0.1 – 19.5	24, 21, 20
Ammonia Nitrogen as Nitrogen (mg/l) (November through April)	15.64	1.8 - 28	34, 32, 30
Total Recoverable Cadmium (mg/l)	---	---	0.008, 0.005, 0.002
Total Recoverable Chromium (mg/l)	---	---	0.008, 0.004, 0.003
Total Recoverable Copper (mg/l)	---	---	0.01, 0.013, 0.012
Total Recoverable Nickel (mg/l)	---	---	0.008, 0.006, 0.005
Total Recoverable Lead (mg/l)	---	---	0.055, 0.021, 0.013
Total Recoverable Zinc (mg/l)	---	---	0.084, 0.0775, 0.076

1. More than one value represents the second and third highest values.
2. Numbers listed are the minimum and maximum daily readings.
3. Number listed represent lowest values reported.

ATTACHMENT C

BOD_5 AND TSS EFFLUENT MASS LIMIT CALCULATIONS

Concentration Limits for BOD_5 and TSS: Monthly Average = 30 mg/l
Weekly Average = 45 mg/l
Daily Maximum = 50 mg/l

Plant Design Flow = 3.0 mgd = 3,000,000 gal/d

Average Monthly Mass Limit:

(30 mg/liter)(3,000,000 gal/d)(1 gram/1000 mg)(1 lb/ 454 gram)(3.785 liter/gal) = 751 lb/d

Average Weekly Mass Limit:

(45 mg/liter)(3,000,000 gal/d)(1 gram/1000 mg)(1 lb/ 454 gram)(3.785 liter/gal) = 1,126 lb/d

Maximum Daily Limit:

(50 mg/liter)(3,000,000 gal/d)(1 gram/1000 mg)(1 lb/ 454 gram)(3.785 liter/gal) = 1,251 lb/d

ATTACHMENT D

EFH DESIGNATIONS FOR GREAT BAY

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Atlantic salmon (*Salmo salar*)			F,M		
Atlantic cod (*Gadus morhua*)	S	S			
haddock (*Meanogrammus aeglefinus*)	S	S			
pollack (*Pollachius virens*)	S	S	S		
red hake (*Urophycis chuss*)			S	S	
white hake (*Urophycis tenuis*)	S		S	S	
redfish (*Sebastes fasciatus*)	n/a				
winter flounder (*Pleuronectes americanus*)	M,S	M,S	M,S	M,S	M,S
yellowtail flounder (*Pleuronectes ferruginea*)	S	S			
windowpane flounder (*Scopthalmus aquosus*)	S	S	S	S	S
Atlantic halibut (*Hippoglossus hippoglossus*)	S	S	S	S	S
Atlantic sea scallop (*Placopecten magellanicus*)			S	S	
Atlantic sea herring (*Clupea harengus*)		M,S	M,S		
bluefish (*Pomatomus saltatrix*)			M,S	M,S	
long finned squid (*Loligo pealei*)	n/a	n/a			
short finned squid (*Illex illecebrosus*)	n/a	n/a			
Atlantic mackerel (*Scomber scombrus*)	M,S	M,S	S		
surf clam (*Spisula solidissima*)	n/a	n/a			
ocean quahog (*Artica islandica*)	n/a	n/a			
spiny dogfish (*Squalus acanthias*)	n/a	n/a			

S = The EFH designation for this species includes the seawater salinity zone of the bay (salinity > or = 25.0 $^{o}/_{oo}$).

M = The EFH designation for this species includes the mixing water/brackish salinity zone of this bay (0.5 $^{o}/_{oo}$ < salinity < 25.0 $^{o}/_{oo}$).

F = The EFH designation for this species includes the tidal freshwater salinity zone of this bay or estuary (0.0 $^{o}/_{oo}$ < or = salinity < or = 0.5 $^{o}/_{oo}$)

n/a = The species does not have this lifestage in its life history or has not EFH designated for this lifestage.

RESPONSE TO COMMENTS ON DRAFT NPDES PERMIT NO. NH0100871
TOWN OF EXETER WASTEWATER TREATMENT PLANT
EXETER, NEW HAMPSHIRE
NOVEMBER 30, 2012

On October 25, 2007, 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 NH0100871 for public notice and comment. The draft permit proposed to reauthorize discharges of treated wastewater effluent from the Town of Exeter, New Hampshire's Wastewater Treatment Plant (–Facility") to the Squamscott River. Comments were accepted until November 23, 2007. EPA and NHDES received written comments from:

- Town of Exeter (–Exeter" or –Permittee")
- Conservation Law Foundation (–CLF")

As a result of comments received, EPA determined to partially revise the draft permit to include effluent limitations for nitrogen and to reopen the public comment period. In the revised draft permit, EPA included a monthly average total nitrogen concentration limit of 3.0 mg/l, applicable April through October; a monthly average total nitrogen mass limit of 75 lbs/day, also applicable April through October; and a requirement for the Facility to optimize treatment for the removal of total nitrogen applicable November through March, using all available treatment equipment already in place at the Facility. The revised draft permit was publicly noticed and made available for public comment from March 25, 2011 to August 12, 2011. In accordance with 40 C.F.R. § 124.14(c), the scope of the reopened comment period was limited to the –substantial new questions that caused its reopening," in this case the imposition of effluent limitations for total nitrogen. EPA and NHDES received written comments from:

- Exeter
- The Great Bay Municipal Coalition (–Coalition")
- CLF
- Underwood Engineers
- The Nature Conservancy
- David Burdick
- City of Portsmouth
- Frederick T. Short
- City of Manchester
- Brian A. Giles
- City of Rochester
- Newfields Village Water and Sewer District
- Patience Chamberlin
- Town of Newington
- Boyd Allen III
- Steven J. Miller

EPA determined to hold a public hearing on the draft permit based on substantial public interest in the permit. The hearing took place on June 9, 2011, at the Exeter Town Hall. At the public hearing, the following individuals made oral comments:

- Jennifer Perry, Town of Exeter
- Peter Atherton, Wright-Pierce Engineers
- Russell Dean, Town of Exeter
- Peter Rice, City of Portsmouth
- John Hall, Hall & Associates
- Scott Myers, Mayor of the City of Dover
- Tom Morgan, Town of Newington
- Ricardo Cantu, City of Manchester
- Michael King, Town of Epping
- Donald Clement
- Peter Whelan, Coastal Conservation Association
- David Anderson, New Hampshire Coastal Protection Partnership
- Walter Fries, Southeast Watershed Alliance
- Tom Irwin, Conservation Law Foundation
- Jean Eno, Winnicut River Coalition
- Fred Short
- Peter Goodwin, NH Water Pollution Control Association
- David Michelsen
- Steve Miller
- Dan Jones
- Boyd Allen
- Christopher Suproc

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

[1] The Coalition submitted voluminous comments outside the public comment period. On December 9, 2011, the Coalition submitted comments that it characterized as "based on information not available at the close of the public comment period." On August 15, August 30, September 7, September 12, September 24, October 18, November 5, and November 8, 2012, the Coalition again 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 relatively narrow scope of re-opening; 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

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 the nitrogen limit has been added (Part 1.I.3, Special Conditions).

3) The pH limit has been changed from 6.5 - 8 su to 6 - 9 su.

4) 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."

5) The monitoring for enterococci bacteria has been changed from 1/Day to 2/Week.

6) A provision has been added to the permit that requires 85% removal for BOD_5 and TSS in the event the permittee upgrades the facility to a treatment process that does not utilize lagoon treatment as the primary treatment technology (Part 1.A.5).

7) Specific language clarifying the condition requiring optimization of the treatment facility for the removal of total nitrogen during the winter months (November 1 – March 31) has been added to the permit (Part 1,A, Footnote 8).

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.

Background

Cultural eutrophication is an ecosystem response to increases in nutrient (primarily nitrogen and

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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 permit raised during the public hearing.

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 impacts. 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.

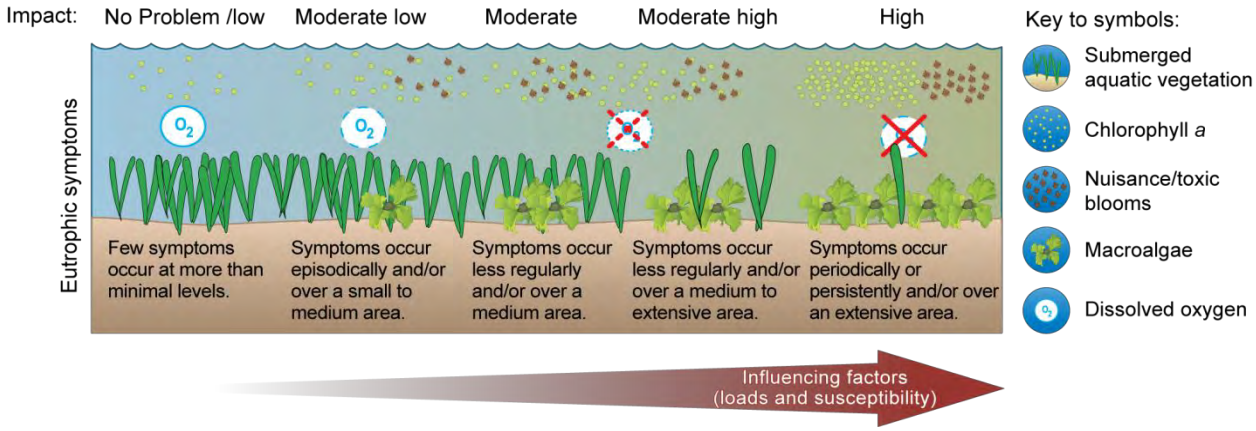

Figure 1: Conceptual diagram of the predictable consequences of increased nutrient discharges (low on left to higher on right) into coastal waterbodies. The response to nutrient loads within the waterbody is conditioned/modulated by the physical characteristics of the estuary such as the tidal exchange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

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

[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.").

[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,

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 Squamscott 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 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]

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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).

[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.

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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 causes 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.

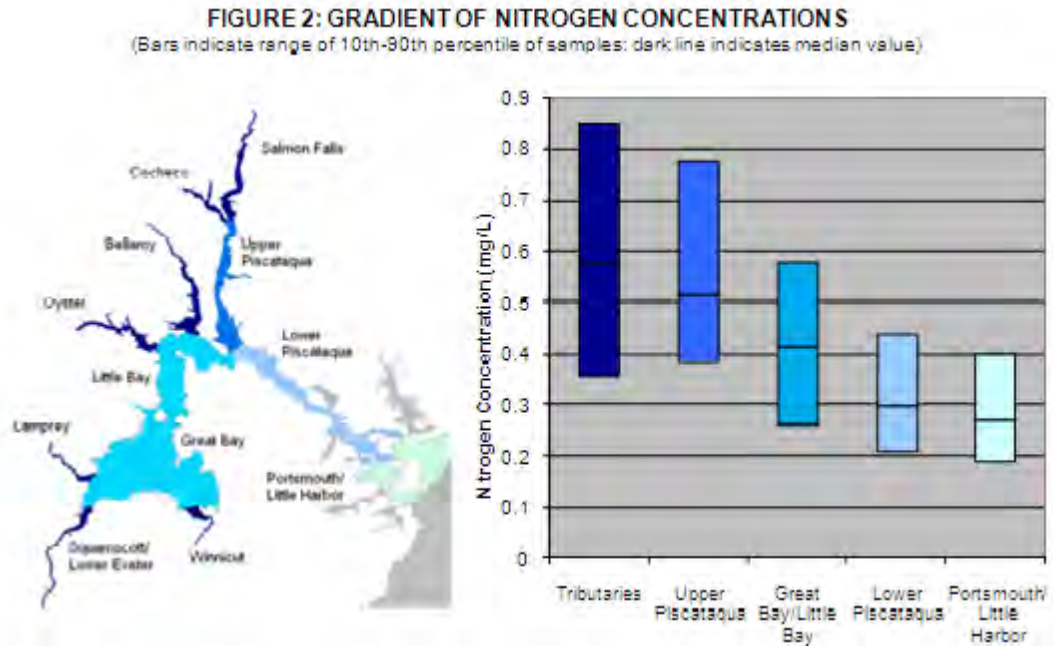

Figure 2. Gradient of Nitrogen Concentrations.

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

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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 Squamscott River, is a tidal river exhibiting multiple symptoms of nutrient overenrichment. Data show that the trend monitoring station closest to the Exeter discharge (known as "GRBCL") has one of the highest water column nitrogen concentrations in the entire estuary (see Table 2B, page 21); one of the highest chlorophyll-a concentrations (Table 6B, page 33); one of the lowest minimum dissolved oxygen concentrations (Table 7B); and an absence of eelgrass.[8] (NHDES, 2009a).

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

[8] The additional short-term water quality data collection by the Coalition has not evidenced substantially different or better water quality from what DES has collected in the past. To the contrary, the additional short-term data collection by the Coalition in August 2011 has shown that, at times, chlorophyll-a levels can be significantly higher than those DES has historically measured. Results from the August 12, 2011 sampling data indicate that chlorophyll-a levels in the upper part of the Squamscott River near the Exeter discharge ranged from 50 - 240 ug/l. (HydroQual, 2012).

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 ambient 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.[9] (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 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

[9] 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.

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 Exeter'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 Nutrient 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.[10] 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 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

[10] As NHDES described in the "Methods" section of the *2009 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).

(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.[11] 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).[12] The proposed water quality thresholds were developed with input from a technical

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[11] The Coalition, and Exeter, 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).

[12] 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 proposed numeric 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).[13] 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."

[13] EPA did not rely solely on NHDES's proposed numeric 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 numeric thresholds are consistent with these values.

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 phytoplakton 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.

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.[14] 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.[15]

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[14] 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 Squamscott River, or 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.

[15] 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.

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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 improve correlation. NHDES selected this approach with the full understanding that spatial and temporal variability is lost, but 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,[16] but also because additional delay would be imprudent in light of receiving water conditions, particularly in tidal tributaries such as the Squamscott 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

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[16] 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 Squamscott 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. 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.[17] 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 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 report *Draft Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-point Sources in the Great Bay Estuary Watershed (the NHDES Nitrogen Loading Reduction Report* (NHDES, 2010), which analyzed various combinations of

[17] 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 raw 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.").

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 mg/l for the Exeter facility (the accepted –Limit of Technology"), coupled with 60-70% reduction in nitrogen from other sources would achieve water quality standards in the Squamscott River and in Great Bay proper. (NHDES, 2010, Appendix C at 6). The analyses for the Squamscott and Great Bay clearly indicate significant nutrient-driven impairments and that the Exeter facility represents an important component 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 Squamscott River and the Great Bay Estuary.[18] 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.[19] 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 Exeter 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

[18] 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.

[19] EPA has issued a permit containing a nitrogen limit of 3 mg/l to one POTW in the watershed (Newmarket) and released a draft permit for public notice containing a nitrogen limit of 3 mg/l to another POTW in the watershed (Dover) and expects to impose nitrogen limitations on other facilities in the near future.

the Squamscott. 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 Exeter facility represents a significant portion of the controllable load into Squamscott, 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 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 Exeter 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 *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.[20] 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 rather than the fine-tuning suggested by numerical limitations" because ~~"th~~is 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 Exeter Wastewater Treatment

[20] 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.").

> 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 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 Exeter 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 Exeter'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 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 Town shares the concern of the federal and state governments about the health of the Great Bay Estuary. The Town fully appreciates that it discharges nitrogen from its wastewater treatment plant (‗WWTP') and that upgrades to that plant are necessary to reduce nutrient loadings into the Squamscott River and ultimately into Great Bay."

And:

> ―The Town has already entered into a written commitment through a Memorandum of Agreement with DES and other municipalities in the Great Bay watershed to reduce substantially the nitrogen discharge from its WWTP. The Town has committed to begin promptly planning for an upgraded treatment plant in Exeter that will achieve a nitrogen discharge limit of 8 mg/1. Thus, the comments filed today by the Town do not represent a disagreement on the need to reduce nitrogen loadings into 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 Exeter 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.

A. Great Bay Municipal Coalition Comments, submitted by Hall & Associates, August 9, 2011

Comment #A1[21]: 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. (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 is 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. Absent such information, there can be no conclusion that transparency is a cause of eelgrass decline, as presumed in EPA's assessment. Analyses prepared by the Coalition's consultants (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 proposed permit action. 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. Thus, continued reliance on prior studies by this author to reach an opposite conclusion would be inappropriate.

Response #A1: 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). [22] 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

[21] Coalition Comment No. 11.

[22] *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.").

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 Squamscott River, Exeter'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. See Response #B1a for further discussion.

EPA disagrees with the public hearing comments that ―the Bay" is not suffering from insufficient transparency due to excessive plant growth.[23] 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

[23] 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.

between the minimum and maximum depth of eelgrass beds, Zmin and Zmax) in the *NHDES Great Bay Nutrient Report*.[24] 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 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 macroalage 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 *NHDES 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

[24] 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).

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."[25,26,27]

While the vast majority of the Coalition's Criteria Memorandum consists of allegations regarding supposed deficiencies in the draft NHDES criteria 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.[28] First, the Evaluation

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[25] 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 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.

[26] 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.

[27] 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 because of nitrogen driven impacts within the Great Bay Estuary. Also, eelgrass has historically been present in the Squamscott River below Chapman's Landing .

[28] 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

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 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 2009 *Great Bay Nutrient Report*, stating,

> "However, the results for the lower Piscataqua River are confusing because very little

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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 #B3a relative to EPA's responsibility to interpret narrative criteria using the best available information and the role of scientific uncertainty in regulatory decision making.

> 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."[29] 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

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

> 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.[30]

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 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.[31] HydroQual fails to explain why their theoretical (and seriously

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[30] 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.

[31] 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%

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 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 target 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*

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of turbidity could be explained by particulate organic carbon therefore is not contradicted by the HydroQual analyses.

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 threshold was proven to be incorrect, NHDES provided multiple lines of evidence that support only slightly less stringent nitrogen thresholds necessary to support eelgrass. Specifically, a threshold based on observed concentrations in waters where eelgrass is still healthy (Portsmouth Harbor) is 0.34 mg/l, the threshold to protect against macroalgae replacement of eelgrass is 0.38 mg/l (in Great Bay proper), and threshold in other estuaries in New England range from 0.35 to 0.38 mg/l. The median total nitrogen concentration in the Squamscott River is 0.748 mg/l and the median in Great Bay proper is 0.421 mg/l, both exceeding any of the eelgrass thresholds developed by NHDES. The Squamscott median value also significantly exceeds the proposed DO threshold, meaning that a high level of control is necessary even to meet this less stringent threshold.

Comment #A2[32]: The Fact Sheet assertion that "large diurnal swings are another indicator of eutrophication for the Squamscott River" is misplaced. The analysis of the diurnal data shows that it is caused by tidal variation and only a very minor component is attributable to the algal growth present in the tidal river. (Ex. 7, Diurnal DO Variation Analysis for Squamscott River developed by DES.) On average, the total algal induced variation is less than 1 mg/l (i.e., less than 10% variation in DO saturation). The total impact on minimum DO from algal growth is estimated at less than 0.4 mg/l - a negligible amount that cannot be significantly reduced. More

[32] Coalition Comment No. 12.

detailed studies of the Squamscott River confirmed that low DO conditions were not apparently related to algal growth (Jones et al., Impacts of Wastewater Treatment Faculties on Receiving Water Quality (April 2007) (NH Estuary Project Report) @ 3: ―The nutrient and chlorophyll a levels at the different sampling sites in the Squamscott River did not appear to have any discernable relationship to DO levels.”). Likewise, 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's 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 #A2: EPA disagrees with the comment‘s characterization of the diurnal dissolved oxygen data. Long term continuous DO monitoring from datasondes shows both a diurnal variation due to algal growth in the Squamscott River and a semidiurnal pattern due to tidal variation. EPA recognizes that the superposition of these two patterns, which have different periods and a shifting offset due to the greater than 24 hour tidal cycle, complicates data analysis. However this complexity does not indicate that the algal contribution is minor. NHDES‘s Diurnal DO Variation Analysis for the Squamscott River (―NHDES Diurnal DO Analysis”) referred to in the comment, shows that the algal-induced variation in DO saturation *on average* ranged between 10 and 13 percent based on average monthly data in July, August and September 2009, not ―less than 10%” as characterized in the comment. EPA agrees with NHDES‘s conclusion that this *average* diurnal variation is significant as an indicator of elevated primary productivity. (NHDES, 2011 at 5). Periodic supersaturated DO is additional evidence of elevated primary productivity, as noted by the Coalition‘s consultant in Exhibit 10 to the Coalition‘s comments. (HydroQual, 2011 at 3). Moreover, average monthly data do not reflect the day-to-day variability in the data or indicate the actual minimum DO (the greatest DO sag) due to algal growth in a particular month.[33] EPA therefore finds no merit in the comment‘s unsupported assertion that the ―total impact on minimum DO from algal growth is estimated at less than 0.4 mg/l.”

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

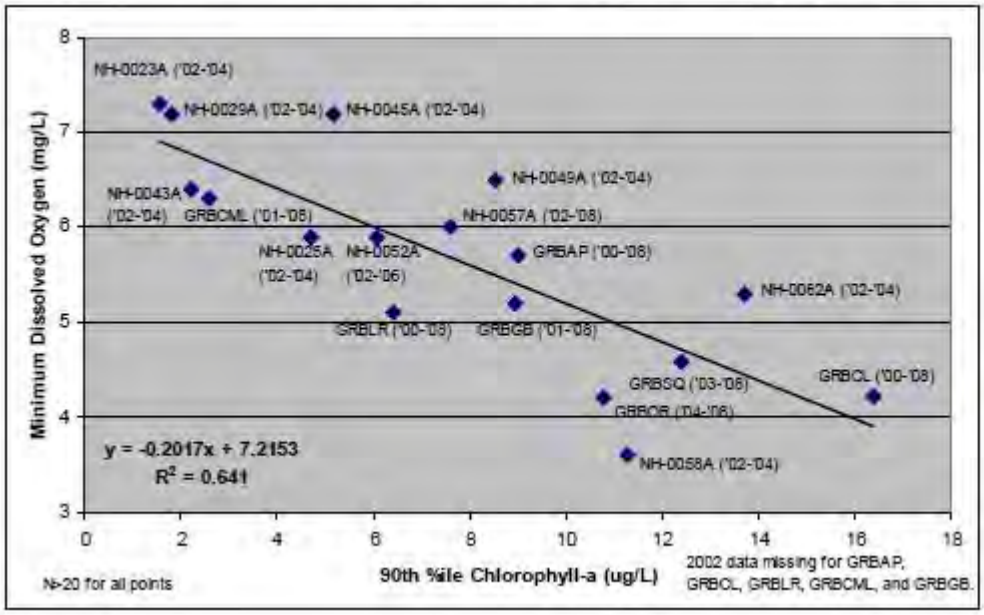
[33] The NH water quality criteria for Class B waters require that the instantaneous dissolved oxygen concentration be greater than 5 mg/l and that the dissolved oxygen content be at least 75 percent of saturation based on a daily average. As can be seen, neither of these criteria is based on a long term average.

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).

The information regarding the Lamprey River is not pertinent to this permit. 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 can have high chlorophyll-a levels and high total nitrogen levels (see id. at 30).

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 two stations in the Squamscott River (GRBCL and GRBSQ) are part of the statistical analysis performed by NHDES in connection with the draft numeric nutrient criteria showing a statistically significant relationship between minimum DO and 90th percentile chlorophyll-a. (NHDES, 2009, Figure 27 (reproduced below)).

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



The data for the Squamscott River are entirely consistent with data at the other trend stations, as the regression is essentially the same if the Squamscott River stations are excluded (though with a lower statistical significance with the lower sample size). See Figure 3.

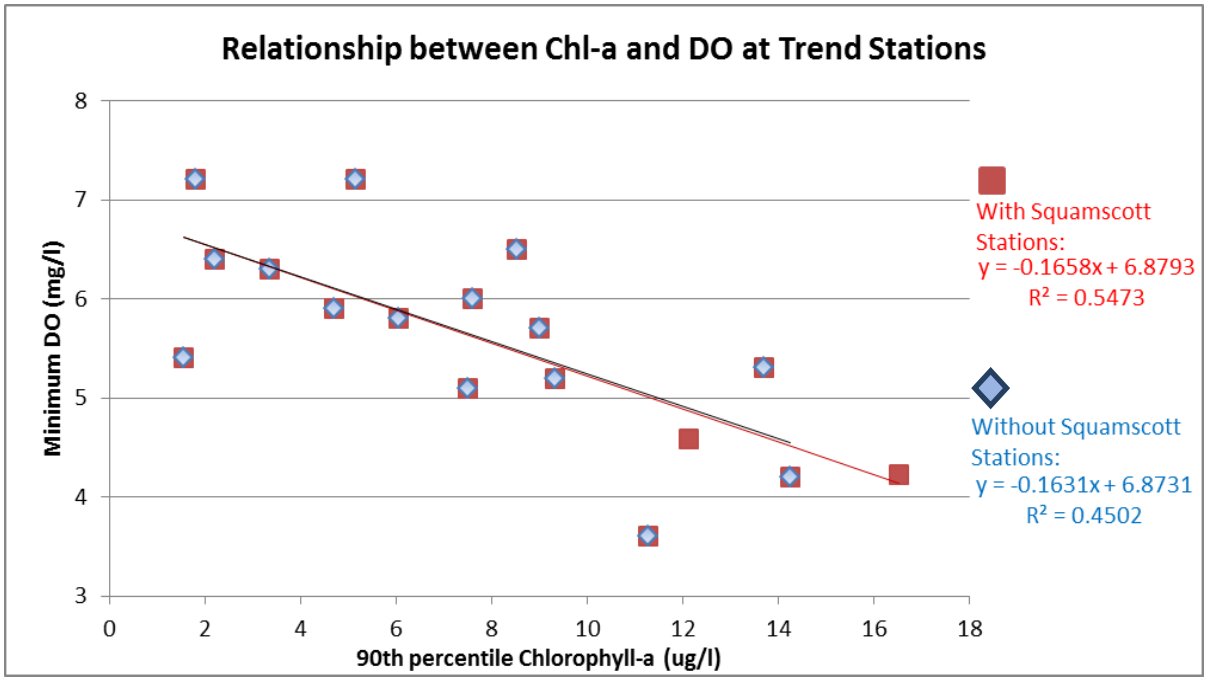


Figure 3. Regression curve created by EPA based on NHDES reported data at Trend Stations. The curve is consistent with but differs slightly from the NHDES regression due to the use of different averaging periods.

EPA thus 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 Squamscott River.

With respect to ~~"t~~he parties" and their ~~"c~~onclu[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 #A15 - A18 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. 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 (~~"m~~odeling 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 proposed criterion 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 Squamscott River are related to algal growth. The information cited in the comment does nothing to disturb that conclusion.

Although not cited in the comment, EPA also notes the claim in HydroQual's Technical Memorandum (Exhibit 5, see page 12) that high phytoplankton in the fresh water upstream of the Squamscott River may be the reason for the high phytoplankton in the Squamscott River. This claim is not supported by the available data. Monthly monitoring has been conducted in the Exeter River at the head of tide and reported in annual reports for 2003 - 2007 and posted on the Piscataqua River Estuaries Partnership web site. The long term median chlorophyll-a concentration for 2003 - 2007 was less than 2.0 ug/l and the maximum value measured was 16 ug/l, while in the Squamscott River downstream of the dam the median value for the same time period was 6.8 ug/l and the maximum value was 106 ug/l. Similar results were obtained in monitoring sponsored by the Coalition in August 2011, which showed a maximum chlorophyll-a concentration of 9.5 ug/l above the dam and 233.8 ug/l downstream of the dam. (HydroQual, 2012, Table 9).

The 2012 HydroQual Memorandum also demonstrates that the Exeter WWTF itself is a direct discharge of chlorophyll-a, as would be expected from a lagoon system. However, HydroQual concludes based on a mass-balance analysis of chlorophyll-a sources that –The fact that the measured chl-a is well above the computed 40 Kg/L to 50 Kg/L concentration indicates that there is additional substantial algal growth in the Upper Squamscott River," and that –inorganic nitrogen and phosphorus from the Exeter WWTP can support further growth of algae in the river." While EPA has concerns regarding the methodologies underlying these analyses (particularly the unusual –translation" of monitoring data to different locations in the river based on the salinity, and the application of steady-state mass balance methods to single day sampling data), EPA notes that nothing in these new data contradicts EPA's conclusions regarding algal growth and DO in the Squamscott River.

Comment #A3[34]: The Bay does have a macroalgae problem due to invasive species as confirmed by several UNH researchers. However, the degree of nitrogen control necessary to address that issue is not known. The 2009 DES Report indicated 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

[34] Coalition Comment No. 13.

species. (2009 DES Report.) This level of reduction would reflect TN levels in the mid-to-late 1990s when macroalgae growth was minimal. It is reasonable that a mid-range reduction of 15% TN 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 will ensure municipal loads are well below pre-1990 levels when macro algae 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.

Moreover, 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 total nitrogen, 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 pg 4), there is no reason to believe that organic nitrogen cycling plays any role in stimulating plant growth in this system, and 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). Those waters have even shorter detention time (2-3 days possibly) than the Bay, and only the readily available nutrient forms could pose an issue in these areas.

Response #A3: 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 Squamscott River that EPA has concluded will attain and maintain applicable water quality criteria and fully protect designated uses.

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.[35]

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, 2010). To explain further, if salinity = 8 ppt (Squamscott GRBSQ avg) 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 8/(32-8) or 0.333, or 33.3 parts ocean water to 100 parts fresh water.

[35] 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.

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:

$$[(1*100) + (0.2*33.3)]/133.3 = 0.80 \text{ mg/l}.$$

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

$$[(0.85*100) + (0.2*33.3)]/133.3 = 0.69 \text{ mg/l (a 14 percent reduction)}$$

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

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:

$$[(1*100) + (0.2*167)]/267 = 0.50 \text{ mg/l}.$$

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

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

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 0.80 mg/l ambient concentration calculated for the Squamscott River with the 0.50 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 Squamscott 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 Response #B4.

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 Response to Comment A5. 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 above, 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 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. The *NHDES Great Bay Nutrient Report* 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 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, 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 #A4[36]: 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. (EPA Fact Sheet pg. 7) 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 (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

[36] Coalition Comment No. 14.

transparency. (See 2009 DES Report (l 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.

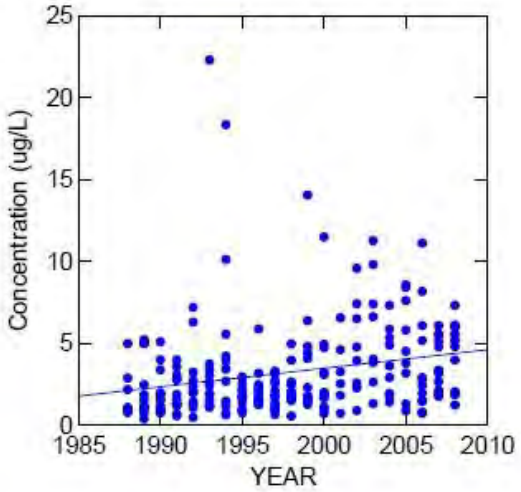
The various references to the 2003 and 2006 PREP reports cited by EPA confirm that even though nitrogen levels have ~~in~~creased by 59% in the past 25 years, negative effects of excessive nitrogen, such as algal blooms and low dissolved oxygen levels, are not evident." (Fact Sheet @ 12.) Thus, the ability 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 will be achieved in the Bay. Thus, the proposed TN criteria for ensuring 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 are occurring 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 reopening the Exeter permit to impose stringent TN limitations as the "cure" for the alleged transparency and DO impairments.

Response #A4: 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 and therefore could not have contributed to eelgrass decline. 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 statistically significant 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). EPA therefore does not accept the commenter's assertion that algal growth could not have been the cause of eelgrass decline.

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 to 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 (NHDES, 2009a Table 6A), it is clearly a contributing factor to the decline of eelgrass in Great Bay proper and a much larger factor in the Squamscott River where the measured 90 percentile for chlorophyll-a was 17.37 ug/l and the maximum was 106.07 ug/l (NHDES, 2009a, Table 6A). 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 Response #A1.

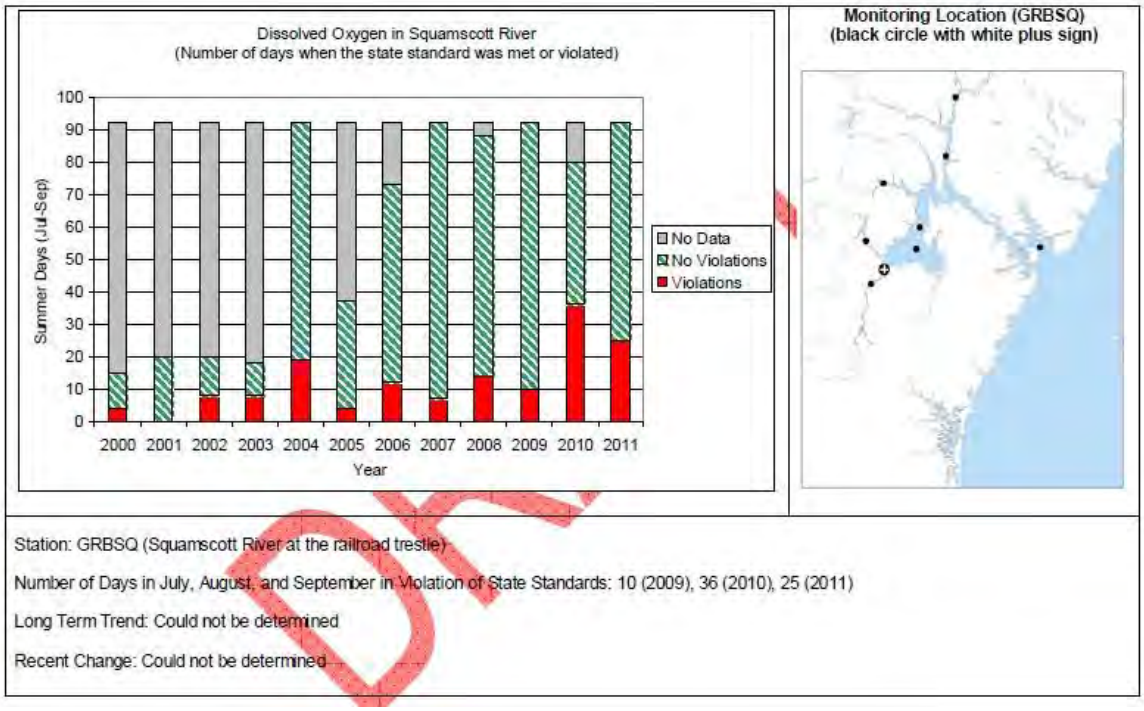
EPA also disagrees that the ability of nitrogen reduction to affect transparency is not significant. EPA is persuaded by NHDES' analysis that nitrogen controls will have a significant effect on transparency through the impact on algal growth and the particulate organic carbon component of turbidity. (NHDES, 2009a at 66). The analysis in HydroQual's Criteria Memorandum (Ex 10)

to the comment is methodologically flawed, as described in Response #A1, 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 *2009 PREP 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 #A1, 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 #A1. EPA further notes that the ―5% change in transparency" figure in the comment 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 Squamscott River. (PREP, 2012, Figure NUT5-2 at 5-12 (reproduced below)). In EPA‘s judgment, the key point is that there continue to be dissolved oxygen violations. NHDES‘s most current analyses relative to dissolved oxygen impairments in the Squamscott has resulted in the continued listing of the Squamscott River as impaired for dissolved oxygen (see NHDES, 2012c).



Comment #A5[37]: Conclusions regarding the increase of system wide TN loadings in the past 5 years (2002 versus 2008) are misleading and inappropriate. (Fact Sheet @ 12.) First, the change in TN level is due to an evaluation comparing loads between drought years and extreme wet weather years. 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 changes in precipitation and land use practices. This indicates that only a moderate reduction in point source contribution is necessary to ensure reduced 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 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."

Response #A5: 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

[37] Coalition Comment No. 15.

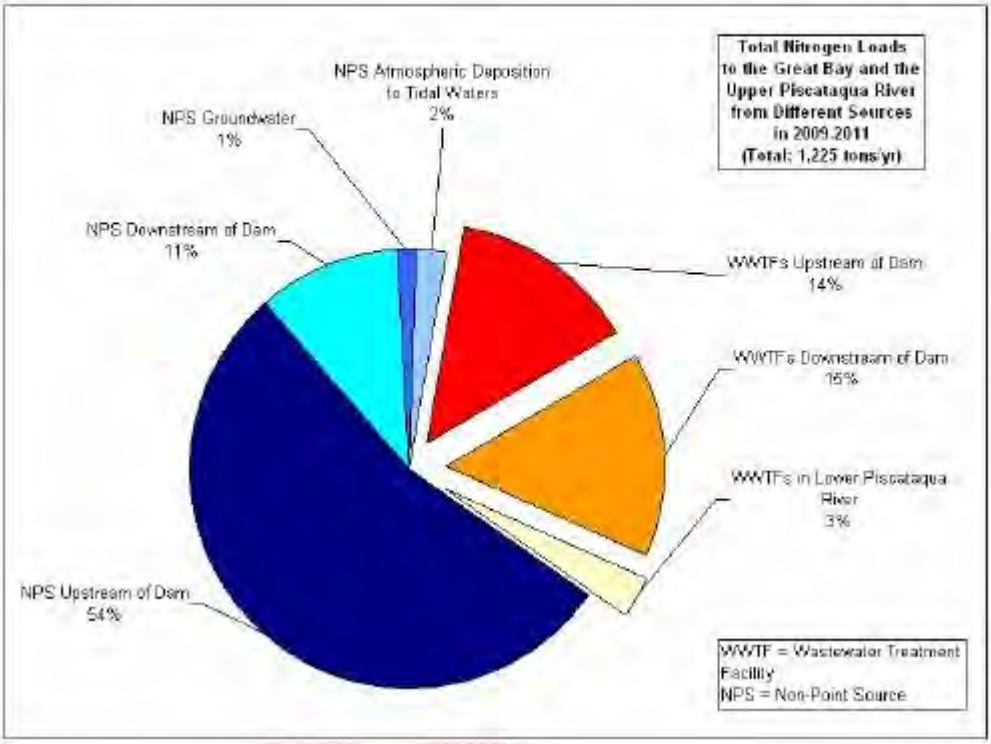
rainfall, this is part of natural variability in weather patterns (PREP, 2012), which do have a significant effect on nitrogen loadings and responses, and that is why the NHDES analyses supporting the proposed numeric thresholds are based on evaluations of long-term data sets. Also as indicated in the Fact Sheet (page 12) there has been a long term increase in Great Bay Estuary 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 criterion. 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 "calculated" 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 Squamscott River, the point source load was 21% of the total load between 2003 and 2008. (NHDES, 2010 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 #A6[38]: 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. (Fact Sheet @ 13.) This statement was intended to confirm that reducing TN levels would lead to improved eelgrass

[38] Coalition Comment No. 16.

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 #A6: EPA‘s statement that the greatest loss in eelgrass has occurred in the upper portion of the estuary is correct. Eelgrass in the tidal rivers, the 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. See also Response #A1.

Water quality in the Upper Piscataqua River is not ―excellent," contrary to the Coalition‘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 and eelgrass populations at more downstream locations. 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 Piscatuaqua, 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 #A2. 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 #A2. While DO in the Lamprey River has been identified as requiring further analysis of the effect of stratification, the Lamprey River can have high concentrations of chlorophyll-a. (NHDES, 2009a, Table 6).

Comment #A7[39]: Data on chlorophyll-a levels and secchi depth, not originally considered by DES when issuing the 2009 draft numeric criteria document, confirms 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.) This data confirms 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, entitled 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 therefore transparency is not likely a controlling factor in this area. (Personal discussion T. Gallagher and F. Short at Southeast Watershed Alliance Symposium and statements at Coalition/DES meeting of July 29, 2011.) 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.

Response #A7: 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

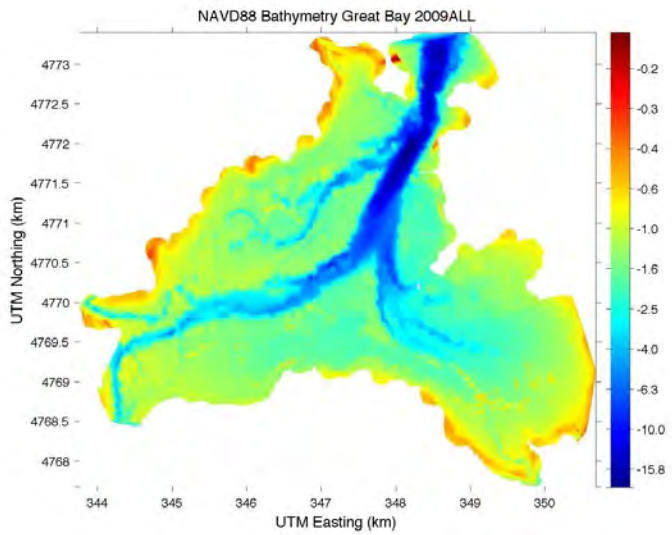
[39] Coalition Comment No. 17.

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.

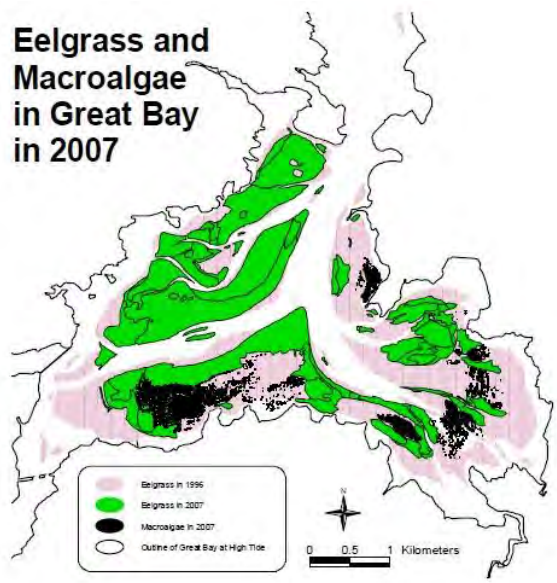
The Coalition incorrectly characterizes the figures in the Fact Sheet. Figure 5 in the Fact Sheet shows that light attenuation in Great Bay proper is reduced relative to better flushed portions of the estuary and Figure 4 indicates that there have been significant declines over time in eelgrass biomass 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 #A1.

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, as shown below, 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 #A2. 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 above with respect to macroalgae and adaptive management.

Comment #A8[40]: The underlying technical basis for the nutrient criteria applied in the permit modification 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. (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. (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.

Response #A8: –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 ~~–r~~adically different” is not clear. In EPA‘s judgment, NHDES properly considered 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.

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 #A9[41]: The USEPA Science Advisory Board has indicated that such ~~–c~~ause and effect” relationships 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 ~~–e~~stuarine nutrient dynamics are complex, and are influenced by flushing time, freshwater inflow and stratification among other factors.” 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. (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. (Ex. 17.) Nitrogen does not relate directly to "turbidity" that is caused by a number

[40] Coalition Comment No. 18.

[41] Coalition Comment No. 19.

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 #A9: 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 at 23). NHDES' weight-of-evidence approach is consistent with this advice. See also Response #A23.

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.[42] 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). 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. (NHDES, 2010). Stratification as well is specifically accounted for in the *NHDES Great Bay Nutrient Report*; where it is significant, it is noted and accounted for in the analyses, e.g. Lamprey River.

[42] 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 shown.

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 Coalition disagrees with the extent of that contribution, EPA finds no merit in that analysis by the Coalition‘s consultant due to its flawed methodology, as discussed in Response #A1.

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[43] 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 Exeter‘s discharge into the Squamscott River. Predictably, the discharge of

[43] Again, EPA does not, by referencing this exhibit, accept the accuracy of the data therein. As with Exhibit 16/18, EPA notes 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.

high levels of nitrogen has resulted in elevated levels of chlorophyll-a and subsequent depressed levels of dissolved oxygen. In addition, eelgrass has been excluded from its historical range in the Squamscott 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 Squamscott River.

Comment #A10[44]: 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 Squamscott River and other tidal rivers are heavily influenced by the color of the waters entering the system. (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 River and cannot be increased simply by regulating TN to control chlorophyll-a growth. (Ex. 20.) 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 Squamscott 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 Squamscott 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 #A10: 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 Squamscott 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 Squamscott 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 statement 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).

Exhibit 20, while containing no references or citations to the source or nature of the data in the charts, appears to be an attempt to compare light attenuation and chlorophyll-a data in the

[44] Coalition Comment No. 20.

Squamscott River to the calculated effect on light attenuation from 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 Squamscott River 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). 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 affecting water quality in the Squamscott River will also need to be addressed. EPA also notes that the Squamscott River does 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 (HydroQual, 2012).[45]

Comment #A11[46]: EPA's reliance on studies from other states or EPA manuals (Fact Sheet @ 20-21) 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. (Fact Sheet @ 11.) 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 Squamscott River, the applicable total nitrogen criteria to ensure its recovery is 0.3 mg/l" is simply unsupported speculation. Other DES-funded studies (e.g., 2006 Great Bay Estuary Restoration Compendium) confirm that it is not reasonable to presume that reducing TN levels will result in eelgrass restoration in the Squamscott River, and Ex. 20 explains that natural transparency is insufficient to support eelgrass growth. DES recently indicated that it plans to clarify the impairment zone listing information to reflect those

[45] 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.

[46] Coalition Comment No. 21.

areas of the tidal river systems where eelgrass growth and restoration is improbable due to factors unrelated to nitrogen impairments. 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 Exeter should be withdrawn because there is no credible scientific data showing that decades-old eelgrass losses in the Squamscott 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.[47]

Response #A11: 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 nutrient 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 #B3a.

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 Squamscott 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 Squamscott River was cited in the nutrient criteria document and was part of the analysis of transparency and TN. (NHDES, 2009a at 56-60 (analysis of assessment zones including Squamscott River for relationship between measured Kd and predicted eelgrass depths)); *id.* at 67 (Figure 39 regression of Kd v. TN, including Squamscott River stations)). Controlling nitrogen in the Squamscott River to a level consistent with the NHDES 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 20 does not include any

[47] 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.

evidence that the low transparency is natural. See also Responses #A10, B3b and C4. 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 Squamscott 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 Squamscott River, including thresholds for the protection of eelgrass habitat. Dissolved oxygen is not the sole ecological concern in the Squamscott River (see also Responses #B3b - d, A1, and A2 relative to impairments in the Squamscott River).

Comment #A12[48]: The proposed permit applies the proposed criteria for eelgrass protection in the tidal rivers, at a 7Ql0 low flow. (Fact Sheet @ 22-23). 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 7Ql0 flow condition. Second, the impact on transparency, if it did exist, has nothing to do with the dilution available in the current Exeter 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 #A12: 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.[49] EPA agrees that the thresholds in the *NHDES 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.

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[48] Coalition Comment No. 22.

[49] The analysis at pages 22-23 of the Revised Fact Sheet was included to illustrate how significant the contribution can be under low flow conditions. As explained in the original fact sheet, the low flow condition applicable to the Squamscott was not based on 7Q10 flows (which are applicable to rivers and streams under NH WQSs), but on a CORMIX model of dilution under tidal conditions performed by NHDES. See 2007 Fact Sheet at 8.

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 #B7a (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 in Responses A25 and B7a, the permit's nitrogen limit of 3.0 mg/l was intended to maximize point source reductions into the Squamscott 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 #B7a.

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 #A13[51]: 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 @ 3.) 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 #A13: 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 criterion 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 does 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 is 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

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[50] EPA also reviewed a September 20, 1996, letter sent by James Pendergast, 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 *NHDES 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 *NHDES Great Bay Nutrient Report*.

[51] Coalition Comment No. 23.

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 WQSs, including its narrative water quality criterion for nutrients, in accordance with Section 301(b)(1)(C) of the CWA.

Comment #A14[52]: 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 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 3 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 #A14: Please see Response #A12 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, 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.

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 Exeter that the available information on effluent variability indicates that 3.0 may not be practicably or consistently achievable as a monthly average limit. See Response #B7a. 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

[52] Coalition Comment No. 24.

for nutrients consistent with EPA's regulations. (Hanlon, 2004)[53] To the extent that the comment is 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. Finally, 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.

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

Comment #A14a[54]: 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

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[53] 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; annual limits 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 discussed elsewhere in this Response to Comments.

[54] Coalition Comment No. 1.

in the permit Fact Sheet and in its public presentations. (Ex. 2.) This information is critical to the preparation of comprehensive comments on the proposed permit modification. EPA only recently provided that information on July 29, 2011. 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 modification. Upon review of the requested information, the Coalition intends to supplement these preliminary comments if necessary.

Response #A14a: 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 request, which was responded to prior to the close of the public comment period on August 12, 2011 and which was 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 submitted comments after August 12, 2011, and is considering them untimely.

Comment #A15[55]: 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 reopen the permit and in establishing 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 criteria must be achieved in the Squamscott River, at the point of Exeter's discharge, to allow 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 modified permit as proposed.

Response #A15: 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 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 and large variations in DO consistent with eutrophication. The Coalition has since determined that it will not be completing a water quality model until after the upgrade of the Exeter WWTF, due to the influence of direct discharges of chlorophyll-a from the Exeter lagoons. See Response #A2.

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 (~~–m~~odeling the further effects

[55] Coalition Comment No. 2.

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 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 Exeter 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 #A16[56]: Assumptions Regarding Causes of Use Impairment are Premature and Unsupported

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. 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. Moreover, the impairment designations for the Squamscott River (and other tidal rivers) are plainly in error with respect to eelgrass losses and DO impairments. In the Squamscott 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.) DES has verbally informed EPA that it intends to amend the eelgrass/transparency impairment designation for the Squamscott River to reflect those conditions that prevent eelgrass growth in these waters (e.g., elevated turbidity and color). Therefore, EPA's assertions that excessive nitrogen concentration is the reason for eelgrass loss and the key to their restoration in the Squamscott River or where this river enters the Bay are 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. Therefore,

[56] Coalition Comment No. 3.

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 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 #A16: 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. 19 - 24). 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 numeric thresholds, 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 #A17 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.

See Response #A15 above and Response #A18 below relative to the MOA.

See Response #B3c relative to eelgrass in the Squamscott River. NHDES is not amending the 303(d) designation to reflect color and turbidity concerns in the Squamscott River but rather is amending the list to reflect the specific portion of the Squamscott River that historically supported eelgrass habitat. The information EPA has received from NHDES (August 8, 2011 letter from Thomas S. Burack) indicates that NHDES merely intends to clarify where eelgrass existed historically and should exist today. The letter is also clear that the reason the lower Squamscott River is not currently suitable for eelgrass restoration is degraded water quality, which was the basis for Figure 6 in the Great Bay Restoration Compendium, September 2006 (Coalition Ex.6). Additionally, the letter indicates that "the modeled scenarios for the Squamscott River and Lamprey River are consistent with the proposed changes to the assessment unit boundaries" and "the changes to the assessment unit boundaries are not likely to significantly change the nitrogen load reductions predicted by DES." See also Responses #A1, A4, A7 and A10 relative to the role of color and turbidity on light transparency and eelgrass.

See Response #A2 relative to the relationship between nitrogen and dissolved oxygen in the Squamscott River. Even if the effluent limit was not based on meeting dissolved oxygen in the Squamscott River but was based only on maintaining eelgrass downstream in Great Bay, it would still be established at 3.0 mg/l (see NHDES, 2010, Appendix C).

Procedural Issues and Objections

Comment #A17[57]: The proposed permit action is premised on the conclusion that the underlying technical basis of DES's 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.[58] 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 Act's 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) ("(more rigorous peer review is necessary for information that is based on **novel methods** or presents complex

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[58] 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. § 131.1(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."

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)).[59] 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 part 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. 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 Clean Water Act 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, in stream TN standard chosen for the Squamscott River will not protect the designated use.

We request that the issues raised in the correspondence to the peer reviewers 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.

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[59] Given the Region's stated intentions of employing these in stream criteria throughout New Hampshire and the Great Bay watershed, EPA's permit modification is akin to criteria development, a process that must include the opportunity for public comment. 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 #A17: 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.[60] 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.[61]

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 the Great

[60] If EPA were in fact simply treating NHDES's ambient 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.

[61] 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.

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 #A1 to A14 and #B3a – e 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 draft nitrogen criterion 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 draft state numeric nutrient criteria.

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 *NHDES 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 Squamscott River in particular, let alone the assertion in the comment that the "in stream TN standard chosen for the Squamscott 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 Squamscott River will not protect the designated uses as claimed by the commenter (see Response #A15, A16 and A18 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 #A15, A17 and B3a, 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 2009 *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 #A18 [62]: 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. (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 493, 469 n.l (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, criteria and apply that draft value as if it were the adopted standard. DES has explicitly acknowledged that it needs to propose the draft criteria for adoption and has not yet done so in light of the admitted technical uncertainties (DES Agreement II-Ex. 1; *see also* 40 C.F.R. § 131.20). 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.

[62] Coalition Comment No. 2

Response #A18: 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 criterion thresholds in determining water quality impairments for the recently released draft 2012 303(d) list.[63]

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.[64] There is no indication that the State meant the

[63] 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 #A2.

[64] 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

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 draft nitrogen criterion thresholds were developed over a lengthy evaluation, including extensive water quality data and analysis. The MOA is a subsequent statement by the State expressing reservations at a particular in 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 ~~m~~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 draft nitrogen criterion 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 draft nitrogen criterion 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).

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responsibilities under the section 301 of the CWA simply by means of a bilateral agreement to which EPA is not a party.

See Background and Responses #A1 and B3a to B3d relative to the appropriateness of the proposed numeric thresholds and the weight-of-evidence approach to developing the criteria. The proposed numeric thresholds are not simply based on transparency.

Comment #A19[65]: EPA is applying an unadopted and unproposed numeric nutrient value to derive the permit limitations and conclude that limits of technology requirements should be applied to all point sources in this basin. There is nothing site-specific or waterbòdy specific with regard to the methods EPA employed to conclude that a 0.3 mg/l TN numeric criteria 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 criteria 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."[66] 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.,,").[67] 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

[65] Coalition Comment No. 3

[66] Criteria, regardless, of whether they are narrative or numeric, must be vetted through a thorough public notice and comment process. 40 C.F.R. § 131.3; 40 C.F.R. § 131.20(a), (b), and (c)

[67] *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).

communities must be afforded the opportunity to submit comments within the designated standard adoption process and appeal, if appropriate, this rule adoption action.

Response #A19: 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[68] 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; the *NHDES 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

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[68] 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.

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 target 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.

Comment #A20[69]: State authority over water quality standard decision-making must be respected by EPA pursuant to applicable federal rules. (33 U.S.C. § 1313, et seq.[70]) EPA is supposed to implement the state's interpretation of its narrative criteria application (see 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

[69] Coalition Comment No. 4

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

objectives to protect designated uses. However, under the MOA, issued after the publication of the draft criteria, 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 transparency-based TN criteria was adequate, EPA has failed to properly apply relevant draft numeric value consistent with the state's intended use of those criteria. 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 modified and must be withdrawn.

Response #A20 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 *NHDES Great Bay Nutrient Report* is not a formal state policy. The *NHDES Great Bay Nutrient Report* binds neither NHDES nor EPA. See also Responses #A15 - A18 relative to the MOA.

Absent formal, EPA-approved state interpretation 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 *NHDES 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 Responses #A17 and A19).

See Responses #A11 and B3c relative to the appropriate nitrogen thresholds in the Squamscott River. Even if dissolved oxygen were the only nutrient threshold required to be met in the Squamscott River, the limit would still be established at 3.0 mg/l (see NHDES, 2010, Appendix C).

Comment #A21[71]: 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. 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.,,).[72] EPA's approach for the Squamscott 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 Squamscott River and the other state criteria renders EPA's analysis fatally flawed and nothing more than speculation.

Response #A21: 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 #A23 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

[71] Coalition Comment No, 5

[72] Available at http://yosemite.epa.gov/sab/sabproduct.nsf/0/E09317EC14CB3F2B85257713004BED5F/$Fi1e/EPA-SAB-1O-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.”).

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 #A11 and B3a).

Comment #A22[73]: EPA's failure to consider site-specific factors before concluding that the Exeter facility contributes to transparency-based eelgrass restoration criteria violations "at the point of discharge" (Fact Sheet @ 3) 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 that the relative importance of factors influencing transparency in the Bay are the same in the Squamscott River at the point of Exeter'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. Thus, EPA's assumption that a 0.3 mg/l TN objective in Squamscott River is required to meet state narrative criteria objectives is not scientifically defensible

Response #A22: The commenter‘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 Squamscott River and downstream in Great Bay. A specific location in the Squamscott was chosen as the location for which compliance with the thresholds would be evaluated. This location is not —at the point of discharge” but is located significantly downstream and close to the area where eelgrass historically existed in the lower part of the Squamscott River. (NHDES, 2010, Appendix B, Table 10 and Attachments A to C, Grid A).

See Responses #A1, A4, A7 and A10 relative to transparency and Responses #A11 and B3c relative to eelgrass in the Squamscott River.

Comment #A23[74]: EPA's proposed permit modification regarding the need for stringent TN limitations at the Exeter 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)(l)(C) of the Act. Specifically, the fundamental "cause and effect" connections are missing from EPA's analyses, in

[73] Coalition Comment No. 6

[74] Coalition Comment No. 7

particular with respect to addressing eelgrass losses and low DO in the estuary arms.[75] 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 Squamscott River in the vicinity of Exeter'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. 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. 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, 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 Squamscott 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 Squamscott River.

Response #A23: 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 #A1 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 Response #A1. The permit record contains ample evidence that:

1) Eelgrass was present in the Squamscott River in the vicinity of the 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 Exeter discharge. See Responses #A11, A22 and B3c.

[75] 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. CWA §§ 303(c)(2)(A) and 304(a); 40 C.F.R. § 131.(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 authority to tighten standards.").

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 #A1.

3) Controlling nutrients will significantly improve transparency, based on NHDES' analysis of the components of water clarity and turbidity as set forth in the *NHDES Great Bay Nutrient Report* at 66. EPA notes that the Coalition'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 #A1.

The comment on the Winnicut River mischaracterizes the cited document. The *NHDES Nitrogen Loading Reduction Report* 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." (NHDES, 2010 at 10). 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 draft numeric nutrient criteria. (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 noting a lack of data or insufficiency 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 is 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 #A2.

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 N-Steps peer reviewers specifically cited to the comprehensiveness and clarity of the weight-of-evidence approach used to develop the draft numeric numeric criterion 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"). (EPA, 2010). 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 which 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.

DOVER 005257

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 means of communicating the current state of knowledge regarding the effects of nitrogen and phosphorus in aquatic systems but also provide an 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 in 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

DOVER 005258

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)" (SAB, 2010). 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 ambient thresholds.

Comment #A24[76]: EPA's decision to reopen the permit based on a previously submitted comment by the Conservation Law Foundations ("CLF"), claiming without site-specific data that the Exeter facility is causing impairments related to DO and chlorophyll a, was inappropriate and unjustified. This is especially true, given the state's previous conclusions that (1) water quality modeling was required to properly assess the factors influencing the DO concerns in the estuary arms, (2) the effect, if any, of TN to the impairments was uncertain, and (3) that a further evaluation of the effect of nitrogen on eelgrass losses was needed in light of information presented by the Coalition. CLF's comments did not raise "substantial new questions" as

[76] Coalition Comment No. 8

claimed by EPA. The new "impacts" claimed to exist are the same impacts that were observed in 2007, when the various reports prepared by Piscataqua River Estuary Project (PREP) were available as part of the permit record at that time. Consequently, the legal standard for reopening the permit has not been met, and EPA acted arbitrarily and without substantial evidence in reopening this permit.

Response #A24: The draft permit as originally released for public comment did not include a nitrogen limit and had no discussion of nutrient impacts. The comments cited to reports and data indicating that the receiving waters had reached their assimilative capacity for nutrients (e.g., PREP State of Estuaries Report for 2003 and 2006), and evidence of existing impairments associated with dissolved oxygen and chlorophyll-a, as indication that the permit as drafted would result in violations of New Hampshire‘s narrative nutrient water quality criterion; the state‘s biological and aquatic community integrity criterion; and its antidegradation policy. Given the increasing attention on the impact of nitrogen on the receiving waters by NHDES and others, the questions raised by CLF about the lack of *any* nitrogen limit in the permit were certainly substantial and were being posed to EPA for the first time in the permit reissuance process. The Fact Sheet makes no reference to new impacts and the legal basis for reopening the permit (40 C.F.R. § 124.14) is not limited to a demonstration of new impacts. Under commenter‘s approach, a draft permit could never be reopened even if based, for instance, on a substantial oversight, omission or mistake that occurred immediately prior to public notice, but could be reopened if those were to occur immediately after public notice. Such a reading of ―substantial new questions” is not reasonable, and also has no basis in the regulations. (EPA finally observes that a decision by EPA to include the nitrogen limit *without* reopening the permit, which was an option available to EPA, would have deprived the commenter the opportunity to question the basis of the limit on the record, an opportunity that it has fully availed itself of.)

While CLF raised substantial questions regarding the need for nitrogen limits in Great Bay, EPA‘s decision making is based on the best available science and the statutory and regulatory requirements relating to wastewater discharges. Since CLF first raised these issues, conditions in the Great Bay estuary have been the subject of significant additional study demonstrating that the estuary has experienced increases in nitrogen levels and troubling signs of degradation consistent with well studied concepts of nitrogen driven eutrophication.

Comment #A25[77]: EPA's interpretation of CWA § 301(b)(1)(C), which lead to the decision to reopen the permit, is in error. This provision of the Act does not mandate that a facility receive effluent limitations that ensure it does not "cause or contribute to" a WQS exceedance, it only requires that limitations be imposed as "necessary to (achieve 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).[78] Since this rationale was presented as the legal basis for

[77] Coalition Comment No. 9

[78] New sources of dischargers are prohibited from causing or contributing to a violation of water quality standards. 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

reopening the permit (Fact Sheet @ 2), the permit should be withdrawn. Moreover, nowhere in the Fact Sheet does EPA demonstrate that a 3 mg/l monthly maximum limitation, as opposed to a less stringent limitation, is "necessary to achieve water quality standard" compliance in the Squamscott 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 Exeter's permit. The very language of the report discloses that no decision regarding the proper in stream 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 Exeter Subestuary.) Moreover, the analysis specifically assessed annual and multi-year average load reductions, not monthly maximum conditions as interpreted by EPA. Thus, to the degree EPA relied on this report as the basis for imposing limitations, EPA misapplied the results.

Response #A25: Although EPA should have quoted Section 301(b)(1)(C) precisely, EPA disagrees that it misapplied the appropriate legal standard under Section 301(b)(1)(C) or that it improperly exercised its discretion to reopen the permit under 40 C.F.R. § 124.14(c) to include a limitation for nitrogen. In defining the ―substantial new questions that caused [the draft permit‘s] reopening," EPA stated that question was limited to:

> Specifically, EPA has determined that a monthly average total nitrogen discharge limit of 3.0 mg/l for the months of April through October and a mass limit of 75 lbs/day based on the concentration limit and the design flow of the treatment facility are necessary to comply with CWA Section 301.

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 Exeter facility‘s discharge contribute to water quality violations at the point of discharge in the Squamscott River, as well as further downstream in Great Bay. Fact Sheet at 3.

EPA then concluded that a limit of 3.0 mg/l would need to be imposed to ensure compliance with applicable water quality standards:

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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 pollutants. 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.")

> The analysis of available information by EPA, 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 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 Exeter 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 #A5, B4, B5 and C3). 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 #B7a). 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 #B7a, 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 #A26[79]: EPA is reinterpreting its rules to mandate "limits of technology" ("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.[80] 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) is the vehicle for resolving the establishment of limitations necessary to achieve applicable water quality standards.[81] 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

[79] Coalition Comment No. 10

[80] 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) ("secondary 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.")

[81] Arkansas v. Oklahoma, 503 U.S. 91,108 (U.S. 1992) ("The (CWAJ 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., § 313(d).").

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 Exeter 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 is unfair and inequitable treatment of similarly situated facilities which violates due process, equal protection, and is fundamentally unfair.

Response #A26: 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 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.[82] 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-based effluent limitations comply with "appropriate water quality standards," and be consistent with "available" waste load allocations. Thus for the purposes of complying

[82] *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.")

> 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 Exeter 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, 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).

<u>Great Bay Municipal Coalition Comments, August 12, 2011</u>

Comment #A27: 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. EPA recently provided that information on July 29, 2011, and Hall & Associates has reviewed those documents. 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 mg/1 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 permit 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 form 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 are 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/1 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).

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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/l 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.

Consequently, this FOIA response 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/l TN in stream objective in the Squamscott River is necessary to restore lost eelgrass beds in that waterway, and 2) that a 3 mg/l 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.

Response #A27: 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 have been* 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 FOIA response lacked Agency records addressing nutrient impacts on the Squamscott River. The Agency records addressing nutrient impacts on the Squamscott River are identified in the Fact Sheet and in the Responses to Comments #A1 to A2 and B3, among others. EPA also disagrees that the record lacks adequate information upon which to base EPA‘s permit decision 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. See Responses #A1 to A12 and B1 to B5.

To the extent that there were specific records or categories of information requested under FOIA for which no data exist,[83] this does not necessarily present a bar to determining the need, and 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,[84] 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.

B. Town of Exeter Comments, August 11, 2011

Comment #B1: Introduction

The Town of Exeter ("Exeter" or the "Town") submits the comments herein on the proposed modification of the Town of Exeter NPDES Permit No. NH0100871, that was published for comment as a draft permit by EPA on March 25, 2011. The deadline for filing comments was extended to August 12, 2011. The draft permit ("Permit") that was released for public comment on March 25, 2011 was partially revised from an earlier draft permit that was released for public comment on October 25, 2007. Based only on comments received from the Conservation Law Foundation ("CLF"), EPA reopened the 2007 draft permit to include new discharge limits for total nitrogen from the Exeter Wastewater Treatment Plant ("WWTP").

This new nitrogen limit for the Exeter permit is reflective of the U.S. Environmental Protection Agency's ("EPA") and the New Hampshire Department of Environmental Services ("DES") concern about nutrient loadings from all sources into Great Bay. The Town shares the concern of the federal and state governments about the health of the Great Bay Estuary. The Town fully appreciates that it discharges nitrogen from its wastewater treatment plant ("WWTP") and that upgrades to that plant are necessary to reduce nutrient loadings into the Squamscott River and ultimately into Great Bay. In addition to the recognized need for an upgraded wastewater treatment facility, the Town of Exeter also appreciates that, as the Fact Sheet indicates, the other sources of nutrient loadings into Great Bay must be identified and reduced. These other sources include sources such as agricultural sources, atmospheric deposition, fertilizer use, landfills, stormwater runoff (both regulated and non-regulated) and the hundreds of septic systems serving businesses and residences in the Squamscott River watershed (those septic systems that are failing, as well as fully functioning ones).

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[83] 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.

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

The Town has already entered into a written commitment through a Memorandum of Agreement with DES and other municipalities in the Great Bay watershed to reduce substantially the nitrogen discharge from its WWTP. The Town has committed to begin promptly planning for an upgraded treatment plant in Exeter that will achieve a nitrogen discharge limit of 8 mg/1. Thus, the comments filed today by the Town do not represent a disagreement on the need to reduce nitrogen loadings into Great Bay. They do, nevertheless, raise a substantial question about the degree to which the Town of Exeter (and subsequently other municipal wastewater treatment plants discharging into Great Bay) must reduce its nitrogen discharges. The ultimate question facing EPA, DES and the Town is (1) whether the nitrogen limit included now in the modified draft permit of a monthly average concentration of 3 mg/l is supported by the data and analyses that have taken place in Great Bay, and (2) whether the additional expenditure of millions of dollars to achieve that lower limit is a reasonable and lawful requirement for EPA to impose in its NPDES permit for Exeter.

For the reasons set forth herein, the Town requests that EPA reconsider its decision to re-open the draft Permit to impose a new limit for total nitrogen and that EPA modify the provisions addressing the nitrogen limit as recommended below.

Response #B1: EPA appreciates that the Town recognizes the need to reduce nitrogen discharges from its wastewater treatment plant and fully concurs that that the current dispute over the nitrogen limit appears to reflect differences over the necessary ―degree" of such reductions. EPA recognizes the Town‘s commitment to moving forward with planning for a treatment plant that will provide nitrogen removal. (EPA understands that the Town has authorized funding for a facilities plan, but has not yet initiated the study.) EPA also appreciates that the Town recognizes the need to control other sources of nitrogen in the watershed.

Upon careful consideration of the Town‘s comments, EPA continues to believe that a nitrogen limit of 3.0 mg/l is as stringent as necessary and must be included in the permit. EPA has generally concluded that the Town‘s proposed changes to the permit s are not appropriate, although Region has made a change to the averaging period for the limit as discussed in Response #B7d. Detailed responses to the Town‘s specific comments follow.

Comment #B2: Incorporation by Reference of the Comments Filed by the Great Bay Municipal Coalition on August 9, 2011

The Town of Exeter 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 Exeter draft permit on August 9, 2011. Those comments were filed on behalf of the Coalition and each of its member communities, and the Town of Exeter specifically incorporates those comments by reference herein. For ease of reference, we also include a copy of the Coalition‘s August 9, 2011 comments (but not the exhibits thereto). (Attachment A)

Response #B2: EPA has responded to all of the Coalition‘s comments in Section A.

Comment #B3: EPA's proposed discharge limits are based on an inappropriate interpretation of the NHDES narrative criteria.

Comment #B3a: 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. Existing Sate Surface Water Quality Criteria (Env-Ws1700) have narrative criteria, but as DES 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. DES 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 #B3a: 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 #B3b: By including a new nitrogen limit in the draft Permit, EPA has relied heavily on the DES 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 DES'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 #B3b: 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 target values for other estuaries were not in all cases transparency-based but drew from a variety of methodologies, including reference-condition approaches.[85] While EPA disagrees with the assertion that nitrogen levels are not the controlling

[85] 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

factor for light transparency and eelgrass habitat in the Great Bay estuary, see below and Response #A1, 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 target 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 draft nitrogen criteria 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 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 #A17 and B3a.

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*:

> 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.

–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 #A1, 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 25 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 #A1.

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:

> ~~I~~ncreasing 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 #B3c: 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. 20), 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 Squamscott River. The actual cause of eelgrass loss in the Squamscott River is unknown and occurred more than 40 years ago (long before most documented eelgrass declines in Great Bay and before increasing TN and decreasing transparency trends). Neither DES nor any other researchers have been able to link Squamscott River eelgrass losses with nitrogen conditions in the river. Further, the Great Bay Estuary Restoration Compendium, Figures 6 and 7, identify the Squamscott River as not suitable habitat for eelgrass restoration. (Attachment B).

Response #B3c: As indicated previously, MADEP thresholds were established based on the nitrogen concentrations in receiving waters with documented high-quality biological health. The majority of Massachusetts site-specific nitrogen thresholds are significantly lower than the Pleasant Bay target. 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 criteria 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 (Massachusetts Estuary Program, 2006). 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* (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 at Chapman's Landing from 2000 - 2008 was 0.29 mg/l (NHDES, 2009b), far in excess of acceptable levels.

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 the 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). See also Response #A3.

NHDES has identified the lower portion of the Squamscott River as an area where eelgrass formerly existed. As explained in the Fact Sheet and this response to comments, maintaining habitat for eelgrass, a cornerstone species, is essential to achieving the water quality standards designated use for the protection of aquatic life, and biological and aquatic community integrity. Env-Wq 1703.19. The Amendment to the Section 303(d) list explains that the historic maps of eelgrass in the Squamscott River show 42.1 acres of habitat in 1948 while median eelgrass cover for the 2006-2008 period was 0 acres. It is not known when the eelgrass was lost. As indicated in an August 8, 2011 letter to EPA from Thomas S. Burack, the reason the Squamscott River was not identified in the Great Bay Estuary Restoration Compendium as suitable for an eelgrass restoration project 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.

Even if eelgrass habitat was not part of the designated use, the total nitrogen discharge limit to meet dissolved oxygen in the Squamscott River and 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 be necessary (see NHDES, 2010, Appendix C).

Comment #B3d: 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 DES will provide substantial new information and insights on the DO regime in the Squamscott River. 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 #B3d: EPA disagrees with the comment. The Fact Sheet and Response #A2 amply details 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 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 Squamscott River. According to the ―Amendment to the New Hampshire 2008 Section 303(d) List Related to Nitrogen and Eelgrass in the Great Bay Estuary" (NHDES, 2009b), the Squamscott River is impaired for dissolved oxygen and biological and aquatic community integrity. The indicators showing dissolved oxygen impairment are chlorophyll-a, nitrogen, and in-stream dissolved oxygen monitoring. As explained in that document, relative to the dissolved oxygen criteria (Env-Wq 1703.07), sufficient data were available for assessments for dissolved oxygen, dissolved oxygen saturation, total nitrogen, and chlorophyll-a. All of these indicators, except for the dissolved oxygen saturation indicator, were categorized as impaired (Non Support) based on

their individual criteria. The dissolved oxygen saturation indicator met the criteria for Fully Supporting but this discrepancy is explained by the large diurnal swings in dissolved oxygen that occur in the Squamscott River. These daily fluctuations cause violations of the daily minimum standard but not necessarily the daily average saturation. These large diurnal swings are another indicator of eutrophication which is consistent with a Non Supporting classification for nitrogen for the Squamscott River. The highest levels of chlorophyll-a and the greatest number of dissolved oxygen criteria violations are experienced in the upper reaches of the estuary where the highest levels of total nitrogen are present. The dissolved oxygen impairment status for the Squamscott River was retained in the recently released NHDES draft 2012 303(d) list (NHDES, 2012b at 9).

The data collected by the Coalition under the MOA are consistent with the existing data for the Squamscott River, showing dissolved oxygen minimums below the water quality standard and high chlorophyll-a and total nitrogen concentrations. See Response #A2. In light of these data and analyses, EPA concludes that the allegations of uncertainty and the mere desire for more data are not sufficient rationales for delaying development of a limit. EPA notes that the Coalition has now 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 #A2.

Comment #B3e: 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 Exeter WWTP discharge on the Squamscott River, and not Great Bay. On pages 21-23 of the Fact Sheet, EPA points to the high nitrogen values measured in the Squamscott River and the total nitrogen concentration in the river, and then calculates a total median nitrogen concentration in the Squamscott by adding the concentration from the Exeter River (upstream of the Squamscott) 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 Exeter 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 Squamscott, or providing a more complete cause and effect relationship between nitrogen discharges from the Exeter treatment plant and any impairments in Great Bay.

Response #B3e: The justification for a total nitrogen limit of 3.0 mg/l appropriately focuses on the Squamscott 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 Squamscott River, see Response #B3c, and based on data and other information in the record disagrees with the contention that the nitrogen-river DO relationship is uncertain, see Response #B3d above.

While the Fact Sheet focuses more on the water quality of the Squamscott River because it is the immediate receiving water, the limit is also clearly necessary to meet nitrogen criteria in Great Bay and Little Bay. As indicated in Response #1c, 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 Load Reduction Report*, the nitrogen loading threshold for restoring the Squamscott River designated uses is also consistent with the nitrogen reductions necessary to meet standards in Great Bay and Little Bay.

Comment #B3f: EPA also inappropriately applies the near field low flow dilution factor of 25.2 to estimate the impact of Exeter‘s discharge on the nitrogen level in the river. This "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. This misapplication of the dilution factor results in an overstatement of the TN concentration impacts of Exeter‘s plant on the river (stating that the Exeter WWTP adds 0.57 mg/l to the river when the actual amount is 0.15 mg/l at Chapman's Landing per DES's model). This misinformation should be corrected.

Response #B3f: 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 Exeter‘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 Response #A12-14.

Comment #B4: There Are Other Sources of Nitrogen That Need Control

Just as the Town of Exeter acknowledges that it has a need for, and has committed to, reductions in the nitrogen discharges from its treatment plant, EPA has also acknowledged that there is a need for other reductions in the entire watershed in order to address the health of Great Bay. Not only must there be reductions in nitrogen loads from other municipal treatment plants, but the largest contribution of nutrients to the Great Bay Estuary is from non-point sources. DES is in the process of identifying and quantifying the various sources of loads for the entire watershed and this effort should inform future non-point source reduction measures. In addition to these efforts, DES will need to undertake a nonpoint source TMDL.

There are also sources of nitrogen from outside the watershed that are contributing to the Great Bay nutrient challenge and these sources need to be targeted for reduction as well. The future direction of these other sources may have a huge impact on Great Bay. Currently 20% of the DES calculated allowable load to the Bay is consumed by background nitrogen from the ocean. The background ocean nitrogen concentration of 0.2 mg/l is already at 2/3rds of DES's target maximum concentration for the Bay. If EPA imposed New England wide nitrogen controls and the background nitrogen level were reduced to say 0.1 mg/l, the watershed reduction goals would be reduced by approximately 25%, with watershed savings likely in excess of $100M.

Conversely, if the background nitrogen levels increase to say 0.3 mg/l, the ocean will provide no dilution benefit to Great Bay and it would be practically impossible to attain DES's water quality objectives for the Bay. Based on this analysis, it would appear that the future of Great Bay water quality could be greatly impacted by what happens to the background nitrogen levels in the ocean. If these levels are allowed to continue to increase, any efforts within the watershed could be futile. In view of this, we need EPA's forecast of future of background nitrogen levels in the ocean and commitment to effect improvement in this regard. Another major source of nitrogen reaching the Bay from outside the watershed is atmospheric deposition. A preliminary estimate for the Lamprey River Sub-basin shows on the order of 50% of the watershed nitrogen input is from atmospheric deposition. This is obviously very significant and another area that we need EPA's forecast and commitment for future improvement.

Response #B4: It is correct that nonpoint sources (including storm water) are the largest source of total nitrogen to the estuary as a whole and that in addition to point source reductions, nonpoint source reductions will be necessary to comply with the narrative nutrient criteria. While it is critically important to control the point sources, since they contain a higher fraction of the most bioavailable form of nitrogen than nonpoint sources, the longer term effort of controlling nonpoint sources will require completion of the NHDES ongoing analysis identifying and quantifying the various sources of nonpoint source loads for the entire watershed. While EPA expects this analysis to form the basis for a detailed nonpoint source reduction strategy, including funding sources, it will not necessarily be in the form of a TMDL.

EPA believes that the assumption in the *NHDES Great Bay Nutrient Report* that the nitrogen concentration in offshore waters is not changing is a reasonable one for the foreseeable future (NHDES, 2009a at 18). As the peer review notes:

> "The report assumes that total nitrogen in the Gulf of Maine is not changing much over time (page 18). I believe this assumption is fine, and the report need not worry overly or be defensive about the increased nitrogen load from land having a major influence on the Gulf of Maine in that regard. In general, the inputs and concentration of total nitrogen on the continental shelf off the northeastern US are dominated by inputs of deep North Atlantic water (Boyer, E.W., and R.W. Howarth. 2008. Nitrogen fluxes from rivers to the coastal oceans. Pages 1565-1587 in D. Capone, D.A. Bronk, M.R. Mulholland & E.J. Carpenter (eds.), Nitrogen in the Marine Environment, 2nd Edition, Elsevier, Oxford.). This would probably be particularly true in the Gulf of Maine."

(Howarth, 2010). While ongoing efforts to control nonpoint source nitrogen discharges in estuaries and embayments could result in reductions in the background ocean levels of nitrogen in the vicinity of Great Bay, it is unlikely to result in a significant change. It is also possible that future population growth and associated development, as well as the effects of climate change, will offset the benefits from those reductions.

While reducing nitrogen levels in atmospheric deposition through improvements to air quality could result in reducing receiving water concentrations of nitrogen, achieving these reductions is far from certain and based on multiple variables.

EPA is not required to affirmatively engage in the type of long-term and complex forecasting regarding future levels of other sources of nitrogen pollution prior to establishing a water quality-effluent limitation for the pollutant in an NPDES permit. EPA is authorized to impose a limit on the discharge based on the best information available during the reissuance process. Rather than attempting to forecast changes in background concentrations from ocean contributions or atmospheric deposition, especially on the basis of the speculative propositions made by the Town, EPA believes the better course is to address future changes in background nitrogen concentrations and in atmospheric load contributions in the context of future permit actions.[86]

Comment #B5: It Is Not Appropriate to Hold Exeter Accountable for Non-point Source Reductions by Others.

On page 24 of the Fact Sheet, EPA asserts that the permit will be reopened to incorporate more stringent nitrogen discharge standards in the event adequate progress is not made relative to non-point source nitrogen reductions. Much of the non-point source control efforts are beyond the Town's control and the Town should not be held accountable for the actions (or inactions) of state or federal agencies, other towns and regional authorities. Exeter is already shouldering a disproportionate share of the watershed nitrogen removal costs because we have a treatment plant that EPA can regulate. The failure to take a watershed-based permit approach to the complex Great Bay nutrient issues makes equitable cost allocation more challenging. Threatening to push Exeter further if the other stakeholders do not do their part with respect to non-point sources adds an onerous and unfair burden on the Town.

These provisions in the Fact Sheet also heighten our concerns about EPA proceeding with inappropriate interpretations of DES narrative criteria. As we identified above, much of the cited precedent for other watersheds (which is based on nitrogen-light transparency issues) is not relevant to Great Bay and results in erroneously low suggested target nitrogen criteria. This in turn may result in significant overestimation as to the level of non-point source nitrogen removal required. The Town of Exeter does not want to be held accountable for removing non-point source nitrogen to unjustifiable levels from sources outside the Town's control. EPA should review the sensitivity analysis (See Table 1 below) on the nitrogen removal requirements at assumed numeric nitrogen levels to understand the impacts of the scientific uncertainty. The provisions threatening further reduction of nitrogen from the Exeter WWTP - even below the limit of technology - should be removed from the Permit.

Response #B5: 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

[86] EPA also notes the ‗near impossibility' of achieving the criteria does not bear on what the appropriate protective instream threshold should be, nor does it impact the calculation of the WQBEL. The provisions requiring EPA to issue a permit that it reasonably believes will ensure compliance with applicable water quality standards do not impose any obligation on EPA to first demonstrate that the standards are attainable. *See* 33 U.S.C §§ 1342(a), 1311(b)(1)(C); 40 C.F.R. § 122.44(d). There is a separate procedure for States – not EPA – to amend their water quality standards to remove uses or adopt less stringent criteria, but only through the established procedural process, not through an individual NPDES permit issuance. *See* 40 C.F.R. §§ 131.10 (g), 131.21.

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 calculated to by itself meet 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 Limit"* 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.").

The language relative to further reductions in the point source limits is intended to make clear EPA's obligation under the Clean Water Act to impose in NPDES permits limits as stringent as necessary to comply with applicable water quality standards. The nitrogen limit of 3.0 mg/l is predicated on nonpoint source reductions being pursued. It follows that that if these reductions are not pursued in accordance with EPA's assumptions, a more stringent limit on the discharge will be necessary. Accordingly, EPA reaffirms the fact sheet language regarding reopening of the permit, and has include express reopener language in the final permit. However, it is EPA's expectation, as documented in the Fact Sheet and in the Final Permit, that a comprehensive watershed-wide nonpoint source reduction effort will be pursued to attain the nitrogen thresholds consistent with the State's narrative 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.

It is important to note that the communities with point sources also tend to be the communities with the most significant nonpoint source contributions. These communities have a relatively high level of development with large areas of impervious cover, they contain approximately half of the septic systems in the watershed, 70 percent of the population of the watershed (USGS, 2007) and they are in closest proximity to the impaired sections of the estuary.

See Background and Responses #B3a-c above relative to the appropriateness of the nitrogen criteria threshold and Response #B6 below relative to the sensitivity of the threshold.

Comment #B6: **The Scientific Uncertainty Has Huge Financial Implications That Beg for an Adaptive Management Strategy.**

While the above-referenced range of potential nitrogen criteria (i.e., 0.3 to 0.45 mg/1 depending on the water quality objective) may not seem that large, it is important to understand the watershed-wide nitrogen control differences between the high and low end of this range is very significant and represents potentially hundreds of millions of dollars for the watershed. Table 1 illustrates the impact small changes in the nutrient criteria have on the Great Bay nitrogen removal requirements.

TABLE 1

GREAT BAY LOAD REDUCTION REQUIREMENTS FOR VARIOUS ASSUMED GREAT BAY TOTAL NITROGEN CRITERIA

TN Criteria (mg/l)	Great Bay Total Nitrogen Load				Point Source Reduction (ton/yr)	WWTP TN Limit (mg/l)	Non Point Source Reduction	
	Existing[1] (ton/yr)	Allowable[1] (ton/yr)	Reduction (ton/yr)	Reduction (%)			(ton/yr)	(%)
0.30	1408	988.9	419.1	29.8	280.8	3.0	138.3	13.4
0.32	1408	1071.3	336.7	23.9	280.8	3.0	55.9	5.4
0.34	1408	1153.7	254.3	18.1	264.4	3.5	0.0	0
0.35	1408	1194.9	213.1	15.1	215.3	5.0	0.0	0
0.36	1408	1236.1	171.9	12.2	182.5	6.0	0.0	0
0.37	1408	1277.3	130.7	9.3	133.4	7.5	0.0	0
0.38	1408	1318.5	89.5	6.4	100.6	8.5	0.0	0
0.39	1408	1359.7	48.3	3.4	48.3	>10	0.0	0
0.45	1408	1607.0	0	0	0	NL	0.0	0

Note

1. DES, *Great Bay Nitrogen Loading Analysis*, November 2010, page 11; Allowable loadings for various criteria determined by pro-rating the allowable loading of 1408 ton/yr based on a criteria of 0.3 mg/l per methodology shown in DES' report, *Preliminary Watershed Nitrogen Loading Thresholds*, October 2009, page 10.

The nitrogen removal requirements at a nitrogen criterion of 0.3 mg/1 are nearly five times what they are with a nitrogen criterion of 0.38 mg/1. EPA's proposed limit of technology (LOT) nitrogen discharge standard is premised on the false assumption that a TN criterion of 0.3 mg/1 has to be attained in the Bay and river to improve light transparency and thus eelgrass habitat. If the actual nitrogen criteria necessary to protect the Great Bay system were in the middle of the above referenced range, an 8 mg/l TN limit for WWTF point sources would be adequate to meet the criteria. It is important to note that there seems to be a consensus forming among the stakeholders that the ultimate controlling issue will be macro algae and not eelgrass light transparency issues or epiphyte issues, and that DES's macro algae criterion is in the middle of the above-referenced range.

Other factors that could reduce the magnitude of the nitrogen reduction required to achieve water quality goals are potential aquaculture (e.g., oyster beds) and bio-remediation efforts in Great Bay that have been discussed and may well be part of an adaptive management strategy.

Given the technical uncertainties with respect to appropriate nutrient criteria and given the very significant cost implications associated with these uncertainties, it would seem that the two reasonable and sustainable paths forward are to either (1) refine the technical basis for the nitrogen criterion and complete a TMDL before finalizing the permit limit, or (2) proceed with

an adaptive management approach with an intermediate target nitrogen criterion (0.38 mg/I TN suggested as in the middle of the range), with future adjustments to this criterion based on monitoring results. DES has appropriately captured the idea of such a phased approach. In its December 2010 draft Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed, DES has set forth the estimated loadings from point source and non-point sources into Great Bay, and has also provided an estimate on the reductions that would be achieved at various treatment levels for nitrogen. In the concluding section of this draft report, DES states that "([a]ll of this information is needed to establish permit limits for nitrogen limits for WWTPs; however, this report does not actually set these permit conditions. The information in this report should be used to develop detailed Watershed Implementation Plans with steps that can be taken in a phased manner to reduce nitrogen loads from both point and non-point source". Further, DES recommends that such Watershed Implementation Plans "should be developed concurrently with additional research to refine our scientific understanding of the system." See Draft Loadings Report at p. 24. The Town of Exeter endorses this approach and encourages EPA to adopt it.

Response #B6: EPA disagrees that choosing a different, less stringent value from somewhere along the narrow range of protective instream nitrogen thresholds (0.3 to 0.45 mg/l) will result in a change to the permit limit for this facility. The analysis presented simply disregards the need to address water quality impacts in the Squamscott River, the direct receiving water for this discharge. The impact of a difference in nitrogen criteria from 0.3 mg/l to 0.45 mg/l in the Squamscott River is set forth in Table 2a of the NHDES Loading Reduction Report (2010). For a threshold concentration of 0.3 mg/l (the threshold to protect eelgrass locally), a 53% reduction in total nitrogen loads is required. For a threshold of 0.45 mg/l (the threshold to prevent low DO locally), the required reduction is 34%. The entire range of potential nitrogen thresholds requires maximizing point source reductions as well as substantial nonpoint source reductions. As explained by NHDES:

> If the WWTFs receive permits that limit the effluent nitrogen concentration to 3 mg N/L at design flow, 30.1 tons per year would be removed from the estuary. In addition, non-point sources would have to be reduced by 25 percent to prevent low dissolved oxygen and 56 percent to protect eelgrass locally. In order to protect eelgrass in downstream areas, nonpoint sources would have to be reduced by 12 percent.

Id. at 12. Similarly, if the threshold were 0.38 mg/l, as suggested by the permittee, applying that threshold in the Squamscott River would require a 3.0 mg/l limit on WWTF discharges as well as substantial (30-40%) reductions in nonpoint sources. EPA disagrees therefore with the Town‘s analysis that the selection of a marginally less stringent instream threshold will result in dramatically less stringent permit limit of 8 mg/l.[87]

EPA perceives no persuasive water quality-based or other rationale in the Town‘s comment for imposing a limit of 8 mg/l. In the Town‘s view, *if* the permit were required only to protect Great Bay proper and could disregard the Squamscott River; *and if* the only issue affecting eelgrass in Great Bay proper were macroalgae; *and if* the least conservative macroalgae threshold of 0.38

[87] A target of 0.34 mg/l suggests a limit of 3.5 mg/l for the WWTF, not 8 mg/l.

mg/l were selected from the range of 0.34-0.38 mg/l determined by NHDES, *then* a permit limit of 8 mg/l TN would be appropriate. None of these assumptions are reasonable or persuasive from a legal or technical standpoint in EPA's judgment for reasons explained in this and other responses.[88] EPA disagrees, for example, with the contention that there is a "consensus" that the "ultimate controlling issue will be macroalgae." While macroalgae impacts are clearly an important issue in Great Bay, particularly in shallower areas where light attenuation impacts are less pronounced, macroalgae are only one aspect of the eelgrass problem. See Responses #A1, A4, A7 and A10 relative to eelgrass and light transparency.

EPA has also explained that forestalling imposition of WQBELs in an NPDES permit while a TMDL is developed is not required and is not appropriate in this case. As also explained above, it is well established that EPA may set an effluent limitation and make a finding that it is as stringent as necessary to ensure compliance with water quality standards even in the face of some uncertainty. EPA does not believe that the scientific uncertainty in this permit proceeding is so great as to preclude establishment of a protective instream threshold. EPA was able to do so here based on the evidence before it, and the Town has not set forth persuasive facts or evidence that EPA's judgment constituted an unreasonable or erroneous interpretation of that evidence. An adaptive management approach is not an acceptable substitute for a properly determined permit limit. It is not consistent with the regulatory requirements of the Act, which mandates that a permit as written include effluent limitations and conditions to ensure compliance with water quality standards irrespective of cost or technological feasibility at the time of permit reissuance. *See* 40 C.F.R. § 122.4(d) (prohibiting issuance of a permit "when the imposition of conditions cannot ensure compliance with the applicable water quality requirements of all affected states.").

Comment #B7: Even If EPA Declines to Withdraw the Draft Permit, Modifications to the Permit are Necessary.

Comment #B7a: <u>EPA's Proposed Nitrogen Limits are Actually Below Limits of Technology (LOT) Are Unattainable and Should be Changed.</u>

As stated above, Exeter does not believe EPA has a sound scientific basis to impose a limit of technology (LOT) nitrogen limit. Even if EPA had reason to establish a LOT-type limit, however, EPA has insufficient basis to establish that limit at 3 mg/l- for several reasons. The first is that limits of technology need to be discussed in the context of a time period. What is achievable on an annual or seasonal average basis is different than what is achievable on a monthly average basis. EPA has inappropriately taken LOT expectations for southern climates and applied them to Exeter. Further, EPA has inappropriately taken annual average LOT expectations and applied them as monthly limits.

EPA's Municipal Nutrient Removal Technologies Reference Document (2008, p. 2-80) ("EPA Reference Document") references the several factors that affect nitrogen removal efficiency.

[88] EPA also disagrees with the calculations set forth in the comment Table. The methodology used (pro-rating of allowable loadings based on the figures shown on page 10 of the DES Report) is not correct; the figures on page 10 are specific to the Lamprey Watershed and do not apply to the overall Great Bay estuary, which has a higher ocean contribution to total nitrogen concentrations.

One factor that can influence how low the TN can be reduced is the dissolved organic nitrogen (DON) concentration. At this point, the DON concentration in Exeter‘s wastewater is not known. This will be explored in more depth as part of the Facility Planning process which is tentatively scheduled for 2012. EPA's reference document states that "The DON concentration is a critical variable for determining TN standards because the chemicals have limited availability for biological removal." Absent this data, EPA cannot establish an appropriate LOT with certainty.

In the absence of DON data, EPA should consider a total inorganic nitrogen (TIN) limit. At a recent Southeast Watershed Alliance meeting, EPA representatives handed out an EPA Publication entitled An Urgent Call to Action Report in the State-EPA Nutrient Innovations Task Group (August 2009). In this publication, the stringent 3 mg/l technology-based nitrogen limits are discussed in the context of nitrate plus nitrite-nitrogen and not in the context of TN -- or even in the context of TIN which includes ammonia as well as nitrate plus nitrite-nitrogen (see Attachment C, p. 14). If EPA chooses to apply a LOT to this Permit, a TIN limit of 3 mg/l on a seasonal average basis would be more appropriate for Exeter than a TN limit of 3 mg/1. There is precedent for this elsewhere (e.g., Kalkaska, MI). The EPA Reference Document reports the LOT to be 3 mg/l on an annual average basis (not monthly average) based on a survey of, primarily, southern plants. The EPA Reference Document also references wastewater temperature as another factor that influences nitrogen treatment efficiency. Given the much colder temperatures in New Hampshire, the LOT for Exeter is expected to be higher than for these southern plants. Based on EPA's Reference Document, the proposed TN limit, even if applied on a seasonal average basis, is beyond the reasonable LOT in this instance because of the cold temperatures in NH.

Over the past few years, Connecticut communities have had to upgrade treatment facilities with state of the art technology to reduce nitrogen levels to the limits of technology in order to meet the requirements of the Long Island Sound total maximum daily load ("TMDL"). Table 2 below is a compilation of the 2010 data from ten of the recently upgraded plants in Connecticut.

TABLE 2 CONNECTICUT WWTFs 2010 DATA MONTHLY AVERAGE TOTAL NITROGEN CONCENTRATION (mg/l)				
Treatment Plant	12 Month Average	Apr-Oct Average	12 Month Max Month	Apr-Oct Max Month
Branford (4-stage Bardenpho)	3.4	3.1	6.6	4.7
Cheshire (Act Sludge, Denite Filter)	1.8	2.0	2.9	2.9
Jewett City (Phased Isolation Ox Ditch)	2.3	2.1	4.2	3.0
Southington (TF, Act Sludge, Denite Filter)	5.4	5.2	7.7	7.7
Suffield (MLE Ox Ditch)	2.1	1.9	4.6	2.9
Waterbury (4-stage Bardenpho)	4.1	3.7	6.0	5.4
Westport (4-stage Bardenpho)	2.6	2.1	4.7	2.6
Stamford (4-stage process)	3.5	2.8	5.4	3.2
New Canaan (MLE Ox Ditch)	3.1	2.4	4.8	3.1
Milford Housatonic (4-stage Bardenpho)	4.7	4.4	6.4	5.1
Average	3.3	3.0	5.3	4.0
Maximum	5.4	5.2	7.7	7.7
Minimum	1.8	1.9	2.9	2.6

*Reference Attachment D for complete 2010 data.

While many of these plants are producing very impressive results, it is important to note that 60% of these plants exceeded an annual average TN concentration of 3 mg/1. Importantly, nine out of ten plants exceeded 3 mg/l on a monthly average basis at least once during the year. The Connecticut data shows that six out of the ten enhanced nitrogen removal plants had annual average TN concentrations above 3 mg/l and four plants were below 3 mg/1. Further these 10 plants had maximum month concentrations that ranged from 2.9 to 7.7 mg/1. These plants have an average maximum month concentration of 1.6 times the annual average. Based on this data, a maximum month concentration of 6 to 8 mg/l or more would appear more appropriate, if a monthly concentration limit is needed at all. Several of these plants are operating considerably below the design loadings and performance may not be as good once these facilities are operating at their design conditions. It is also important to note that Connecticut plants would be expected to outperform similar plants in NH due to temperature differences. For example, the design low water temperature for a facility in Westport, CT was 11 degrees Celsius, which is considerably higher than the 8 degrees Celsius design low temperature used for a recently constructed advanced treatment facility in Jaffrey, NH. As noted previously, actual water temperatures for advanced treatment facilities in northern New England (Jaffrey, North Conway, NH and Sanford, ME) can be as low as 5 degrees Celsius. Based on the CT data and based on the fact that NH is much colder than CT, EPA has no basis to establish a 3 mg/l limit on a seasonal basis, let alone on a monthly basis.

Massachusetts is another state with coastal nitrogen pollution concerns. The lowest TN permit limit EPA has imposed in Massachusetts that we could identify is 4 mg/l on a monthly basis in Scituate. Yet EPA proposes a limit of technology type limit in NH that is more restrictive than in Massachusetts. Even if EPA did have a sound basis to establish a LOT-type limit and even if that limit were 3 mg/l on a seasonal average basis, this limit would not translate to 3 mg/1 TN on a maximum monthly average basis.

Exeter will likely have to employ an enhanced nitrogen removal process such as the Bardenpho process to achieve the proposed limit. This process has two anoxic zones and supplemental carbon as necessary to reduce nitrate levels as low as practical, as compared with more basic biological nutrient removal processes such as the Modified Ludzack Ettinger (MLE) process which has only one anoxic zone. EPA's Municipal Nutrient Removal Technologies Reference Document (2008) ("EPA Reference Document") references the Bardenpho process as one of the primary alternatives to achieve low nitrogen levels as well as some other combined processes, such as a MLE process followed by a denitrification (denite) filter (pp. 2-57 to 2-60, per 2-77). In the Reference Document, EPA found that the combined processes operating in northern climates achieved maximum monthly TN values of between 4.2 and 4.9 mg/1. EPA referenced no Bardenpho plant employing supplemental carbon in northern climates.

In EPA's Reference Document, seven plants (mostly southern plants) that achieved an annual average TN concentration of less than 3 mg/l were profiled (p. 2-61). The maximum monthly concentrations averaged 1.5 times the annual average values. Based upon this data, a maximum monthly concentration limit of 4.5 mg/l or more would be consistent with an annual average of 3 mg/l for these southern plants.

A 2011 WEF/WERF report (Attachment E) showed the performance of ten Bardenpho plants in Florida achieved a 95 percentile monthly TN value of 3.5 mg/1. It should be noted that Florida plants are expected to perform better than northern plants because of the impact of temperature on biological kinetics. This same study cautioned against using 95 percentile data to confirm that maximum month permit levels can be achieved, since by definition they would be expected to be exceeded 5% of the time or for 3 months in a 5 year permit cycle.

The WEF/WERF study showed that Scituate, MA facility achieved a 95 percentile monthly TN value of 4.22 mg/1. This study also concluded that there is a substantial degree of variability that needs to be recognized in establishing permit limits.

Based on the above referenced data, it is inappropriate for EPA to establish a monthly permit limit of 3 mg/l TN. If LOT were applied on a seasonal average basis, we believe a limit of 4 mg/l or greater (depending on the DON concentration) is more consistent with demonstrated LOT performance in northern climates and this would translate to a maximum month concentration of 6 to 8 mg/1.

<u>The Proposed Monthly Average TN Limit Should be Changed to a Seasonal Average Limit</u>

As documented in EPA's Reference Document, there is significant temporal variability in the performance of treatment facilities removing nitrogen to low levels. In Exeter'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 TN mass limit is the more appropriate permit basis that would allow compliance and meet water quality goals.

The Proposed Nitrogen Removal Season Should be Changed.

EPA's Reference Document addresses the impacts 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 Exeter's winter/spring time temperatures through April are very cold due to the climate and the magnitude of infiltration/inflow problems. The temperature issue will be explored in more detail in the Facility Planning process. Some neighboring communities have seen winter temperatures below 10 degrees Celsius and 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 #B7a: 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.[89]

The Town's claim that Connecticut treatment facilities have had to upgrade with ―state of the art technology to reduce nitrogen levels to the limits of technology in order to meet the requirements of the Long Island Sound" TMDL is not accurate. The mass-only limits established under the TMDL equate to concentration limits at design flows ranging from 3.3 mg/l - 4.7 mg/l, and since the actual average flow at these facilities is significantly lower than the design flow, the concentration they must achieve is significantly higher (see table below). Despite not being required to achieve limits as low as is feasible, seven of these facilities achieve a seasonal average (April – October) of less than 3.0 mg/l (Branford's 2010 seasonal average was 2.8 mg/l and not 3.1 mg/l as indicated in the comment as a result of a calculation error in the table in Appendix E) and four of these facilities achieve a year round average of less than 3.0 mg/l. Although not included in the table provided with the comment, the Town of Simsbury, Connecticut had a 2010 seasonal average of 2.2 mg/l and an annual average of 2.6 mg/l. Average April minimum temperatures in Connecticut are only about 3° C warmer than New Hampshire.

Facility	Total Nitrogen lbs/day (TMDL)	Design Flow (MGD)	Total Nitrogen Concentration at Design Flow (mg/l)
Branford	192	4.9	4.7
Cheshire	103	3.5	3.5
Jewett	15	0.5	3.6
Southington	204	7.4	3.3
Suffield	45	1.5	3.6
Waterbury	1049	27.0	4.7
Westport	87	2.85	3.7
Stamford	926	24.0	4.6
New Canaan	64	1.7	4.5
Milford Housatonic	307	8.0	4.6

[89] 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.

The same WEF report cited in the comment indicates that the Tahoe, California wastewater treatment facility achieves a median TN concentration of 2.5 mg/l (95% are less than 3.37 mg/l) and Tahoe has an average April minimum temperatures that is about 3° C colder than New Hampshire.

While the commenter points to a study of ten Bardenpho plants in Florida with a monthly average 95th percentile TN concentration of 3.5 mg/l, treatment options are not limited to the Bardenpho process. The same table referenced in the comment cites several facilities that achieve a monthly average 95 percentile total nitrogen concentration of less than 3.0 mg/l. The same study that evaluated the ten Bardenpho plants also concluded that other technologies have consistently achieved median total nitrogen discharge values below 2.0 mg/l with 95 percent of the discharge values below 3.0 mg/l (Jimenez et al., 2007).

The study also concluded that ―Currently, there is industry agreement that the LOT for current technologies is on the order of TN and TP of 3.0 mg/L and 0.10 mg/L respectively. However, based on the information presented herein, ―conventional" BNR facilities can actually consistently meet lower effluent requirements, particularly for TN. Based on the results of this survey, the actual LOT for nitrogen varies upon the process used. However, from the results it does appear that this limit ranges from approximately 2.0 to 4.0 mg/L."

The study further noted that, ―It must be kept in mind that the actual TN and TP requirements for all of the plants in this study are 3.0 mg/L and 1.0 mg/L as TN and TP, respectively; therefore, they do not have to produce lower effluent quality."

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 (it 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.

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.

Regarding the concern that non-bioreactive dissolved organic nitrogen in the effluent will preclude attainment of the 3.0 mg/l limit, in EPA's judgment there is little likelihood that this nitrogen component of the Facility's effluent will prevent attainment of the 3.0 mg/l TN limit. Typical concentrations of DON in effluents from municipal wastewater treatment plants

designed for biological nutrient removal range from 0.5 mg/l – 2.0 mg/l and the portion of DON that is not bioreactive is only 10 – 29% of the effluent DON (Sedlak, 2011). Additionally, a paper published in *Estuaries and Coasts* on July 20, 2010 documents the bioavailability of effluent derived organic nitrogen in estuarine systems (Fillipino et al., 2010). In the event that the permittee can demonstrate that DON levels in the effluent prevent attainment of the permit limit, EPA will consider any associated request for a permit modification.

For the reasons stated in Responses #A3 and B3c above and due to the potential for a large percentage of the DON to be bioavailable and contribute to the cultural eutrophication in the Great Bay Estuary, the final permit regulates TN and finds no merit in the suggestion for a permit limit in terms of TIN. The reference to DIN in the publication, *An Urgent Call to Action Report in the State-EPA Nutrient Innovations Task Group* (August 2009), appears to be a typographical error. Wastewater treatment technology is capable of achieving dissolved inorganic nitrogen effluent concentrations of 1.0 mg/l or less (Barnard, 2006). The Kalkaska Michigan total inorganic nitrogen limit is based on drinking water concerns with nitrate levels and not cultural eutrophication concerns.

EPA has explained elsewhere in this Response to Comments why a mass-only limit for nitrogen would not be appropriate.

Comment #B7b: **<u>The Proposed Mass Limit Restricts the Town's Ability to Expand Sewer Service and Address Nonpoint Source (NPS) Nitrogen Pollution - the Permit Should Include Provisions to Allow This Flexibility</u>.**

The proposed mass limit for nitrogen effectively limits future plant flows to the current license flow limit of 3 million gallons per day (mgd). The proposed monthly average basis and inclusion of April of the permit limit severely limits future expansion of the sewer service area to help address non-point source loading reductions because existing maximum month flows to this facility are very near to the permit flow (example April 2010 flow = 2.8 MGD). As EPA knows, non-point sources of nitrogen represent the majority of the watershed nitrogen pollution to the Bay. Part of the solution to the NPS nitrogen might include sewer extensions to some unsewered areas to eliminate the nitrogen load from septic systems. For example, the Town has already had preliminary discussions with the neighboring community of Stratham about the possibility of extending sewers to their commercial strip (which is in close proximity to the Squamscott River). Stratham may desire as much as 0.75 mgd of capacity in Exeter's new treatment plant. While the Bay would most certainly be enhanced by the nitrogen reduction that would occur as a result of extending sewers to parts of Stratham, other neighboring communities and to unsewered parts of Exeter, the EPA's proposed mass limits would effectively prevent this from occurring without going through the onerous anti-degradation review process. As part of the Facility Planning process, the Town envisions exploring expanding the sewer service area. But it can only do so if it does not result in unachievable limits or trigger anti-degradation issues with EPA. We encourage EPA to provide a load offset mechanism for Exeter to receive adjustments in the mass limit as necessary to achieve NPS reductions.

Response #B7b: Providing treatment for septic system loading 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 it would useful to include a ―load offset mechanism" in the permit that allowed an increased load, until there is confirmation of the commenter‘s view that expanding the current sewer system is the preferred option and that it will be accomplished in such a way as to achieve a net reduction in nitrogen loadings over the long term. If that information turns out to be true, the permittee can pursue a permit modification to allow for an increased loading from the treatment facility in accordance with applicable CWA requirements.

Comment #B7c: <u>The Vague References to Removing Phosphorus in the Draft Permit Should be Deleted.</u>

Section I.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 Exeter‘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 #B7c: 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 #B7d: <u>Exeter 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 to undertake such a project will be assessed in detail. Based on preliminary cost estimates developed by DES, the rate impacts of upgrading the plant to 8, 5, and 3 mg/l limits are presented in Attachment F. To achieve limits of technology, sewer use rates are predicted to go up by a factor of 3.57and exceed typical EPA affordability thresholds. This excludes any costs for inflow and infiltration reduction, combined sewer overflow ("CSO") abatement or asset renewal. This also excludes extensive expenditure anticipated for other Town infrastructure systems.

Even if the DES estimates are conservatively high, the Town faces very substantial expenditures in the near term to address environmental infrastructure needs. The Town will need an affordability-based implementation schedule to make the WWTF upgrade project financially viable. To complete a financial capability analysis, the Town will need to discuss and reach an understanding with EPA as to what other regulatory drivers the Town should expect over the next 20 years in areas such as storm water, water treatment and additional wastewater requirements. The Town will most certainly need EPA input regarding prioritization and extended implementation schedules on all these regulatory-driven infrastructure projects (e.g., CSO abatement and storm water mandates). The Town also understands that it will be necessary to enter into a compliance order after this Permit is finalized. In that we will not have completed a facility plan at the time we enter such an agreement, the Town requests that the compliance schedule have flexibility to reflect the outcome of the facility planning process.

Response #B7d: 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. Costs such as CSO remediation and infiltration/inflow control will be part of the affordability determination. 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 as is used in Appendix F. A phased implementation schedule will be allowed, to the extent appropriate, to address documented affordability concerns.

C. CLF Comments, August 8, 2011

Comment #C1: 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 "the 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." *Id.* § 122.44(d)(1).[90]

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[90] 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

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Section 301(b)(1)(C) of the Clean Water Act and its implementing regulations require that all permits issued after 1977 include any ―more stringent…limitation necessary to meet water quality standards," 33 U.S.C. § 1311(b)(1)(C); 40 C.F.R. § 122.44(d)(1) (―[E]ach NPDES permit shall include…any requirements…necessary to achieve water quality standards."); *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. (emphasis added). 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*.[91] 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*. (emphasis added).

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 ―at" 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

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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.*

[91] *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.").

> 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][92] 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.

Response #C1: The comments are noted for the record. EPA concurs generally with the comments, particular with respect to the causal threshold or demonstration for imposing a water quality-based effluent limitation, and the need to address ongoing and severe water quality impairments in the receiving waters expeditiously and without further delay to accommodate mathematical modeling or additional review or supplementation of the scientific record, which already provides more than sufficient basis upon which to act.

Comment #C2: The Squamscott River, which flows into Great Bay, is an important part of the larger Great Bay estuarine ecosystem. Since the time of CLF's prior comments, 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

[92] 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."

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), appended as Attachment 1. 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 2.

- **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), appended as Attachment 3. The Amendment was the culmination of a comprehensive process in which NHDES (1) published and sought comments on 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;[93] (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,[94] 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 the Squamscott River and Great 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 Squamscott River pertaining to, *inter alia*, total nitrogen, estuarine bioassessments (i.e., eelgrass),[95] light attenuation, dissolved oxygen and chlorophyll-a, and in Great 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, excerpts appended as Attachment 6. In addition to these impairments relative to aquatic life uses, the Squamscott River's Primary Contact Recreation use also is impaired as a result of chlorophyll-a and total nitrogen.[96]

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[93] 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").

[94] 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), appended as Attachment 4.

[95] Eelgrass historically was present in the Squamscott River. *See* NHDES Numeric Nutrient Criteria for the Great Bay Estuary at 68, n.4. *See also* Correspondence from Frederick T. Short, Ph.D., UNH Jackson Estuarine Laboratory, to Tom Irwin, Conservation Law Foundation (July 8, 2011), and accompanying map, appended as Attachment 5.

[96] As stated in NHDES's 2008 Amendment to the New Hampshire 2008 Section 303(d) List, "[t]he new impairments for chlorophyll-a relative to the Aquatic Life designated use do not replace the existing impairments for chlorophyll-a relative to the Primary Contact Recreation designated use." Attachment 3 at 30.

- ***State of the Estuaries* report, 2009.** In 2009, the Piscataqua Region Estuaries Partnership (PREP) published its most recent *State of the Estuaries* report, appended as Attachment 7. The report documents a continuation of the troubling trends outlined in previous *State of the Estuaries* reports, as outlined in CLF's prior comments. 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, appended as Attachment 8. The analysis, which was predated by a stakeholder review draft for which NHDES sought and obtained comments,[97] 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.
    - Both wastewater treatment facilities and non-point sources will need to reduce nitrogen loads to attain the numeric nutrient criteria.
    - The percent reduction targets for nitrogen loads only change minimally between wet and dry years.
    - Wastewater treatment facility upgrades to remove nitrogen will be costly; however, the average cost per pound of nitrogen removed from the estuary due to wastewater facility upgrades is lower than for non-point source controls.
    - The permitting options for some wastewater treatment facilities will be limited by requirements to not increase pollutant loads to impaired waterbodies.
    - The numeric nutrient criteria and models used by DES are sufficiently accurate for calculating nitrogen loading thresholds for the Great Bay watershed.
    - Additional monitoring and modeling is needed to better characterize conditions and nitrogen loading thresholds for the Lower Piscataqua River.

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

- This nitrogen loading analysis for Great Bay may provide a framework for setting nitrogen permit limits for wastewater treatment facilities and developing watershed implementation plans to reduce nitrogen loads.

Response #C2: The comments are noted for the 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 #C3: The Clean Water Act mandates a WQBEL for total nitrogen at the limit of technology, coupled with storm water 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 Squamscott 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 Squamscott River flows into Great Bay, its nitrogen loads, including those from the Exeter 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 Exeter WWTF, which is a significant source of nitrogen pollution in the Squamscott 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 Squamscott River (and to Great Bay) will be required. For example, according to NHDES' draft nitrogen loading analysis, existing nitrogen loads need to be reduced by 123.7 tons per year (58 percent) to protect eelgrass in the Squamscott River.[98] Attachment 8 at 12. Imposing effluent limits of 3 mg/l total nitrogen to the two WWTFs discharging to the Squamscott River (of which the Exeter WWTF contributes 96 percent) will result in the removal of 30.1 tons per year of total nitrogen, meaning that reductions from storm water and non-point sources will be necessary to achieve water quality standards. *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 Exeter 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

[98] According to NHDES' analysis, preventing low dissolved oxygen in the Squamscott River and protecting eelgrass in the downstream subestuaries would require nitrogen load reductions of 71.2 tons per year and 49.8 tons per year, respectively. Attachment 8 at 12. CLF agrees with EPA that the 58 percent load reduction is necessary, as it protects *all* designated uses. *See* Fact Sheet at 24. However, even the application of the smallest load reduction (i.e., reducing TN load by 49.8 tons per year to protect eelgrass downstream in Great Bay), still would require the imposition of an effluent limit of 3 mg/l *plus* load reductions from storm water and non-point sources in order to achieve water quality standards.

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 storm water and non-point sources will be necessary. EPA's Fact Sheet recognizes this need, outlining various steps that must be taken to reduce storm water and non-point source contributions. EPA, Partial Fact Sheet at 24. 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.

Response #C3: Please see Response # A12-A14 and B7a 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 Exeter cannot be determined. EPA has determined that it is 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 (see Comment #A26), 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 #C4: 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 certain Seacoast-area sewered communities (including the Town of Exeter, and led by the City of Portsmouth – which still operates its Peirce Island WWTF with only primary treatment) has engaged in a concerted strategy to delay NPDES permitting for the Exeter WWTF 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 that this coalition does not represent the views of all sewered communities with WWTFs discharging into or otherwise affecting the estuary. To the contrary, 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 9. 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.

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 Squamscott River and Great 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 10. 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 11.[99]

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 14. 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),[100] found the eelgrass effects of nitrogen concentrations and loads in the Squamscott River and Great Bay to be consistent with effects observed elsewhere. *Id.* With specific regard to light attenuation in the Squamscott River and the municipal coalition's claim that natural non-nitrogen-related conditions preclude the growth of eelgrass, Drs. Valiela and Kinney note: "Squamscott river 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." *Id.* at 6-7.

Also with specific regard to the Squamscott River, Drs. Valiela and Kinney observed that dissolved oxygen trends are strongly correlated with diurnal patterns – linked to primary production and nitrogen – as opposed to hydrodynamics:

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[99] 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 12 ("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 13 ("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).

[100] Drs. Valiela's and Kinney's *curriculum vitae* are included within Attachment 15.

> The continuous measurements of oxygen concentrations in Great Bay and the Squamscott River (NHDES 2009a) consistently showed that DO begins to increase in the morning, peaks during mid-day, and becomes lower at night, reaching low values early in the morning: the simplest explanation of this repeated daily effect is that concentrations of DO are largely influenced by the daily activity of the plants and algae within the estuary. This clear diurnal pattern would definitely not be so evident if tidal exchange or other hydrodynamic processes were controlling DO concentration (because changes in daylight and tides are not synchronous).

Id. at 8.

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, including those for the Exeter wastewater treatment plant.

Id. at 9-10.

Even separate and apart from the numeric criteria, there can be no question that the Squamscott River and Great Bay violate state water quality standards.[101] 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 Exeter 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, EPA is authorized, if not required, to exercise reasonable discretion and

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

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 and can be accomplished at costs significantly lower than predicted by Exeter officials.[102]

Response #C4: The comments are noted for the record. In particular, EPA notes the letter from Drs. Valiela and Kinney, which includes their assessment of water quality information in Great Bay and NHDES's draft numeric nitrogen criteria. EPA notes their concurrence with the proposed numeric 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

[102] *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*.

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 numeric criteria. (Valiela et al., 2011).

D. Nature Conservancy Comments, August 11, 2011

Comment #D1: On behalf of our donors, funding agencies, and foundation partners, The Nature Conservancy urges EPA to move decisively and quickly toward a solution that significantly reduces total nitrogen in the entire estuary. We agree with the science-based conclusions of NH Department of Environmental Services and EPA that nitrogen loads are increasing and that this pollutant is responsible for an estuary with more algae, lower levels of life-supporting oxygen, and fewer acres of eelgrass meadows.

To those in the community who are unconvinced of this analysis and request more data, we respectfully disagree. Our estuary has been studied for decades and it is hard to imagine that another few months of data will uncover findings outside the range of observations already made. But whether or not this study occurs, we strongly urge EPA to work with towns to implement clear limits on a schedule that is as rapid as practicable, toward a comprehensive solution that shares responsibility of nitrogen reduction across EPA. Nitrogen loading is a pervasive problem that requires a regional solution, one that includes removal at point sources, non-point sources, and within estuarine waters.

Response #D1: EPA concurs with the comments and note them for the record.

DOVER 005305

E. Boyd Allen Comments, July 20, 2011

Comment #E1: Beginning in the late 1970s, EPA helped communities to meet the Clean Water Act goals with construction grants programs. That changed over to the Clean Water State Revolving Fund which now builds on EPA-state partnerships with funding through the states. In the case of the new wastewater treatment plant permit, the Town is being asked to leap ahead several orders of magnitude in a single bound - to jump into the future with a permit limit that is basically state of technology and can be difficult to achieve in a northern climate.

Recent articles in the newspapers highlight that municipal treatment plants account for approximately 30% of the total nitrogen load in the Great Bay estuary; much of the remaining balance comes from nonpoint sources that EPA and the State find problematic to regulate based on the diffuse nature of these loadings. The municipal plants are easy targets to regulate. So, if you insist on putting the problems in Great Bay on our backs because you are unable to reach the other two-thirds of the contributors, then please provide assistance financially with construction grants and issuing reasonable permit levels on a graduated and affordable schedule. Perhaps you can help us build and operate a plant with a flexible enough layout to eventually reach the 3 mg/l limit in stages and we can incrementally add the various treatment trains and processes to reach that magic number.

We are fighting an uphill battle in these times of stressed municipal budgets. Only 65% of the Town is sewered. Thus, the financial burden for a state of technology plant is even greater than you might imagine. I ask you to please reconsider the permit limits and help as build and operate a plant that will protect the Great Bay within a reasonable budget and time frame by increasing the funding available to the State and Town.

Response #E1: 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 (from ambient rivers monitoring data – Exeter River) 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, 2010 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.

While much of the costs for upgrading treatment facilities are not solely related to the nitrogen limits, but rather are associated with the need to upgrade aging infrastructure, EPA recognizes that the total cost will not be insignificant. There has not been a significant upgrade to the treatment plant since 1990. The implementation schedule can and will reflect affordability concerns (see Response #B7d).

F. David Burdick Comments, August 12, 2011

Comment #F1: I write to support the revision of the draft EPA permit to include 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 75 lb/day for the months of April through October. The Squamscott River itself, Great Bay, and the estuary overall, need this limit if estuarine water quality and health are to be maintained and eventually improved throughout our estuary.

I am a research associate professor at the University of New Hampshire with over 20 years of experience in Great Bay. I study salt marsh and seagrass ecology. Unfortunately, with all of the research and management actions to prevent increasing levels of nitrogen from entering the estuary, increasing population and impervious surfaces appear to be destroying the ecology of the Great Bay Estuary.

Losses of eelgrass and the increasing dominance of nuisance algae will combine to decrease water quality and change the character and ecology of the Bay for the rest of our lifetimes. The problem is excess nitrogen and setting target concentrations and mass limits for nitrogen entering the system through all point sources is justified and needed to preserve an ecosystem that, although damaged, can still function.

Response #F1: The comments are noted for the record. Please see Response #B7a above relative to the nitrogen limit averaging period.

G. Steve J. Miller Comments, June 9, 2011

Comment #G1: As you know it is 2011 and there are over 310 million people populating the US and even if we all wish otherwise the plain truth is we need environmental regulations and regulators to protect our health and the environment. I urge the EPA to meet its regulatory responsibilities under the Clean Water Act for issuing sewage discharge permits with nitrogen limits based on the best technology and science available to us today.

Nitrogen is a major problem in Great Bay, just as it is an issue all over our country. The fact that nitrogen is a problem in Great Bay is not news nor is it controversial. Seacoast municipalities have known that nitrogen is a growing problem for decades. And there has been a very active legislative, decision maker, and public effort to solve the nitrogen problem in the seacoast for at least a decade. In 2003 there was a major effort to study options for a regional wastewater treatment solution, led by the same wastewater coalition towns that today are leading the fight to prevent nitrogen reductions, because they knew nitrogen loading issues in Great Bay were an issue and that stricter regulations were headed our way. They hoped for a quick cheap solution –

pipe the problem off shore, and the state funded a 1 million dollar study only to find out a cheap quick solution was in fact a pipe dream.

The time is now to implement reductions of nitrogen from all the wastewater treatment plants within the Great Bay watershed. Wastewater sourced nitrogen is a majority of the manageable nitrogen inputs to the Bay and our coastal waters. Let‘s move beyond denying there is a problem, and implement nitrogen reductions to the limit of the science through wastewater discharge permits. Then we can get on to solving the real problems of paying for the needed upgrades.

And this is not just about Great Bay, as it concerns all of our coastal water resources and our valuable coast. Wastewater treatment plants are not the sole nitrogen polluter, but they are the clear place to begin the fix. All sources of nitrogen pollution need to be addressed and reduced. This is our shared responsibility.

Response #G1: The comments are noted for the record.

H. City of Portsmouth, NH Comments, August 11, 2011

Comment #H1: EPA's action is flawed and premature because it is based almost entirely upon a document, Draft Numeric Nutrient Criteria (NHDES June 2009) which NHDES itself has declared should not be used for regulatory purposes. The Memorandum of Agreement between the Coalition and NHDES has stated that the statements contained in the Draft Numeric Nutrient Criteria document should not be used for regulatory purposes until additional scientific information can be developed to support or discredit its conclusions. It is noteworthy that the Nutrient Criteria document has never been subjected to a formal rule-making proceeding as required by New Hampshire law (NHRSA 541-A). NHDES has conceded that it must conduct such a proceeding in order to give this document the legal status required for use in the regulatory system. As a matter of law, RSA 541-A:22, provides that no agency rule is valid or effective against any person nor may it be enforced by the state for any purpose until it has been filed as required by this Chapter.

Response #H1: Under the Clean Water Act, EPA is authorized to utilize all relevant scientific information and data when establishing permit limits that meet state water quality standards. The best available science was used in drafting the permit for the Exeter, NH wastewater discharge permit. This included the *NHDES Great Bay Nutrient Report*, which EPA utilized only after independently assessing its relevance and reliability. In addition to the *NHDES Great Bay Nutrient Report*, several other important sources of information were utilized in deriving the nitrogen permit limit. These sources include: published scientific literature and guidance documents; years worth of site specific data for nitrogen, chlorophyll-a, dissolved oxygen, light attenuation (water clarity), suspended solids, macroalgae and epiphyte growth and coverage; current and historic eelgrass densities and coverage; and a steady state watershed nitrogen loading model for Great Bay and the tributary rivers which flow into Great Bay. There is nothing in the record to suggest that in the absence of the *NHDES Great Bay Nutrient Report*, the instream threshold calculated by EPA would have been materially different or that that the limit imposed by EPA would have changed.

EPA disagrees that this action is premature. The Exeter facility‘s existing NPDES permit expired on July 5, 2005. Given the well-documented and severe TN-induced water quality impairments in the Squamscott River and in Great Bay, the significance of the facility‘s contribution to TN loadings to these waters, the complete lack of TN controls in the existing permit, and the large amount of credible scientific analysis, technical information and data in the record, EPA concluded that the it was reasonable to move forward with the reissuance process.

Consistent with the Clean Water Act and its implementing regulations, EPA relied on a body of technical and scientific information specifically contemplated by NPDES regulations at 40 C.F.R. § 122.44(d)(1)(vi), which implement section 301 and 402 of the Act. EPA acknowledges the existence of unavoidable scientific uncertainty in this proceeding, the desire for additional study and NHDES‘s commentary on its thresholds. Even so, EPA has discerned ample basis to utilize NHDES‘s thresholds analysis as a source of information in deriving an instream concentration that would be protective of uses. NHDES has never disavowed its analysis; NHDES most recently used the proposed numeric thresholds to help make use impairment decisions for the 2012 303(d) list (NHDES, 2012a and 2012b). In any case, the analysis in EPA‘s judgment possesses independent indicia of reliability and scientific credibility stemming from an independent peer-review process by national experts. EPA‘s comfort with the scientific validity of this analysis was furthered by an objective, internal review by EPA. (see also Response #A18).

In the absence of EPA-approved numeric nitrogen criteria, EPA as a matter of federal law is still required to interpret the narrative criteria and establish a water quality-based effluent limitation as stringent as necessary to meet water quality standards. In doing so, EPA would necessarily rely on nitrogen thresholds in the literature and nitrogen thresholds established for other estuarine systems, all of which are consistent with the NHDES‘s draft nitrogen criterion thresholds. The commenter‘s proposed course is untenable, as it would preclude EPA from relying on valid scientific analysis underlying the proposed numeric thresholds on the basis of a non-binding memorandum of agreement (to which EPA is not a party) between NHDES and regulated entities, even though the material is well within the bounds of consideration under the operative federal regulation governing the translation of a narrative criterion into a numeric effluent limit. See also Response # A18.

Comment #H2: Additionally, the document has not been subjected to an open peer review process. In April of 2010, the Coalition specifically requested that NHDES and EPA conduct an open and independent peer review process of this document. (See Letter to Commissioner Burack dated April 9, 2010; Letter of USEPA in response dated May 11, 2010). Despite this request, NHDES and EPA decided not to allow an independent peer review process but rather conducted its own "peer review proceeding" where they selected the reviewers and the charge questions to be addressed. Despite the requests of members of the Coalition to allow their comments to be submitted to the peer reviewers, NHDES and EPA failed to forward such comments to the reviewers. As a result, the peer review process provided little in the way of assurance that the Draft Numeric Nutrient Criteria document reached conclusions supported by good science because the comments of the Coalition were never addressed.

Response #H2: While there is no requirement for proposed state criteria to be peer reviewed, the proposed numeric thresholds were peer reviewed by two independent reviewers (faculty members from Cornell University and University of Maryland) who are experts in the field of estuarine science. 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 on developing nutrient criteria.

Although the peer review process did not include public participation, New Hampshire Department of Environmental Services did solicit public comment from December 30, 2008 until March 20, 2009 as part of the state's water quality standards revision process. NHDES' responses to public comments are included in pages 74-84 of the *NHDES Great Bay Nutrient Report*. The material provided to the peer reviewers included copies of all comments received on the proposed numeric thresholds document. The peer reviewers specifically cited to the comprehensiveness and clarity of the weight-of-evidence approach used to develop the proposed numeric nitrogen criteria as well as the vast quantity of site specific data available and utilized in the analyses.

As described in EPA's Peer Review Handbook, peer review is a documented critical review of a specific Agency scientific and/or technical work product. Peer review is conducted by qualified individuals (or organizations) who are independent of those who performed the work, and who are collectively equivalent in technical expertise (i.e., peers) to those who performed the original work. Therefore, peer review is not the same as public participation and the peer review process does not include a solicitation and response to public comment. The EPA Peer Review Policy was developed to be consistent with OMB Peer Review Bulletin. 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.

Additionally, NHDES received comments and a critique of the criteria document from Hall and Associates on behalf of the communities of Portsmouth, Dover, Durham, Exeter, Newmarket and Rochester that it addressed in Appendix B of the 2009 *NHDES Great Bay Nutrient Report* (NHDES, 2009a), which included a review of the scientific literature documenting the relationship between excess nitrogen and the detrimental effects that it has on estuaries, specifically with regard to dissolved oxygen and eelgrass

Comment #H3: NHDES has mistakenly used some of the assumptions contained in the June 2009 draft document as a basis for making "impairment" findings for assessment units in the Great Bay Estuary to comply with its responsibility under the Clean Water Act. This has resulted in purported findings of impairments for eelgrass, light attenuation and total nitrogen. However, there is no valid regulatory basis for such findings and there is serious question whether there is any scientific basis of support for those impairment findings. The subsequent discussion of these concerns resulted in the MOA referred to above concluding that additional evidence for the relationships between nitrogen and eelgrass loss should be developed before the nutrient criteria are used to set permit limits. Nevertheless, EPA has disregarded NHDES's plain

warning and done exactly the contrary. The City believes that this is a misuse of regulatory authority resulting in an arbitrary determination in the case of Exeter's permit and one which constitutes an abuse of discretion. Thus, the City of Portsmouth joins the Coalition in objecting to the EPA's proposed action on Exeter, New Hampshire NPDES Permit No. NH0100871 as technically and legally flawed and requests that the proposed permit modification action be withdrawn.

Response #H3: EPA does not rely solely on state impairment listings in determining the need for the water quality-based effluent limit to comply with section 301(b)(1)(C) of the Act. Impairment listings are not a prerequisite to establishing water quality-based permit limits. EPA‘s independent review of the available data concluded that there are significant nitrogen-related impairments in the Great Bay Estuary. The Clean Water Act has a protection and prevention component as well as a restoration component and thus water quality based limits are required whenever there is a reasonable potential for the discharge to cause or contribute to a violation of water quality standards. Please see Responses #A18, A25 and B3a relative to EPA‘s obligation to interpret narrative criteria and establish water quality based permit limits using the best available information and Responses #A15 – A18 regarding the role of the MOA.

The scientific basis for the proposed numeric thresholds are addressed throughout this document wherever more specific comments are provided.

Comment #H4: The EPA action not only has significant procedural and scientific flaws but it also fails to adequately consider the unique history and environmental complexity of the Great Bay Estuary. There is historical scientific information which demonstrates that the eelgrass resource in the Great Bay has been subject to wide fluctuations over the years. Eelgrass suffered a dramatic decline in the 1930s due to what was considered to be a "wasting disease". (A Biological Survey of Great Bay, 1944). The resource did recover only to fall victim to another decline in the mid-1980s. During this period the Piscataqua River and Little Bay experienced the loss while Great Bay experienced an increase in eelgrass distribution even though nutrient levels were generally similar in all areas. (Short 1986) By 1985, eelgrass had rebounded only to suffer another decline in 1989 (State of the Estuaries 2003). This decline was followed by an equally robust recovery and subsequently eelgrass reached its maximum recorded coverage in about 1996. This again was followed by a period of decline to current levels. (State of the Estuaries 2006). The history suggests that the eelgrass resource within the Great Bay Estuary is a complex resource and the cause of its fluctuations is unknown. Scientific data further indicates that even though the eelgrass resource in the lower Piscataqua has been reduced, this area of the estuary is not impaired for light attenuation (water clarity/transparency) and it is not subject to excess nitrogen levels. This information suggests that EPA/NHDES do not have a sufficient scientific basis for understanding the causes of eelgrass fluctuations in the Great Bay Estuary. This led to the development of the Memorandum of Agreement which seeks to provide additional scientific information to clarify conditions within the estuary. EPA's effort to ignore the agreement between NHDES and the Coalition that the complexities of the Great Bay Estuary require further study before taking regulatory action is unwise and inconsistent with a rational scientific approach. Moreover, it could lead to a significant waste of local resources.

Response #H4: While wasting disease has occurred in the past, and as recently as 1989, the effects of wasting disease on eelgrass are easily observed in the field by a biologist, and the gradual eelgrass decline of the past decade is not consistent with a wasting disease event (see PREP, 2006). During wasting disease, eelgrass survives in low salinity areas because the disease cannot survive in these areas (NHDES, 2008). A pattern of complete eelgrass loss, including in the low salinity tidal rivers, is inconsistent with wasting disease.

The *2006 State of the Estuaries Report* also indicated that "there have been anecdotal reports of increasing populations of nuisance macroalgae and epiphytic growth on eelgrass leaves, which may be related to increasing nitrogen concentrations in the Bay. Macroalgae can compete with and smother eelgrass, and heavy epiphyte loads can decrease eelgrass growth, reducing eelgrass biomass and cover." That report also stated, "The greatest extent of eelgrass was observed in 1996 (2,421 acres) after recovery from the wasting disease. The current (2004) extent of eelgrass in Great Bay is 2,008 acres, which is 17 percent less than the maximum extent observed in 1996. The biomass of eelgrass in Great Bay has experienced a more significant decline relative to the levels observed in 1996 (Figure 17). Biomass is the combined weight of eelgrass plants in the bay. In 1990, 1991, and 1995, the biomass was low due to wasting disease events. Superimposed on these rapid events has been a gradual, decreasing trend in eelgrass biomass that does not appear to be related to wasting disease. The current eelgrass biomass level for Great Bay is 948 metric tons, which is 41 percent lower than the biomass observed in 1996." (PREP, 2006).

Both sections of the Lower Piscataqua River (North and South) are listed by NHDES as having insufficient information for determining nitrogen impacts (see also Response #A1 and #A6).

Comment #H5: EPA has ignored the fact that NHDES has recognized that there is new information suggesting that its own assumptions presented in the Draft Numeric Nutrient Criteria document (June 2009) may not be reliable. Instead of accepting NHDES's decision to seek additional information before making regulatory or permitting decisions, EPA has arbitrarily chosen to rely on questionable assumptions in a draft document as a basis for permitting decisions. EPA has adopted the 2009 nutrients document's assumption that transparency is controlling eelgrass growth and that increase nitrogen is the cause of reduced transparency. A closer examination of the data (which lead to the Memorandum of Agreement between the NHDES and the Coalition) suggests the more likely conclusion is that the eelgrass decline is not related to either transparency or excessive nitrogen in the estuary. As pointed out in the Coalition comments, significant re-analysis of data has been presented to NHDES since the June 2009 document was published. Although NHDES has indicated its willingness to review this new information and to development additional information, EPA has arbitrarily refused to cooperate with this effort. Moreover, other new information which is relevant to EPA's analysis has been developed. For example, EPA has relied on the discredited assumption that over 30% of the TN loadings to the Great Bay Estuary is from point sources. DES has rejected that assumption and now estimates that the point source contribution is about 16%, only one-half of the prior estimate. Therefore EPA's assumptions about the achievement of environmental benefits by forcing communities to the "limits of technology effluent standards" is likely wrong.

Response #H5: See Responses #A16, A25, A26 and B3a relative to EPA's obligation to use available information to establish water quality-based limits that ensure attainment of water quality standards and Response # A15 – A18 regarding the role of the MOA.

See Responses #A1, A4, A7 and A10 relative to transparency. Water clarity and light attenuation are clear indicators of the multiple ways that nitrogen effects eelgrass. 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 light levels that are critical for eelgrass health.

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 thresholds in helping to determine water quality impairments for the recently released draft 2012 303(d) list (NHDES, 2012a, 2012b, 2012c).

The point source component of the total nitrogen loadings for individual tributaries that contain point sources ranges from 10% - 46%. The overall loading for the Great Bay estuary is approximately 27% (NHDES, 2010). While it is important to address total nitrogen, dissolved inorganic nitrogen has the greatest impact on algae growth and is a priority for implementation of controls. Point sources contain a significantly higher percentage of dissolved inorganic nitrogen than nonpoint sources. See also Response #A3 and B3c.

Comment #H6: The appropriate action for EPA to take at this time would be to join NHDES in allowing the activities anticipated by the Memorandum of Agreement to move forward and to have the conclusions of those activities considered by EPA in deciding the appropriate action to be taken on the Exeter Permit. To do otherwise is for EPA to proceed in a manner that is legally flawed and one which is scientifically unsupported.

Response #H6: As detailed in the responses above, EPA does not concur with many of the conclusions and recommendations of the MOA. While EPA has indicated that it will consider any significant findings that come out of the MOA, we note that little progress has been made on the proposed modeling work.(see also Responses #A15 – A18 relative to the MOA).

I. Underwood Engineers Comments, August 11, 2011

Comment #I1: The New Hampshire Legislature funded an extensive study of wastewater solutions for the seacoast area titled the New Hampshire Seacoast Region Wastewater Management Feasibility Study (December 2005). The Draft Report Subtask 4.5 was revised and issued in November 2007. At the time, treatment to remove nitrogen was not included in the analysis of options. Since the recently proposed nutrient limits are more restrictive, we believe that the regional outfall option should be revisited in light of the nitrogen issues. The additional costs for nitrogen removal bring the various costs closer together on a capital cost basis. The Draft Report Subtask 4.5 should also be updated to provide an estimate for the operation and maintenance costs in order to compare the alternatives on a present worth basis. The updated costs and options should be a consideration for the impacted communities.

A regional outfall removes the point source impacts from the Great Bay. The environmental benefits are significant. The costs comparisons, when considering the total present worth of the capital and operation and maintenance of nitrogen removal, deem that the alternatives developed in this report are worthy of reconsideration as part of an option for the Town of Exeter and other seacoast communities.

More specifically, Exeter should be afforded the opportunity to pursue a regional outfall solution which may be optimized to serve their needs and perhaps several other municipalities. This regional approach may prove to be a cost effective and long term sustainable solution to removing nitrogen form Great Bay.

Response #I1: EPA notes that the Seacoast Region Feasibility Study was completed in 2007, while the *NHDES Nitrogen Loading Reduction Report* was completed in December 2010 and the nitrogen limit for the Exeter permit was public noticed in March 2011. In addition to the significant amount of time to pursue this alternative that has already occurred, there will also be a reasonable compliance schedule developed once the permit is finalized. If the Town decides to pursue a regional option, sufficient planning time may be included in the compliance schedule. EPA notes that the regional option is not without significant concerns, and that the MOA developed by the Coalition indicates that the member communities believe that upgrading the current treatment facilities to achieve nitrogen limits of 8.0 mg/l should proceed immediately.

Comment #I2: Rather than including a concentration limit on a weekly basis for total nitrogen in the draft permit, EPA should allow Exeter to have a NPDES permit limit that is a running monthly average on a mass basis for the total nitrogen limit. We understand this is done in other regions when addressing a TMDL nutrient limit and more appropriately reflects the seasonal variability of the treatment due to weather conditions in New Hampshire.

Response #I2: The nitrogen limit in the draft Exeter permit is a monthly average nitrogen limit and not a weekly average limit. 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). This would not be a desirable result since capping flows would impede growth and limit the ability to take in more flows from areas now served by septic systems.

There is no TMDL for Great Bay, so the assumptions and requirements of a waste load allocation for the facility were not available for use here. The limit is a water quality-based limit developed based on the available scientific information and the regulations regarding wastewater permitting. See Response #B7a.

Comment #I3: The sample type for total nitrogen is stated as a grab sample. Consideration should be given to using a composite sample which would be most representative of the true effluent total nitrogen discharge rather than a grab sample.

Response #I3: EPA believes that a grab is appropriate for lagoons systems. The detention time for wastewater going into a lagoon is lengthy (i.e., weeks). For other processes, such as activated sludge, the detention time is less than a day. Because of the short detention times in other types of systems, the effluent variability can be substantial, so a composite sample is needed. For lagoons, the effluent variability is very low so a grab sample is adequate. A condition has been added to the permit that upon completion of an upgrade to the treatment plant the sample type shall be changed to a 24-hour composite for all parameters other than pH, TRC and bacteria.

Comment #I4: In order for the Town of Exeter to responsibly plan for the major changes resulting in such a strict nitrogen limit, the Town should be provided some guidance on how future sewered areas will impact the effluent nitrogen limit.

Response #I4: The *NHDES Nitrogen Loading Reduction Report* (NHDES, 2010) indicates that significant nonpoint source reductions must occur in addition to the point source limits. It is our expectation that NHDES will complete a nonpoint source loading reduction analysis and develop a cost effective implementation plan for achieving the necessary reductions. To the extent that connecting existing septic systems to the treatment facility may be a cost effective means for reducing nonpoint source nitrogen, this should be thoroughly evaluated as part of the facilities planning associated with treatment facility upgrades. For additional discussion of nonpoint source reductions see *Background* and Responses #A5, B4, B5 and C3.

Comment #I5: The draft permit indicates that all available treatment equipment must be operated without the need for carbon addition during the November – March time period. This statement is too limiting in that all available treatment equipment may not be needed in order to provide for optimum nitrogen removal during the initial years of the plant operation, depending on the technology selected and the loadings to the WWTF. The condition to operate all equipment should be removed and a general statement to optimize nitrogen removal based on good engineering and operational practices should be put in place of this statement.

Response #I5: EPA concurs with the comment and has modified the language to clarify that all available treatment equipment must be used only if it results in lower effluent nitrogen levels. The language now reads: "The permittee shall optimize the operation of the treatment facility for the removal of total nitrogen during the period November 1 through March 31. All available treatment equipment in place at the facility shall be operated unless equal or better performance can be achieved in a reduced operational mode."

<u>J. Patience Chamberlin Comments, June 29, 2011</u>

Comment #J1: I am writing to urge the EPA to take whatever steps possible and necessary to protect the Great Bay by enforcing strict levels of nitrogen input and to adhere to the letter and spirit of the Clean Water Act.

The Great Bay is in serious decline. The science is clear. It is an important estuary for both environmental and recreational purposes. Delaying further necessary restrictions will only make the problem more serious, and expensive to fix.

Please do not be swayed by the short-sighted appeals to supposedly save money now by the municipalities. I live in Exeter, and that coalition does not speak for me.

Response #J1: The comments are noted for the record.

K. City of Rochester Comments, August 10, 2011

Comment #K1: The City is part of the Great Bay Municipal Coalition, an organization of several communities in New Hampshire dedicated to the establishment of appropriate and cost-effective restoration measures to protect Great Bay and its resources. We are writing in support of the comments submitted on behalf of the Coalition by Attorney John Hall, forwarded to you on or about August 8, 2011. As explained in the Coalitions comments, the City and Coalition members assert that the proposed permit revisions are unsupported by the available science and inconsistent with relevant provisions of the Clean Water Act and related federal regulations.

We write separately to emphasize the following. The proposed 0.3 mg/l TN in stream objective was developed to protect and allegedly restore eelgrass in the Bay. This parameter should have no applicability to the Cocheco River, the river to which the City‘s WWTF discharges, since there is no evidence that (1) eelgrass were ever present in this river and (2) the Rochester WWTF is so remote from the Great Bay that minimal flow from the plant could ever reach Great Bay.

We urge EPA to reconsider its proposed modifications to the Town of Exeter NPDES for the reasons set forth in the Coalition‘s comments.

Response #K1: The comments are noted for the record. The comments submitted by John Hall on behalf of the Coalition were addressed in Section A. The issues raised in this comment specific to the Cocheco River do not pertain to the Exeter permit and will not be addressed in this proceeding.

L. Newfields Village Water and Sewer District Comments, July 26, 2011

Comment #L1: The Newfields Village Water and Sewer District wishes to comment on the draft permit issued to the Town of Exeter. As an abutting neighbor, we are concerned that the proposed effluent discharge limit for nitrogen at 3.0 mg/l is unduly stringent.

The NH Southeast Watershed Alliance recently initiated development of a comprehensive watershed restoration plan and believes EPA‘s participation would be an essential contribution to its success. This would require active collaboration between the communities, EPA, the NHDES and numerous other stakeholders and would involve a multi-faceted holistic approach that goes beyond the point source discharges to include non-point sources as well.

A more regional approach to the watershed should be implemented and evidence of water quality improvements within the watershed should be documented prior to imposing strict effluent limits on communities.

Response #L1: As noted in previous responses, in addition to the necessary point source reductions, nonpoint source reductions will also be necessary in order to achieve standards in the Great Bay Estuary. Development of a comprehensive watershed restoration plan that identifies where and how the necessary nonpoint source reductions will occur, including the funding mechanisms for accomplishing the reductions, is essential. EPA intends to be an active participant in the process. EPA does not, however, concur that the necessary point source reductions should be delayed in light of the technical and scientific record in this case. Such an approach would not be consistent with the requirements of the Clean Water Act.

M. Brian A. Giles Comments, June 9, 2011

Comment #M1: The purpose of this letter is to unequivocally support timely action by the EPA to regulate the nitrogen discharge of the Exeter Wastewater Treatment Plant into the Squamscott River and the Great Bay estuarine system.

This action must not be delayed. It has been recognized for several years that nitrogen concentrations have been increasing and eelgrass has been declining in the Great Bay Estuary. As a result, New Hampshire has identified these waters as ―impaired, poor water quality" under Section 303(d) of the Clean Water Act. One source of the nitrogen pollution is the municipal sewage treatment plant at Exeter. It is time to take corrective action.

The rate of decline is startling. In the last 28 years dissolved inorganic nitrogen concentrations have increased by 44 percent; and between 1990 and 2008, the eelgrass biomass in Great Bay has declined by 64% (see reference EPA Fact Sheet). These time periods represent only an instance on a geological time scale projecting an extremely rapid and severe rate of pollution and environmental degradation. It can be said that the Great Bay is being polluted at a rate comparable to a major oil spill.

Cost should not be an issue. Municipalities such as Exeter will argue that they cannot afford the expense of meeting discharge limits for nitrogen. The Great Bay and its tributary rivers belong to the people of New Hampshire, future human generations, and the marine life that depends on it for existence. No specific group has the right to compromise the environmental integrity of these unique and valuable natural resources for financial reasons. This makes no sense.
As a public citizen and member of a number of environmental organizations in the Seacoast area of New Hampshire, I support the EPA in meeting its regulatory responsibilities under the Clean Water Act for issuing sewage discharge permits with strict science-based nitrogen limits. The EPA is encouraged to meet these responsibilities with urgency and resolve for the Exeter Sewage Treatment Plant. In turn, the Town of Exeter must also meet their responsibilities, both fiscal and ethical, to protect the fragile environmental resources of the Great Bay.

Response #M1: The comments are noted for the record.

N. Scott Myers, Dover NH (Public Hearing)

Comment #N1: The City of Dover is a member of the Great Bay Municipal Coalition and is certainly aware and concerned about the water quality issues facing the Great Bay estuary. The City of Dover is willing to do its share to address the issues and participate in the solutions.

That said, we have concerns with some of the conclusions drawn in the New Hampshire DES nutrient criteria document. We believe the manner in which the available historic data was analyzed and presented in the nutrient criteria document resulted in many conclusions, some of which are questionable at best. The Coalition and the New Hampshire DES have worked cooperatively to find a means to productively resolve the uncertainties raised by negotiating a memorandum of agreement between NH DES and the Coalition communities. And, my city council unanimously adopted the resolution supporting the MOA at a recent meeting.

This MOA includes the development of a calibrated hydro dynamic model and additional field sample collection completely funded by the Coalition communities. This model will help resolve the current uncertainties, and will be a tool to track the changes as we implement nitrogen reduction strategies in the watershed. The City firmly believes that an adaptive management approach, which addresses both point and non-point sources throughout the watershed is the most effective and cost efficient way to reach the goal of improving conditions in the estuary.

It will require a collaborative effort involving EPA, New Hampshire DES, the watershed communities, the residents and environmental advocates. And, we encourage EPA to support the MOA by holding the proposed Exeter permit and other Piscataqua watershed wastewater treatment plant permitting in abeyance until the initial model of the Squamscott tidal river is completed in January of 2012.

In the spirit of adaptive management, the Coalition agrees to begin the upgrade of all wastewater treatment plants discharging to the Great Bay to meet an eight milligrams per liter limit. This will be a significant reduction in nitrogen. For example, in the City of Dover, the effluent currently averages 24 milligrams per liter of nitrogen. Achieving a level of eight milligrams would reduce nitrogen discharging to the estuary by 67 percent. Once the eight milligrams per liter is achieved, we will be able to measure the effect on the estuary water quality. While not inexpensive to achieve, it would allow room for the Coalition communities to invest in implementing non-point nitrogen reduction in concert with the point source reductions. As you know, non-point sources represent 70 percent or more of the total nitrogen load. These non-point sources include storm water, septic systems and fertilizers. We must not overlook the potential that bio extraction offers to supplement nutrient removal in the estuary, while rebuilding depleted communities of shellfish in the estuary. Adaptive management affords us the opportunity to implement nitrogen reduction strategies and measure their effectiveness which resolves the uncertainties for treatment options while making progress toward the goal of improving water quality in the estuary. If we are to be successful in improving the conditions in the Great Bay, the entire watershed needs to work collaboratively, work smarter and fairly share the burden.

Russ Thibeault, who's a well known economist here in the state, presented to the city council recently about the economic impacts for communities for the various wastewater components for permit limits ranging from a three up to an eight. And, what if we find later on that the eight is enough? He talked about things like sprawl, about businesses looking to locate in communities that don't have wastewater treatment plants at this point, and also the major cost disadvantages to communities having to charge the sewer rates.

The City of Dover encourages that we take a step by step approach and the wastewater treatment plants can and should move forward to a level of eight, understanding that, and planning for that, someday we may have to bring that number lower. But, for the time being, we feel that we should be looking at a number of eight and continue to study. And, we urge the EPA to support what the Coalition communities and DES that work together toward on the MOA.

Response #N1: Issues relating to the quality of the science that formed the basis for the development of the nitrogen limit have been extensively addressed in responses above. Please see Background and Response #A15, A17 and B3b for discussions relating to uncertainty and Responses #A15 to A18 relative to the role of the MOA, including the modeling study referred to in the comment that was never completed. For discussions relating to nonpoint sources please see Background and Response # A5, B4, B5 and C3. For discussions relating to affordability please see Response #B7d.

O. Newington, NH Comments, June 9, 2011

Comment #O1: The Town of Newington urges the EPA to move decisively in a comprehensive fashion to reduce the volume of all sources of nitrogen that contribute to the impairment of water quality in the estuary.

Our town is situated in Eastern Rockingham County. Newington's land area encompasses 8.9 square miles.[103] We are bounded on the west by Great Bay[104], on the northwest by Little Bay, and on the northeast by the Piscataqua River. We enjoy twelve miles of shoreline along the bays and three miles along the Piscataqua.

Scientist inform us that excessive nitrogen in the Great Bay watershed is a serious threat to water quality, wildlife, commercial fisheries, sport fishing, and public recreation. They advise us that in the absence of timely countermeasures, the environmental degradation will be irreversible.

Accordingly, the Town of Newington urges 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.

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.

If the EPA were to delay implementation we 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 regular 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.

As you know, nitrogen enters the estuary by multiple sources, wastewater treatment plants, storm water runoff, septic systems, fertilizers, animal waste, land development and the atmosphere. While we applaud EPA's attention to wastewater plants, it concerns us that your agency appears to be deferring action on the remaining 70% of nitrogen sources.

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[103] Presently, our municipal jurisdiction is limited to 6.5 square miles. That is because some 2.4 square miles of our town are currently occupied by a state agency, the Pease Development Authority (PDA).

[104] The municipalities whose boundaries actually encompass Great Bay, such as ours, should not be confused with the Great Bay Municipal Coalition, most of whose member communities are situated at some distance from the bay, and whose only relationship to the bay is the utilization of same as a repository for sewer effluent.

Our town has little control over atmospheric pollution, however we fully intend to move aggressively in regards to that which we can influence. The specifics of our community's approach are detailed below in order to illustrate solutions that work on a municipal level, and also to provide the EPA with examples of proven techniques that could be replicated on a regional level as part of a comprehensive approach to nitrogen mitigation.

1) **Storm water –** Newington strives to achieve a balance between economic development and environmental protection. For that reason, our storm water regulations are among the most stringent in New Hampshire. By way of example, our Planning Board recently approved a proposal by Tyco Electronic Subsea Communications to build a 102,000 square foot manufacturing facility that incorporates storm water infrastructure designed to remove 80% of suspended solids, 53% of phosphorus, and 66% of nitrogen.[105]

2) **Open Space Preservation -** In the simplest of terms, excess nitrogen in the estuary can be attributed to land development. It then stands to reason that open space preservation would be a mitigating factor. Our program in that regard is ambitious.[106]

3) **Fertilizer -** We will shortly commence a program of public education regarding the nitrogen problem associated with fertilizer.[107]

4) **Septic Systems and Animal Waste** - We will likewise engage the public in an educational effort addressing the nitrogen issues associated with leaky septic systems and animal waste. Alternative technologies will be recommended to address the former, and best management practices for the latter. To the extent that education falls short of solving the problem, we will pursue a regulatory approach.

5) **Atmospheric Sources of Nitrogen -** Since 1994, our zoning ordinance has included provisions for air pollution mitigation.[108] We will continue our efforts to mitigate the effects of such pollutants to the extent permitted by NH law.

6) **Oysters** filter nitrogen and improve light penetration that aids in the reestablishment of eelgrass.[109] The Town of Newington has fully supported an oyster farming operation situated

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[105] The new facility will bring 105 high-wage manufacturing jobs to New Hampshire. In that regard, Portsmouth Herald editors opined on 12/17/10 (copy attached) that *"increased environmental safeguards are not a barrier to increased development."*

[106] During the past two decades, Newington purchased or facilitated the permanent preservation of 36% of the land area within our jurisdiction (see attached map). This includes more than half of the town's 12 miles of shoreline along great Bay and Little Bay. Highlights of this effort include persuading the US Fish $ Wildlife Service to establish its first national wildlife refuge in New Hampshire (1,089 acres), and a 17-year effort to transfer control from the PDA of 70 acres of woodland that comprise the nation's oldest town forest.

[107] In this regard, we suggest that the EPA analyze water samples downstream from the Pease golf course.

[108] These zoning provisions drew national attention as result of coverage by the New York Times. See Article IX of the Town of Newington Zoning Ordinance.

[109] A single oyster can filter as many as fifteen gallons of water per day.

off of Fox point in which over one million oysters have been imported. The Town will continue to actively support such efforts.

In 1994, the Town of Newington brought suit against the Air Force in Federal Court due to the latter's failure to comply with environmental statutes[110]. The Town prevailed. This is not to suggest that we are contemplating litigation in the present instance, we are not. But we want to make you aware of our longstanding commitment to the protection of Great Bay Estuary. The Bay is a priceless natural and economic resource that has provided immeasurable value to our community for the better part of four centuries.

In summary, we urge EPA to move quickly and decisively and to employ a comprehensive approach to restoring the health of the Great Bay Estuary. We ask you to hold all communities to whatever standard is necessary to get the job done.

Response #O1: The comments are noted for the record. Please see *Background* and Response #A5, B4, B5 and C3 relative to nonpoint sources of nitrogen.

P. City of Manchester Comments, August 11, 2011

Comment #P1: Manchester is concerned that the proposed nitrogen limit of 3.0 mg/l and the use of ―Best Available Technology" criteria in setting that limit will have negative financial impacts to Exeter residents and negative long-term impacts on the other 17 wastewater treatment plants (WWTP) that discharge into Great Bay. The permit condition of 3.0 mg/l for nitrogen will potentially cost Exeter $75 million to achieve and the other 17 WWTPs that discharge into Great Bay upwards of $750 million.

Response #P1: The limit of 3.0 mg/l is a water quality-based limit and not based on ―Best Available Technology," which is standard applicable to technology-based effluent limitations. Under the Clean Water Act, water quality-based discharge limits are required to be established independent of cost or technological feasibility. However, cost can and will be considered in establishing implementation schedules (see Response #B7d). Based on our experience with other facilities, these cost estimates are significantly inflated and additionally, not all facilities will be required to achieve a nitrogen limit as low as 3.0 mg/l.

Comment #P2: Page 12 of the partially revised fact sheet indicates in the last two paragraphs that nitrogen concentrations have increased 59% in the Great Bay over the last 25 years. A subsequent statement in the next paragraph indicates 42% of that increase has happened over the past five years. This calculation implies that 17% of the growth happened over the first 20 years and 42% over the last five. Another item in the fact sheet states that between 2006 and 2009, the number of negative/cautionary trends increased from seven indicators to 12 indicators. These statements indicate that the majority of the nitrogen increase happened most recently and that the majority of this is due to the Exeter WWTP point source discharge along with the other 17 WWTPs that discharge into Great Bay. The rationale of cause and effect would lead the reader to believe that the WWTP discharges have increased steadily with the majority of the effluent

[110] Town of Newington & Conservation Law Foundation v. USAF, 864 F. Supp. 265 (D.N.H. 1994)

discharge happening over the past five years. In reality most plant discharges have remained the same or actually decreased over the past five years due to the downturn in the economy and the increased awareness of water conservation. Industries are closing down, industrial wastewater discharges are being reduced and residents are conserving more water due to economic and green initiative measures.

The permit's fact sheet failed to demonstrate a cause and effect relationship of the increase in Great Bay's nitrogen being attributable to the same increase in the Exeter treatment plant discharge to the Bay. Additional WWTP nitrogen discharges to Great Bay do not equate to the 42% nitrogen increase stated in the fact sheet over the past five years. The only other explanation is the steady increase in nitrogen is due to naturally occurring components and non-point sources.

Response #P2: Both total nitrogen and dissolved inorganic nitrogen have increased significantly in the Great Bay Estuary. The Fact Sheet does not attribute the nitrogen increases in Great Bay Estuary to recent point source increases. The Fact Sheet documents that current nitrogen levels in the Great Bay Estuary exceed levels necessary to meet water quality standards and point sources of nitrogen are a significant contributor to the documented impairments. It is also important to note that wastewater treatment plant nitrogen loadings can increase even if discharge flows do not increase. 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.

While there is substantial evidence of increases in nonpoint sources of nitrogen, EPA is not aware of any evidence that "naturally" occurring (i.e. not anthropogenic) sources of nitrogen have increased.

Comment #P3: The fact sheet, page 24, details the threshold loading capacity for the Exeter/Squamscott River watershed to protect all designated uses at 87.8 tons for total nitrogen. The current estimated load is 211.5 tons. The estimated load has 44.3 tons coming from point source and 167.3 tons coming from non-point source. The non-point source contribution is greater than 3.75 times that of the WWTPs. The data further states that there must be a 58% reduction in total load to meet the Exeter/Squamscott River watershed protective criteria. That would require a reduction of 122.57 tons of nitrogen. The average nitrogen discharge for Exeter was 14.434 mg/l. The proposed permit has a limit of 3 mg/l. That is an 80% reduction in loading to the watershed. Taking 80% from the 44.3 tons from point source means a 35.44 ton reduction from the required amount of 122.57 tons. This leaves 87.13 tons to be eliminated through non-point source discharge.

To address non-point source discharges, seacoast communities have been in the process of implementing storm water management programs for several years. Over the past five years they have implemented pet waste programs, increased the level of street sweeping, better catch basin cleaning, and sewer line inspection/cleaning programs. This increased diligence is outlined

in their annual storm water reports. Yet, we still see an ever increasing level of nitrogen despite these positive steps in non-point source controls.

Response #P3: Please see Background and Response #A5, B4, B5 and C3 relative to nonpoint sources. While some progress has been made in addressing nonpoint sources of nitrogen, in many cases these efforts have not kept up with nitrogen increases associated with new development, including the construction of new septic systems. A much more comprehensive and effective nonpoint source program will be necessary in order to address the impairments in Great Bay Estuary.

Comment #P4: This leaves us with ―Naturally Occurring" conditions as one of the most significant contributors of nitrogen to Great Bay. NHDES recently completed draft *"Final Report, New Hampshire Statewide Total Maximum Daily Load (TMDL) for Bacteria Impaired Waters"* identifies significant impacts from pet waste/wildlife waste to water quality and outlines proposed mitigation measures. It has been documented that two-thirds of the nitrogen pollution in Great Bay comes from non-point source contribution. Pet and wildlife waste are a key contributor to these non-point discharges. However, EPA has exempted all agricultural sites (the exceptions is those sites being designated feed lots) from any requirement for storm water or runoff management controls.

Response #P4: As indicated in previous responses, it is EPA's expectation, as documented in the Fact Sheet, that a comprehensive watershed wide nonpoint source reduction effort will be developed by NHDES with input from the communities and the public and will be pursued as necessary to reduce nitrogen loads sufficient to meet applicable narrative water quality criteria. This effort will quantify the nonpoint sources of nitrogen and will evaluate and target controllable sources as part of an implementation plan. Unlike most wildlife sources, pet waste is not a ―natural" source of nitrogen and will be evaluated for potential controls. Agriculture sources are expected to be a relatively minor, but not insignificant source of nitrogen to the Great Bay Estuary and will also be evaluated for potential controls.

Comment #P5: To address this nitrogen issue in a cost effective manner, the seacoast communities have committed to attaining a level 1 nitrogen achievement limit of 8 mg/l. This is a 45% reduction regarding Exeter's nitrogen discharge. This is greater than 75% of the stated 58% reduction in total load to meet the Exeter/Squamscott River watershed protective criteria. A five-year permit cycle at 8 mg/l would determine if the reduction in the point source discharge, along with the continued improvement of the cities and town's storm water programs, result in an overall reduction in nitrogen loading to Great Bay, or is as suspected, the problem is due to the ever increasing naturally occurring conditions from wildlife and exempt agriculture contributions.

Mandating a partial fix to a complex issue and forcing NH communities to spend millions of dollars for a nitrogen reduction goal that is currently unattainable is a misplacement of the public trust and public taxpayer dollars. Fact sheets, besides outlining the numeric loadings associated with point source pollution within a watershed, must also do a better job at outlining the non-point source pollutants. The proposed permit for Exeter does state that two-thirds of the pollution is non-point source but one is led to believe that a better collection system management

program and implementation of LID practices along with a good storm water management program will reduce this load to acceptable loads.

It is incumbent upon EPA to consider a comprehensive approach before requiring point sources to exhaust funds to attain a water quality measure that is not within reach in any watershed. In closing, we respectfully request that EPA re-examine the proposed nitrogen limit of 3.0 mg/l and the use of ―Best Available Technology" criteria in setting that limit. EPA, NHDES, and the seacoast communities must partner to apply a holistic approach to watershed management to protect the water quality of Great Bay.

Response #P5: See Responses #A16, A25, A26 and B3a relative to EPA's obligation to establish a limit that ensures compliance with water quality standards.

See Response #B7d relative to how affordability is addressed under the Clean Water Act and Background and Responses #A5, B4, B5 and C3 relative to nonpoint sources, including the relative importance and cost of point source versus nonpoint source controls.

Q. Ricardo Cantu, City of Manchester (Public Hearing)

Comment #Q1: I had a chance to look over the fact sheet which was pretty extensive. It painted a pretty bleak picture of the Squamscott River. Looking through there, everything was high. It had high gradient concentrations for nitrogen, and also for chlorophyll a transparency. As I read through the fact sheet, the eelgrass had disappeared there in 1981 or before.

The inland fisheries are studying the Squamscott River. They're doing a study on the rainbow smelt. There's more rainbow smelt in the Squamscott River than are in the Great Bay, the entire Great Bay. The study's been ongoing for five years and there will be a report coming out. They studied turbidity, chlorophyll, and nitrogen. It will be kind of interesting to see how, even though we're told that it's been very detrimental to the aquatic life, these things are propagating very well in there.

Also in the fact sheet, it goes on to say that there's 211 ton per year of nitrogen from all the sources. They say 44.3 tons comes from the wastewater treatment plants and 167 tons comes from non-point sources. On top of that, they're saying that for the bay and the river, the total sustainability is 87 tons. So, if you were to shut down every treatment plant, you still have 167 tons which is twice what the Great Bay supposedly can handle. It doesn't matter what you're going to do there, it's not going to resolve the impairment issue.

The United States Department of Agriculture indicates that 2500 cows produce the same amount of waste as 411,000 people. That's one cow equals the waste of a 164 people. The cows out there on farms, Packer Farm, Marmar Farm, pig farms, and moose and bear living in the watershed, all contribute naturally occurring stuff and there's no way to control that. Out of 167 tons, you'd have to remove 90 ton in order to reach attainment. I would like to see a plan from anybody, whether it's the EPA, the state, regulators of the treatment plants, where are you going to find 90 tons of non-point source? I worked in storm water for five years for the City of Manchester and started a program. It's impossible to find that.

So, water quality will never be attained in the Great Bay. I think that's the reality. We can take everything out, we can work like hell, I say, yes, we work toward that, but you're not going to achieve that water quality criteria of 87 tons, it just can't be done. You've got geese. Geese produce 125 pounds of waste per year and about ten percent of that is nitrogen, so you figure 12 pounds of that is nitrogen. How many geese do you see flying over? How many geese do you see over the parks and rest areas? They're there. That's naturally occurring. You're not going to get rid of that. You're not going to chase them away.

So, I just wanted to say that I'm in favor of doing the small incremental approaches and getting that done. What happens here in the Great Bay is going to happen across the state. Manchester's concerned because we had a very tight aluminum limit. We're fighting that now. Let‘s find the biggest bang for the buck. If non-point source is the biggest problem, which it is79 percent of the problem in the Great Bay, let's find out what that is. Let's attack that and see if we can attack that and if we can, spend your money wisely. If you can't, then you live with the realities that it can't be achieved.

Response #Q1: Rainbow Smelt are widely understood to be on the decline in the Great Bay Estuary (see Great Bay Estuary Restoration Compendium, September 2006).

The allowable nitrogen loading cited in the comment is for the Squamscott River only. The allowable nitrogen loading for the entire Great Bay watershed is much higher. While it is correct that significant nonpoint source reductions, in addition to stringent point source controls, will be necessary to achieve standards, EPA does not concur that it is impossible. There are many steps that can and need to be made to both reduce the amount of nitrogen applied to the watershed and to manage the nitrogen that is applied to the watershed such that it is not delivered to the waterbodies. These include improved agricultural, turf management, and storm water practices. While there is a limit to how much nonpoint source nitrogen can be controlled, EPA concurs with the commenter that we have to try. EPA believes that point source controls are cost effective and, even assuming it is not possible to achieve the nitrogen threshold for eelgrass in the Squamscott River, achieving the eelgrass threshold in Great Bay is possible and requires the same stringent point source controls.

R. Michael King (Public Hearing)

Comment #R1: Non-source pollution is really the main cause. The numbers coming out of the Exeter River, for example, are almost equal to the numbers that were reported by the EPA that come out of the Exeter plant. The Exeter plant discharges three million gallons a day and the fact is, the Exeter River discharges many, many more times that amount into Great Bay. The numbers reported by the EPA for the Exeter River is three times what the Exeter plant is reported to have been discharge into the Exeter River. My sense tells me, that non-point source pollution is the major source of the problem.

Response #R1: Please see Background and Responses #A5, B4, B5 and C3 relative to the role of nonpoint sources in achieving nitrogen thresholds.

S. Donald Clement, Exeter River Local Advisory Committee (Public Hearing)

Comment #S1: I am not speaking for the Exeter River Local Advisory Committee tonight, because the committee has not taken a position.

We've got an awful lot of interesting information and data and we're all arguing and having a discussion about the science. What I hope as we go forward is that we don't lose sight of the bigger picture and that is the health of the Bay. So, this is what we all need to be working towards and we need to come together on this. It is time for Washington and our congressional delegation to go back to Washington and say, this is a national treasure and it's going to cost money to clean it up. Put forth some money from the federal government to the Great Bay communities and to the Great Bay. Whatever we do, whatever nitrogen levels we decide on or the EPA decides on, we all can agree it's going to cost. Put the money forth. We need to make sure that this Bay and all the over rivers in this Bay get cleaned up.

Response #S1: The comments are noted for the record.

T. Peter Whelan, Coastal Conservation Association (Public Hearing)

Comment #T1: I'm on the Board of Directors of the Coastal Conservation Association in New Hampshire. We currently have over 300 members here in New Hampshire and over 90,000 nationally.

Our mission statement, the stated purpose of the Coastal Conservation Association, is to advise and educate the public on conservation of marine resources. The objective of CCA is to conserve, promote and enhance the present and future availability of these coastal resources for the benefit, enjoyment of the general public.

Just some comments on the Exeter permit. Coastal Conservation Association in New Hampshire recognizes that based on the current data, the Great Bay estuaries are in a state of decline. If immediate action is not taken, the Great Bay may experience a similar ecosystem collapse such as what's happened in the Chesapeake. Therefore, CCA's position on the current status of the Great Bay Estuary is, EPA permitting and compliance of the region's wastewater treatment facilities as required by the Clean Water Act must proceed without delay and that includes Exeter. Aggressive mitigation of non-point source pollution must proceed rapidly also.

CCA strongly supports the realignment of federal budgetary priorities in the hope of obtaining federal assistance consistent with the critical importance of these initiatives. And, this was passed by our Board of Directors at a recent meeting last month.

Response #T1: The comments are noted for the record.

U. David Anderson, New Hampshire Coastal Protection Partnership (Public Hearing)

Comment #U1: I'm the project coordinator for a local non-profit called the New Hampshire Coastal Protection Partnership. We have about 500 members and supporters located throughout the seacoast region and are dedicated to protecting the natural resources of the Granite State's coastal watershed.

In general, we support an all the above approach to mitigating the problem of nitrogen pollution in the Great Bay Estuary. That includes approaches that will help to reduce nitrogen from wastewater treatment plants, which I think the draft permit proposed by EPA will do.

I just want to note that part of the reason we're here tonight is that parts of Great Bay, Lamprey River, Piscataqua River, Squamscott River, Exeter River, as well as a number of other rivers in the region have been listed as impaired for nitrogen by NHDES. It's an ongoing process that's been going on for years. More and more water bodies keep being added because of the measurements done by scientists in the area. It's not like the science is new, or the studies have only been going on for a short amount of time. I think there's actually quite a big body of literature out there and you could probably spend many months just going online, on the UNH website and other websites, finding reports about these things.

It's also important to look at not only the science that has been used by NHDES and the EPA, but also to look at the science being put out there by consultants like HydroQual. There has actually been a peer review of some of the information that was presented tonight, which was fairly poking holes in some of what they had to say. It's not necessarily that either side is completely right or wrong. There's always room for more studies and interaction and compromise. That's what science is all about, a learning process.

In general, I just want to also add that the problem of nitrogen, algae blooms and nitrification, which is the process whereby oxygen is reduced by algae growth and sunlight blocked out, leading to dead zones in water is not isolated to New Hampshire. Dead zones can be found in coastal waters elsewhere in the United States, as well as around the world. So, the problem of nitrogen isn't just something that's been studied here, the science already existed and much of what the EPA is using has been applied elsewhere and learned from experiences elsewhere as well.

Efforts are also under way to address non-point sources here in New Hampshire, some of which have been undertaken by the group that I work for. Last year we did a pilot program aimed at reducing nitrogen from lawn fertilizers and also built the Town's first demonstration green garden. That project was funded in part by EPA money. So, to claim that the EPA is not doing anything to address non-point source pollution is false. They are doing things.

Upgrading wastewater treatment plants doesn't only have costs, it will also have benefits. As we all know, New Hampshire has been relatively lucky in terms of maintaining relatively low unemployment compared to the rest of the country. And, investing in upgrading our wastewater treatment plants to improve water quality is likely to create new employment opportunities, both with the construction and engineering sectors. Also, in terms of funding, in the past we had

bipartisan congressional support for green and federal dollars to help protect Great Bay. I believe, John Bragg alone brought in somewhere around 42 million for Great Bay protection. I'd just reiterate a point that was made here a few minutes ago, that if these upgrades do have to move forward, it's really going to be the job of our congressional delegation to get out there and see if we can bring some funds into the state. Also, up until a few years ago, the State of New Hampshire had a fund that covered up to 30 percent of wastewater treatment plant upgrades undertaken by communities. That fund has been eliminated, but it's yet another example of where that type of money might come from. This is perhaps something that we should take a look at restoring.

Response #U1: The comments are noted for the record.

V. Walter Fries, Southeast Watershed Alliance (Public Hearing)

Comment #V1: Southeast Watershed Alliance was established by the legislature over a year ago and we've been in existence almost a year. It represents the 42 communities in the New Hampshire coastal watershed. I think there's one message that's very clear in listening to the comments here tonight and that is there is a total appreciation for the common goal. I think EPA, from the contacts we've had in the past and what you've seen tonight, shares the same objectives that the New Hampshire legislature did and that each of the communities do, as seen in the decision of the Alliance to go to EPA and to NHDES to create a true collaborative effort to come up with a solution to the problems.

There are enough questions about the science and how to proceed, but we need to put our heads together. There is such an enormity of talent available within the NHDES and within the EPA, with their experience in terms of technical and practical experience, to bring together with the people in the towns and the engineering firms to come up with realistic practical solutions. Let us devote our time and our energies to doing this, rather than getting involved in a litigious adversarial contest. Too much time and too much effort and money and resources go in that direction. The history around the country has been that problem. I believe most sincerely that EPA is willing to cooperate in that effort and I know that NHDES is. We've certainly seen that, so, let us put our heads together and work forward. The Alliance will go forward to EPA and NHDES with a proposal in this area sometime in the near future. I expect we'll put forward a proposal with a specific outline for your review and for your comment. We would like to see that approach rather than going the traditional route of here's our decision, now do it. I realize the constraints that a government agency works under. You have to operate according to the code of federal regulations and the legislative intent. We will work and we will strive to get that changed. I believe there is a receptivity in Washington based on the discussions I had there a couple of months ago with congressional delegations from several states and that they will be responsive and support such an act. So, I urge everyone to think in terms of let's go forward pro-actively and positively and avoid a litigious environment.

Response #V1: The comments are noted for the record. While the final permit will be based on current law and regulations, EPA considers affordability issues (among others) when fashioning implementation schedules to meet permit requirements. Establishing a longer schedule that

would allow for phasing in the treatment upgrades may be warranted by affordability and other factors.

W. Jean Eno, Winnicut River Coalition (Public Hearing)

Comment #W1: I was really happy to hear that there's been a lot of support from the audience regarding a holistic approach to this problem that we're having with Great Bay.

It should be all of the communities in and around the Great Bay Estuary impacting the estuary that contribute to taking care of the wastewater facilities. It just seems like common sense to me. I would be happy to step up and pay a higher rate to have our waste shipped to whichever facility it goes to. So, I think it's important for the Exeter people to know that I don't think I'm alone. I think there are other people in other communities that would agree, that you shouldn't have to bear the burden by yourselves, that any community whose waste comes to your facility should have to contribute to the cost of upgrading that facility.

That said, I have spent the better part of the last two years committed to community workshop training, learning, as well as hands-on training for watershed conversation type issues, conferences, and symposiums up and down the northeast coast. That's following four years of learning at UNH under phenomenal professors, people who I immensely trust and I am a little disheartened by the fact that some of the presentations or speakers today have been a little condescending and passed off that scientific work as if it's just redundant. It is not redundant. I've spent hours every spring working for the Great Bay National Estuary Research Preserve, taking kids around, teaching them about the ecology of Great Bay. We see the excess algae washing up on shore and the incredible sedimentation. I know that through the last six – seven years of my life, having been involved with studies at UNH, having been in the field working as a volunteer, having been to these conferences and these symposiums that are trying to educate anyone who is willing to go and be educated, to be taught about the sciences that as complicated as they are, they're often quite basic. And, once you understand how the system works, you recognize the need that we all work together.

That said, it has never been disputed that non-point source pollution is a big nut. As the project director for a newly formed, very small, watershed coalition, a group of three towns trying to make a change on the river that we impact, that does in fact have impairments because of our poor land use decision making, I have seen firsthand how incredibly ridiculously, crazy it is, to try and get the average person to recognize how much of an impact they make on their system right next door.

The bigger nut, the wastewater treatment facility issue, is something so identifiable, we are crazy not to address that. We should move forward and think, you know there needs to be more studies. You listen to one congressman's proposals to ban the EPA for another five years from stepping forward and cleaning up. I don't want to wait five years. I'm a property owner in Greenland. I'm between the Winnicut River and Shaw Brook, a tidally influenced area of land off of Great Bay. I see the pollution washing up in many forms, not just in physical objects, but in water quality.

Waiting five years to move forward is incredibly bothersome to me. And, I think that we should recognize that as a society, we have had it really good forever. Everybody in this audience has had it really good. Your parents had it really good. We made really poor grandiose models decades ago. Unfortunately, it has fallen into our lot now to turn around and recognize, we need to make drastic changes. I don't agree that it should happen on the Exeter taxpayer only. And tomorrow, obviously not. I'm aware of the hardships that you all -- we all face every day trying to make ends meet with the way things are. But, to just sacrifice the quality of Great Bay and, thus, the quality of life for every community involved, is everyone‘s responsibility.

Response #W1: The comments are noted for the record.

X. Fred Short, University of New Hampshire

Public Hearing Comments

Comment #X1: I am at the University of New Hampshire, Jackson Estuary Lab. I am a research scientist and I've been studying Great Bay for 30 years. Looking at eelgrass is my primary focus. The various aspects of eelgrass data that were questioned here tonight, I am responsible for collecting that data and presenting it, and I feel that it's quite strong.

We don't really need to redefine the science. The science is there and speaks for itself. Some people try to reinterpret it and some people like to look at it from a different perspective and that happens over and over again. But, you know, as someone mentioned earlier, the science that went into this whole program that NHDES put together was done by NHDES with a technical advisory committee of about 20 scientists or more from around the university that reviewed every step of developing the nitrogen criteria and reviewed every step of what goes into those state of the estuary reports. So, the science is strong and it's been pretty thoroughly reviewed.

I don't think that's the place we need to spend our money. What I've seen over the last 30 years is that the Bay was doing great for a while. It had some problems with various natural impacts, but things that it could recover from. What happened in the last ten years is a rapid decline in the whole functioning of the system and eelgrass is the organism which indicates that best. It's really used around the world as an indicator organism for how healthy a system is. When you start losing the eelgrass, you know the system's in trouble and we're losing the eelgrass. Despite some interpretations, I know why we're losing the eelgrass. I know why it's disappearing in the Piscataqua River and I know why it's disappearing in Great Bay. Both lead to too much nitrogen in the system. There's always been turbidity problems but, turbidity has gotten much worse since we lost the eelgrass. It's a feedback loop. Eelgrass keeps the sediment on the bottom, without that you get a lot of resuspension. I've been looking at the Bay and the nitrogen issue a lot longer than John Hall from the DC consulting company down in Chesapeake Bay. I don't want us to go the route of Chesapeake Bay. We're basically where Chesapeake Bay was in the early '70's. In the mid 70's, they lost their eelgrass from Chesapeake Bay, a dramatic decline. That loss has been basically impossible to turn around, because it went so complete and so thoroughly and they didn't take any steps beforehand. They spent billions of dollars trying to get eelgrass back into Chesapeake Bay. A lot of that has gone into research and restoration. That's what I do. I like doing research. My whole way of life is doing research and restoration of

habitat. But, I don't think that's what we need right now in Great Bay because we'll be throwing money down the same hole that Chesapeake Bay did. We need to stop the nitrogen inputs. It's not all point source, that's absolutely true. Point source is a third of it. Point source is the one that we can quickly identify and we know what to do to reduce that, so that should be a point we should start at. But, we shouldn't focus on three milligrams per liter, or eight milligrams per liter. We should focus on reducing the impairment of the Bay. The impairment of the Bay is the problem and, if we can reduce that impairment, then EPA's not going to be bugging us about how much we're putting in. So, if we can reduce the point source, we can reduce the non-point source, we can cut them both in half, we'd solve the problem. I think we can do that. It's going to take a huge effort and it's going to be expensive, but as people have mentioned, it's something that should be spread out through the whole watershed and we should get federal help through federal grants or federal loans. There are ways to make it happen, we just have to take the challenge of trying to turn the system around. I think we can do it and I encourage you all to do your part.

Response #X1: The comments are noted for the record.

Fred Short Written Comment, August 10, 2011

Comment #X2: I write to you regarding the Squamscott River and the Exeter Wastewater Treatment Plant discharge. I support the revision of the draft EPA permit to include 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 75 lb/day for the months of April through October.

The Squamscott River itself, Great Bay, and the estuary overall, need this limit if estuarine water quality and health are to be maintained and eventually improved.

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 field 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 Squamscott River and Great Bay Estuary: it is declining, has been completely lost from Little Bay and the central Piscataqua River, and now has less than half its historical biomass in Great Bay itself. In the Squamscott River, as will all

the river tributaries to the Great Bay Estuary, eelgrass is also completely lost. For the Squamscott River specifically, I have put together a map that summarizes what is known about the historic eelgrass distribution (see attached). The best evidence is an eelgrass map from a 1948 UNH Master's Degree thesis. Additionally, I have a direct personal communication from Mr. ―Chappie" Chapman whom I interviewed in 1985; he stated that ―eelgrass grew at Chapman's Landing in 1960, but it had not been seen there recently." I have also added to the map the location of the area in the Squamscott River where I found eelgrass growing in 1990. There is now no eelgrass in the Squamscott River. Of the many times I have been in the Squamscott in the past decade, the water clarity has been extremely poor and the water has a greenish tint.

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 waste water 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 Exeter must be <u>greatly</u> reduced. To that end, the identification of 3.0 mg/L as a target concentration will have substantial impact on improving the Squamscott River and the Bay.

Questioning the science is the oldest stalling trick in the book. Unfortunately, the Squamscott and the estuary cannot afford to be stalled – water quality continues to degrade and the resources of the estuary are diminished season by season. The proposed Great Bay Municipal Coalition study will not provide useful information with its limited amount of proposed sampling and ultimately, a model that will be based on too little information to draw sound scientific conclusions. Indeed, such a study will be likely to take current conditions in the river and estuary as a basis for what is normal or healthy – whereas the long-term view shows tremendous lost of estuarine habitats and ecosystem values over the past 30 years and more.

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 <u>now</u>, and the proposed nitrogen limit to the Exeter Wastewater Treatment Plant effluent is a good first step.

Response #X2: The comments are noted for the record.

Y. Peter Goodwin (Public Hearing)

Comment #Y1: I'm here tonight representing the Board of Directors of the New Hampshire Water Pollution Control Association. The Association is an organization of over 300 professionals from across the State of New Hampshire that is truly committed to protecting our most important resource, which is the environment. Many of these professionals are the day-to-day mechanics, operators, and managers of the wastewater treatment facilities throughout the state. It's our understanding and as you've heard tonight from previous speakers, that there are recognized data gaps in the development of the state's nutrient criteria, which has been utilized by the EPA to issue the wastewater treatment facility NPDES permits, specifically the one here in Exeter. In order to best protect our water resources and the quality of life in New Hampshire, our organization supports the Great Bay Municipal Coalition and the NHDES memorandum of agreement. This memorandum of agreement, as we understand it, would allow the Coalition and NHDES to scientifically evaluate the documented water quality concerns and the data gaps prior to requiring taxpayers to expend significant capital, and most important when you're getting to levels of three milligrams per liter, the long-term operation and maintenance costs of running these facilities. This management approach, as discussed previously, is supported by both the NHDES and the Coalition, is appropriate for this instance where the degree of treatment needed to address identified impairments is not well understood. The agreement, which calls for implementing biological nutrient removal at key facilities as the science moves forward in the Great Bay while reviewing the responses in ecosystems, is just straight common sense and we should support that. These goals are further supported by Congressman Guinta's House Resolution 1480 that would require the Environmental Protection Agency to conduct a peer review of the study of the impact of nitrogen released into the Great Bay estuary, minimize nutrient related construction expenditures for the next five years and allow citizen input throughout this process. Both of these items, the memorandum of agreement between NHDES and the Municipal Coalition and House Bill 1480, will allow a holistic approach to achieve the desired water quality that we all want here in the Great Bay. And, it shows the communities that the current planning that they've been working on and future planning efforts, along with capital investments, are developed wisely. The Board of Directors and the membership of the New Hampshire Water Pollution Control Association thank you.

Response #Y1: The commenter‘s preferred approach to addressing nutrient impairments in the receiving waters is noted for the record. Please see Response #B6 relative to adaptive management, Background and Response #A15, A17 and B3b for discussions relating to uncertainty and Responses #A15 to A18 relative to the role of the MOA. For discussions relating to affordability please see Response #B7d.

Z. David Michelsen (Public Hearing)

Comment #Z1: I'm actually a resident of the Town of Exeter and one of the people that will be helping pay for this treatment plant upgrade that may come out of this permit and been waiting for it for quite a long time both on the capital and the operating costs. I just have a concern of these very low limits postulated and the costs that will be coming out of that in order to pay for and maintain the plant. And, where there is some question, or the science to me doesn't seem to be definitive, I just urge some caution to go slowly on this. I really am supportive of the idea of

looking at an eight milligram per liter limit initially, designing the plant for the ability to upgrade eventually to three milligrams per liter and rolling that out in the future if it's needed.

Response #Z1: Please see Response #B6 relative to adaptive management, Background and Response #A15, A17 and B3b for discussions relating to uncertainty and Responses #A15 to A18 relative to the role of the MOA. For discussions relating to affordability please see Response #B7d,

AA. Steve Miller (Public Hearing)

Comment #AA1: I'm here as a taxpayer and citizen of Portsmouth. First, I'd like to thank you and all of the other staff at EPA. I appreciate your hard work protecting the health of Americans and your difficult work protecting the environment. At a recent symposium, I heard the EPA being criticized for not being omnipotent. I don't think this is about a criticism of the EPA. But, I think it puts a point on the sometimes thankless job you do and the perceptions that you can do it all, even if you don't get the funding that you need. So, thank you for your work.

As you know, it's 2011 and there are over three hundred and ten million people populating the United States and even if we all wish otherwise, the plain truth is, we need environmental regulations and the regulators to protect our health and the environment. I urge the EPA to meet its regulatory responsibilities under the Clean Water Act for issuing sewage discharge permits with nitrogen limits based on the best technology and science available to us today. Nitrogen is a major problem in Great Bay, just as it is an issue all over our country. The fact that nitrogen is a problem in Great Bay is not news, nor is it controversial. Seacoast municipalities have known that nitrogen is a growing problem for decades, and there has been a very active legislative decision maker and public effort to solve the nitrogen problem in the seacoast for at least a decade. In 2003, there was a major effort to study options for a regional wastewater treatment solution led by the same wastewater coalition towns of which I am a citizen of one, that today are leading the fight to prevent nitrogen reductions because they knew then, as we know now, that nitrogen loading issues in Great Bay were and are an issue and that stricter regulations were headed our way. They hoped for quick cheap solution, pipe the problem off shore and the state funded a one million dollar study, only to find out a quick cheap solution was in fact a pipe dream.

The time is now to implement reductions of nitrogen from all wastewater treatment plants within the Great Bay watershed. Wastewater source nitrogen is a majority of the manageable nitrogen inputs to the bay and our coastal waters. Let's move beyond denying there's a problem and implement nitrogen reductions to the limit of the science through wastewater discharge permits, then we can get on to solving the real problems of how we're going to pay for the needed upgrades. This is not just about Great Bay, as it concerns all of our coastal water resources and our valuable coast.

Wastewater treatment plants are not the sole nitrogen polluter, but they are the clear place to begin the fix. All sources of nitrogen pollution need to be addressed and reduced. This is our share of responsibility.

Response #AA1: The comments are noted for the record.

BB. Daniel Jones (Public Hearing)

Comment #BB1: I'm Dan Jones, Exeter resident, taxpayer and I also pay water and sewer, a great deal for it. I've heard about two rivers tonight. I've heard about the Squamscott and I've heard about denial. I think it's time to get rid of denial. Let's get this thing built and do something to preserve the Squamscott. While interest rates are minimal, the costs will be much lower, put people to work.

Response #BB2: The comments are noted for the record.

CC. Christopher Suproc (Public Hearing)

Comment #CC1: My name's Christopher Suproc and I run a company in Exeter, New Hampshire that does engineering work. I have a Ph.D. in engineering. I'd like to say that the graph data presented by the EPA doesn't really show a good sign of historical trend because it doesn't go back in time very far. It doesn't discuss anything about the noise in the system, the measurement or experimental accuracy. I think that they should measure nitrogen upstream from the treatment plant, as the gentleman from Epping has suggested. I think that we need to measure the nitrogen at various depths and discuss the concentration at various depths as a function of the silt concentration and its herbicity [sic – transcription error] that we discussed earlier in some of the presentations. I think also that the densities and species of hydro plank [sic – transcription error] that need to be measured and cross correlated with the eelgrass population and the clarity because that is a critical thing and I think there was a lot of data that was missing from the EPA presentation on this. Have you taken other measurements in northern regions? Have you taken a look at non-populated areas and estuaries that have eelgrass? What are the trends in those areas? Do they correlate to the trends in the Great Bay where there are no people?

Lastly, I'd like to make a couple of comments and let a local problem be analyzed and solved as a local problem. The gentleman from the wastewater treatment plant in Epping made a good point. We can solve this locally and we can solve it a lot less expensively and less burdensome for the taxpayer if we take a look at it on a practical level, at the Town level.

I think that the EPA conclusions are inaccurate at best and make strong assumptions about a complex ecological system that has multiple variables and is not easily identified with simple regressions and models that were presented tonight. Linear regression don't accurately identify what's going on in a multivariant system, not even a covariant analysis does a very good job if it's linearly based on models that don't go back historically.

Now, this is a heavy burden on taxpayers and it's coming from the federal government, which is already bankrupt. I think that the EPA is an extra constitutional entity. It's been created by legislature at the federal level and I think New Hampshire should recognize it as such and practice the state's right of nullification. I think we should look at this as a local problem because it is a local problem. It's our resource. It's our local problem to look at. I think the EPA

and the federal government should get out of New Hampshire and take the bureaucracy and inefficiencies back to Washington. This is our problem. We can fix it. I think the gentleman from Epping made an excellent point that his waste treatment plant is putting out the appropriate levels. He invited the EPA to come look at them and I think the local towns should talk with him. Take him up on his offer. Look at what we can do here. We don't need to spend 200 or 700 million dollars to fix this problem. It can be solved for much less.

Response #CC1: EPA is required to establish limits that will ensure compliance with applicable State water quality standards using all reasonably available information. EPA agrees that Great Bay is an extremely complex ecological system and, for that reason, no analysis would perfectly mirror the conditions in the Bay. Nevertheless, EPA has concluded that the modeling, site-specific data and other relevant technical and scientific information that was used by EPA to derive the permit limit bore a sufficiently close and rational relationship to the receiving waters to rely on for permitting purposes. There may well be the potential for completion of other analyses in the future that include some or all of the components that the commenter refers to, but EPA does not believe that that fact renders the existing data and analyses infirm or unreliable, for reasons discussed elsewhere in this response to comments. (That certainly has not been the conclusion of independent experts in the field who have reviewed NHDES's proposed numeric thresholds.)

As discussed in several responses above, the desire for more data or for further research is not a valid reason for delaying permit reissuance or deferring water quality-based limits where the record contains sufficient information to make necessary permitting decisions. The commenter does not indicate how much historical data is required before trends can be analyzed (or put another way how much longer water quality-based permitting need be held in abeyance pending the collection of data). In this case, data going back many years indicate that the receiving waters are now impaired, which remains true regardless whether one believes such data are sufficient for evaluating historical trends. The conclusions reached in Great Bay are consistent with studies done in other estuaries, including those in northern climates. Studies that have been conducted in unenriched estuaries have shown nitrogen, chlorophyll-a and macroalgae levels to be much lower than they are in the Great Bay Estuary (see EPA, 2001).

Uncertainty associated with determining allowable nitrogen loads and the amount of nitrogen reduction required to meet those loads has been evaluated and discussed in detail in the *NHDES Great Bay Nutrient Report* and the *NHDES Nitrogen Loading Reduction Report*.

Please see Background and Responses #A1 – A14 and B3a - d relative to the appropriateness of the methodology used in developing the draft nitrogen criterion thresholds.

The local communities will play a significant role in determining how to most cost effectively achieve the necessary nitrogen reductions.[111] Under the Clean Water Act however, it is EPA's

[111] EPA notes that the specific point referred to from "the gentleman from the wastewater treatment plant in Epping" (Michael King, see Comment R above) was not made during the public hearing or in written comments and therefore was not preserved as a formal comment on the draft permit.

responsibility to establish point source limitations consistent with restoring and protecting the local resource.

The comment on the constitutionality of EPA is noted for the record.

II. Comments Received on the Draft Permit Released for Public Comment in 2007

Conservation Law Foundation, November 21, 2007

Comment #DD1: The Squamscott River flows into the southwestern-most, or inner-most, location of Great Bay, meaning that its discharge waters have significant residence time within Great Bay and the Great Bay estuary before reaching the Gulf of Maine. Great Bay has been recognized ―as an estuarine system of national significance." New Hampshire Estuaries Project (NHEP) Management Plan (2000).[112] It is part of the National Estuarine Research Reserve and the National Estuary Program[113] and, pursuant to the latter, is the subject of ongoing management efforts by the New Hampshire Estuaries Project (NHEP). *Id.* at 2-5. Great Bay also is home to the University of New Hampshire's Jackson Estuarine Laboratory.

The Great Bay estuary contains eelgrass, salt marshes, mudflats, channel bottom, and rocky intertidal zones that provide diverse habitats for a broad range of species. Eelgrass beds play an especially important role, providing breeding and nursery grounds for fish, shellfish and other invertebrates, and ―feeding grounds for many fish, invertebrates and birds." *Id.* at 2-19. Eelgrass also ―stabilizes bottom sediments, and may also filter nutrients, suspended sediments, and contaminants from estuarine waters." *Id.* at 2-19. Great Bay has been designated Essential Fish Habitat for numerous fish species, including but not limited to Atlantic salmon, Atlantic cod and Atlantic sea herring, in various stages of their life cycles. Fact Sheet, Attachment D.

The Squamscott River is listed on New Hampshire's Section 303(d) list as an impaired water requiring a TMDL. Attachment 1 (Final 2006 List of Threatened or Impaired Waters That Require a TMDL, excerpt). Specifically, the river has been identified as not supporting primary contact recreation uses as a result of chlorophyll-a and enterococcus, and as not supporting aquatic life uses as a result of dissolved oxygen saturation levels. *Id.* *See also* Attachment 2 (NHEP Environmental Indicator Report: Water Quality, excerpts).

The Great Bay estuary, including Great Bay proper, also faces significant water quality issues. In recent years, knowledge regarding the levels of nitrogen in the Great Bay estuary, and the impacts thereof, has evolved significantly. The evolution of this knowledge can be traced through many studies and documents.

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[112] NHEP's 2000 Management Plan is publicly available through the New Hampshire Estuaries Program and, given the nature of the NHEP's responsibilities, is likely already within EPA's possession.

[113] The National Estuary Program is a ―state grant program within the U.S. Environmental Protection Agency established to designate estuaries of national significance and to assist local stakeholders in the preparation of a *Comprehensive Conservation and Management Plan* for the designated estuaries." NHEP Management Plan (2000) at AP-7.

In its 2000 Management Plan, NHEP reported that although all of New Hampshire's estuaries are subject to nutrient loading, ―nutrient concentrations in Great Bay have been largely stable over the last 20 years. No widespread eutrophication has been observed." NHEP *Management Plan* (2000) at 4-4. It nonetheless identified as a high priority the need to evaluate the effects of wastewater treatment facility discharges on estuarine water quality, and to ―seek practical options at the state level for secondary and tertiary or alternative treatment where appropriate."[114] *Id.* at 4-17. NHEP further established water quality program objectives addressing nutrients and eutrophication, including the management objective of maintaining, *inter alia*, ―inorganic nutrients, nitrogen, phosphorous, and chlorophyll-a in Great Bay, Hampton Harbor and their tributaries at 1998-2000 NERR baseline levels." *Id.* at 11-5.

In its 2003 *State of the Estuaries* report, NHEP reported that nitrogen concentrations in Great Bay were increasing. Attachment 3 (NHEP *State of the Estuaries* (2003)) at 8. The report explained that, despite increasing nitrogen concentrations in the estuary, there have not yet been ―any significant trends for the typical indicators of eutrophication: dissolved oxygen and chlorophyll-a concentrations. Therefore, the load of nitrate+nitrite to the bay appears to have not yet reached the level at which the undesirable effects of eutrophication occur." *Id.* NHEP further reported that eelgrass habitat in Great Bay had, over the prior 10 years, remained relatively constant. *Id.* at 16.

In December 2003, researchers engaged by NHEP and NHDES published a final report evaluating the effects of wastewater treatment discharge on estuarine water quality. Attachment 4 (Bolster, Carl H. *et al.*, ―Evaluation of Effects of Wastewater Treatment Discharge on Estuarine Water Quality" (Dec. 2003)). According to the report, WWTFs were estimated to contribute ―41% of the total nitrogen loading to the Great Bay Estuary." *Id.* at 5. The Exeter plant was found to be the third largest WWTF contributor of nitrogen to the estuary, with an annual total dissolved nitrogen load of 24.5 tons.[115] *Id.* at 24. The report advised that, ―with the potential for increased nutrient loading to occur from point and nonpoint sources as the human population in the Seacoast increases, continued assessments of water quality are necessary to track any possible changes that may occur." *Id.* at 5.

In 2006, NHEP published another *State of the Estuaries* report. Attachment 5 (NHEP *Sate of the Estuaries* (2006)). The report provided critically important new information about rising nitrogen levels in the estuary and, unlike prior reports, described nitrogen-related changes that presently are being observed in the estuary. More specifically, NHEP explained in its 2006 report that dissolved inorganic nitrogen concentrations had ―increased in Great Bay by 59 percent in the past 25 years." *Id.* at 12. The report documented that nitrogen concentrations in Great Bay had reached the same levels that had been shown to cause negative effects in other estuaries, and described troubling changes that were now being observed:

> So far, the typical effects of excess nitrogen have not been observed in Great Bay, although DIN concentrations in Great Bay are similar to concentrations in other estuaries where negative effects have been clearly observed. The only increasing trend for

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[114] The NHEP Management Plan ranked Action items as either ―Highest," ―High," or ―Priority." NHEP Management Plan (2000) at 4-16.

[115] *See* Attachment 2 for more recent data regarding WWTF contributions.

> chlorophyll-a, a surrogate for algae, was observed at a station with very low concentrations. Low dissolved oxygen concentrations only have been found in the tributaries to the Bay, not the Bay itself. *However, changes in other parts of the ecosystem, particularly eelgrass cover and biomass, have been observed. There also have been anecdotal reports of increasing populations of nuisance macroalgae in some areas of Great Bay. While precise threshold for DIN effects is not known*, ***it is certain that the estuary cannot continue to receive increasing nitrogen loads indefinitely without experiencing a lowering of water quality and ecosystem changes.***

Id. (emphasis added). The 2006 *State of the Estuaries* report, as compared to the 2003 report, also described a disturbing new trend in the decline of eelgrass in the estuary:

> Throughout the 1990s, the total eelgrass cover in Great Bay was relatively constant at approximately 2,000 acres. In 1988 and 1989, there was a dramatic crash of the eelgrass beds down to 300 acres (15 percent of normal levels). The cause of this crash was an infestation of a slime mold, *Labryinthula zosterae*, commonly called ―wasting disease." The greatest extent of eelgrass was observed in 1996 (2,421 acres) after recovery from the wasting disease. The current (2004) extent of eelgrass in Great Bay is 2.008 acres, which is 17 percent less than the maximum extent observed in 1996.
>
> *The biomass of eelgrass in Great Bay has experienced a more significant decline relative to the levels observed in 1996*. Biomass is the combined weight of eelgrass plants in the bay. In 1990, 1991, and 1995, biomass was low due to wasting disease events. Superimposed on these rapid events has been a gradual, decreasing trend in eelgrass biomass that does not appear to be related to wasting disease. *The current eelgrass biomass level for Great Bay is 948 metric tons, which is 41 percent lower than the biomass observed in 1996.*
>
> The specific cause of the decline in eelgrass cover and biomass is unclear, but appears to be related to a reduction in the amount of light reaching the plants. *Eelgrass is sensitive to water quality, especially water clarity.* The observed changes in eelgrass cannot be linked directly to a water quality trend in Great Bay, although increasing concentrations of suspended solids have been observed at Adams Point. *The effects of the wasting disease are easily observed on the plants and the gradual decline of the past decade is not consistent with a wasting disease event. There have been anecdotal reports of increasing populations of nuisance macroalgae and epiphytic growth on eelgrass leaves, which may be related to increasing nitrogen concentrations in the Bay. Macroalgae can compete with and smother eelgrass, and heavy epiphyte loads can decrease eelgrass growth, reducing eelgrass biomass and cover.*

Id. at 20 (emphases added). NHEP further reported that ―loss of water clarity, disease, excess nitrogen, and nuisance macroalgae," are all factors contributing, to eelgrass decline. *Id.* at 4.

More recently, nitrogen-related concerns were raised in the context of EPA's NPDES permitting process for the City of Portsmouth, New Hampshire's Peirce Island wastewater treatment facility. During that process, correspondence from Frederick T. Short, Ph.D., a researcher at the

University of New Hampshire's Jackson Estuarine Laboratory with more than twenty years' experience working on Great Bay, described significant nitrogen-related concerns. Attachment 6. Among those concerns, Dr. Short explained that "[t]he Great Bay Estuary is a stressed ecosystem as a result of high loading of nitrogen into the estuary from many sewage treatment plants and from non-point sources as well," and that the increased nitrogen levels documented in the 2003 *State of the Estuaries* report are "accompanied by more abundant nuisance algae growth throughout the estuary, an indicator of eutrophication from nutrient over-enrichment." *Id.*[116] Dr. Short's written comments concluded unequivocally that "the Great Bay Estuary is suffering from excess nitrogen inputs. . . ." *Id.*

At a May 9, 2005 public hearing conducted by the EPA relative to the City of Portsmouth's Peirce Island WWTF, Dr. Short expanded on his written observations and opinions, explaining:

> Increasing nitrogen levels in an estuary are a problem because it increases gradually and suddenly – all of the sudden you get a change in the system, a dynamic turnover in the system. And the prime example of that is Chesapeake Bay, where in the 1980s the Chesapeake Bay estuary ecosystem collapsed. It lost its eelgrass, it lost its blue crabs, its oysters, because the system was too heavily loaded with nitrogen and the system fell apart. And I'm concerned at the levels of nitrogen that we're seeing here in the Great Bay estuary.
>
> Being a professor, I brought my references. The State of New Hampshire put out the state of the estuary report in 2003 and it shows a significant increase in nitrate levels in the Great Bay estuary. And I looked up those nitrogen levels and compared them to what the levels were in Chesapeake Bay in the 1980s, at the time of the collapse, and we are as high or higher than the levels were in Chesapeake Bay, so I think that's a concern.

Attachment 7 (EPA Hearing Transcript) at 45.

More recently, Dr. Short has conducted eelgrass monitoring which demonstrates significant eelgrass declines in the estuary. Attachment 8. According to Dr. Short,

> [t]he overwhelming eelgrass decline at all sites indicates that these trends are the result of an estuary-wide factor. DIN concentrations in GBE [the Great Bay Estuary] have increased 59% in the past 25 years, with the single largest contributor of nitrogen being wastewater treatment facilities, clearly linked to increased human population.

Id. See also Attachment 9; Attachment 10; Attachment 11 (Project Narrative Statement Workplan submitted by NHEP and NHDES to EPA) ("Increased nitrogen concentrations . . . and declining eelgrass beds in Great Bay . . . are clear indicators of impending problems for NH's estuaries.").

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[116] CLF submitted written comments in this process, which included similar observations and conclusions from the Jackson Estuarine Laboratory's Professor Arthur C. Mathieson, regarding nuisance algae, including epiphytic algae on eelgrass.

The Draft NPDES Permit Fails to Ensure that the Exeter WWTF Will Not Cause or Contribute to Violation of Water Quality Standards.

EPA has a legal duty under the Clean Water Act to ensure that the discharge from the Exeter WWTF does not cause or contribute to the violation of water quality standards.[117] As EPA's fact sheet acknowledges: "The permit must limit any pollutant or pollutant parameter (conventional, non-conventional, toxic, and whole effluent toxicity) that is or may be discharged at a level that causes or has 'reasonable potential' to cause or contribute to an excursion above any water quality standard, including narrative water quality criteria." Fact Sheet at 5 (*citing* 40 CFR § 122.44(d)(1). *See also* 40 C.F.R. § 122.4(d).

The Draft NPDES Permit Fails to Ensure that the Exeter WWTF Will Not Cause or Contribute to Squamscott River Impairments Identified on New Hampshire's Section 303(d) List.

As discussed above, the Squamscott River is violating state water quality standards as a result of problems associated with chlorophyll-a, dissolved oxygen levels, and enterococcus. The Fact Sheet fails to in any way acknowledge or address these impairments and whether, specifically, the draft NPDES permit limits will ensure the attainment of water quality standards. In particular, the draft NPDES permit contains no discharge limits for total nitrogen, which may cause or contribute to impairments associated with chlorophyll-a and dissolved oxygen. Absent such limits, EPA cannot fulfill its duty of ensuring that the Exeter WWTF's discharge will not cause or contribute to water quality violations. To reiterate, the permit "must limit any pollutant or pollutant parameter (conventional, non-conventional, toxic, and whole effluent toxicity) that is or may be discharged at a level that causes or has 'reasonable potential' to cause or contribute to an excursion above any water quality standard . . . ." Fact Sheet at 5. The draft NPDES permit unlawfully fails to do so. EPA must specifically address this issue, and must include necessary effluent limitations – including, but not limited to, the most stringent nitrogen limits achievable by the limits of technology – to ensure attainment and maintenance of water quality standards. In addressing this issue, EPA also must ensure that BOD5 limits are sufficient to address dissolved oxygen impairments, and ensure that the CSO that is the subject of the draft NPDES permit does not cause or contribute to impairments associated with enterococcus.

The Draft NPDES Permit Fails to Ensure that the Exeter WWTF Will Not Cause or Contribute to Violation of Narrative Water Quality Standards.

Although New Hampshire has not yet adopted numeric criteria relative to nitrogen, it nonetheless has two narrative water quality standards that are directly applicable to EPA's review. First, New Hampshire's water quality standards specifically provide, with respect to nutrients, that "Class B waters shall contain no phosphorous or nitrogen in such concentrations that would impair any existing or designated uses, unless naturally occurring," and that "[e]xisting discharges containing either phosphorous or nitrogen which encourage cultural eutrophication shall be treated to remove phosphorous or nitrogen to ensure attainment and maintenance of

[117] To be clear, neither CLF nor any other commenter bears the burden of establishing that the proposed discharge will cause or contribute to water quality violations. Rather, EPA, as the permitting authority, has the duty to ensure that permitted discharges will *not* cause or contribute to such violations.

water quality standards." Rule Env-Ws 1703.14. Despite the above-described impairments of the Squamscott River, the draft NPDES permit contains no nitrogen limits and fails to ensure attainment and maintenance of water quality standards. To reiterate, to address these issues the final NPDES permit for the Exeter WWTF must include nitrogen limits achievable with the most protective limits of technology, BOD5 limits sufficient to address dissolved oxygen impairments, and measures to ensure that the CSO does not cause or contribute to enterococcus impairments.

New Hampshire's water quality standards also include the following narrative standard designed to protect biological and aquatic community integrity:

> Biological and Aquatic Community Integrity.
>
> (a) The 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.
>
> (b) Differences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function.

Rule Env-Ws 1703.19 ("BACI Standard").[118] There is no evidence in the Fact Sheet or draft NPDES permit that EPA has considered New Hampshire's BACI narrative standard, including, but not limited to, the structure and integrity of the Squamscott River's and Great Bay estuary's biological and aquatic communities, and the impacts of the Exeter WWTF on such communities. EPA must specifically address this narrative water quality standard -- including, but not limited to, the impacts of nitrogen, total suspended solids and biological oxygen demanding materials on eelgrass habitats, and eelgrass-dependent species[119] -- and must include nitrogen limits and other effluent limits, including appropriate limits for TSS and BOD5, to ensure the Exeter WWTF does not cause or contribute to a violation of this standard.

In light of the above deficiencies, the draft NPDES permit fails to ensure that the Exeter WWTF will not cause or contribute to a violation of New Hampshire's antidegradation policy, incorporated into New Hampshire's water quality standards at PART Env-Ws 1708.

Response #DD1: EPA concurs with the need to address nitrogen in the reissued permit and the final permit contains a seasonal effluent limit of 3.0 mg/l TN. EPA has concluded that an

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[118] In addition to the BACI standard, New Hampshire's water quality standards include the following definitional language: "biological integrity' means the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region." Rule Env-Ws 1702.07.

[119] With respect to eelgrass, the 2006 *State of the Estuaries* report states in its discussion of nitrogen: "[C]hanges in other parts of the ecosystem, particularly eelgrass cover and biomass, have been observed." Attachment 5 at 12. The report further explains that (1) eelgrass cover in the Great Bay declined 17% between 1996 and 2004, *id.* at 5, 20; (2) eelgrass *biomass* in Great Bay declined 41% as compared to 1996 levels, *id.* at 20; and (3) "[t]he causes of these declines are uncertain, but *loss of water clarity*, disease, *excess nitrogen*, and *nuisance macroalgae* are all contributing factors." *Id.* at 4 (emphases added).

effluent limitation of 3.0 mg/l for total nitrogen in combination with reductions in non-point sources of total nitrogen will result in attainment of applicable water quality standards in the Squamscott River.

See Response #DD2 below relative to BOD and TSS.

The permit already contains several measures relating to the CSO discharge—i.e., including a dry-weather overflow prohibition, nine minimum controls, and documentation of the implementation of these nine minimum controls—that have been imposed to comply with applicable water quality standards, including those with respect to bacteria. The commenter does not indicate why, in its view, this suite of controls is insufficient to meet applicable requirements of the Act.

Comment #DD2: The Draft NPDES permit specifically states: ―The permittee's treatment facility shall maintain a minimum of 85 percent removal of both BOD5 and TSS." Draft NPDES Permit No. NH0100871 at 5. In contrast to this requirement, however, the Fact Sheet explains that the draft permit's limits for these conventional pollutants are actually lower than 85 percent removal. Specifically, the Fact Sheet states: ―Presently, the permittee is required to maintain 70% removal for BOD5 and 65% for TSS. These limits have been carried forward to the draft permit." Fact Sheet at 7.

With the qualification that removal percentages greater than 85 percent may be required to ensure that the Exeter WWTF does not cause or contribute to water quality violations (*see* Part II, above), CLF agrees that the above-quoted language from the draft NPDES permit (i.e., the requirement of a minimum 85 percent removal) is the appropriate standard for secondary treatment purposes. Particularly in light of significant concerns relative to eelgrass – concerns which include water clarity considerations, including TSS and BOD5 – and particularly in light of the Exeter WWTF's location at one of the inner-most points within the estuary, EPA should not allow percentage removals less than 85 percent for these pollutants.

Response #DD2: The previous permit contained effluent limitations for BOD and TSS percent removal of 70 and 65 percent, respectively. These effluent limitations were based upon 40 C.F.R. § 133.105 (Treatment Equivalent to Secondary Treatment), and EPA has concluded that based on the existing configuration and operation of the facility it is appropriate to carry forward this determination for this permit, as outlined in the Fact Sheet (the draft permit was incorrect). The final permit contains the effluent limitations for BOD and TSS percent removal of 70 and 65 percent, respectively. However, the final permit contains a condition that in the event the permittee upgrades the facility to a treatment process that does not utilize lagoon treatment as the primary treatment technology, the facility shall maintain a minimum of 85 percent removal for BOD_5 and TSS upon completion of the upgrade. EPA has concluded that an effluent limitation of 3.0 mg/l for total nitrogen in combination with reductions in non-point sources of total nitrogen will result in attainment of applicable water quality standards in the Squamscott River and EPA accordingly believes that the limits for BOD and TSS are as stringent as necessary at this time. Should efforts to address necessary nonpoint source reductions not occur, then EPA will reevaluate the need for more stringent effluent limitations for BOD, TSS and/or total nitrogen as necessary.

Comment #DD3: The draft NPDES permit requires monitoring for total nitrogen on a once monthly basis. Draft NPDES Permit No. NH0100871 at 2. Given the serious issues facing the Squamscott River and Great Bay estuary relative to nitrogen, CLF urges a much more aggressive monitoring requirement. We note, for example, that EPA has required the Town of Farmington, New Hampshire‘s WWTF to monitor total nitrogen two times per month. Given the design flow of the Exeter WWTF and its location at one of the inner-most points within the Great Bay estuary, and in light of the seriousness of nitrogen-related concerns, EPA should require monitoring on a once-per-week basis.

Response #DD3: EPA concurs that the location of the discharge and the condition of the receiving water and sensitivity to nitrogen impacts all counsel in favor of an enhanced nitrogen monitoring regime. A total nitrogen limit with monitoring of once per week has been included in the revised permit to assist EPA in determining the variability of effluent discharge levels, before and after the upgrade.

EE. Town of Exeter, November 20, 2007

Comment #EE1: A daily reporting requirement has been added for enterococci bacteria. It is our understanding that this is a requirement for tidal waters utilized for swimming purposes; however, there are no swimming areas or beaches in the vicinity of the outfall. It has come to our attention that the Peirce Island WWTF in Portsmouth, a much larger facility in closer proximity to swimming areas, is only required to monitor enterococci twice per week. We believe that the daily monitoring frequency is excessive, and request a reduction to twice per week. We also request a reduction or elimination of the test after an adequate comparison with the established fecal coliform testing.

Response #EE1: While N.H RSA 485-A:8,V sets forth specific enterococci bacteria criteria applicable in ―tidal waters utilized for swimming purposes," a swimming area or beach in the vicinity of the outfall is not a precondition for enterococci monitoring.[120] State of New Hampshire Surface Water Quality standards require that, "All surface waters shall provide, wherever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters," which includes swimming. Env-Wq 1703.01(c). These ―designated uses" specified in water quality standards for each waterbody or segment are applicable whether or not such uses are presently occurring. Env-Wq 1702.17. Collecting bacteria data from the treatments plant‘s effluent will allow EPA and NHDES to evaluate potential enterococci impacts on the receiving water. The monitoring frequency for enterococci bacteria has been reduced to twice per week in the final permit, the same frequency required by the NPDES permit for Portsmouth's Peirce Island treatment plant, because this frequency of monitoring should adequately characterize the effluent, as EPA does not anticipate significant daily variation in effluent quality. In the next permitting cycle the regulatory agencies will

[120] Although EPA noted in the Fact Sheet that ―there were there are no readily apparent swimming areas in the area of the discharge," and that for this reason opted against inclusion of a numeric effluent limitation for enterococci, there is nothing to foreclose the possibility that swimming does take place in this vicinity. Given the potential for adverse impacts on recreational uses, EPA believes a monitoring condition to adequately characterize the discharge for this pollutant and to take any additional measures with respect to the pollutant, if necessary, is reasonable.

determine whether or not a permit limit for enterococci bacteria is necessary for this discharge.

The fecal requirement is for the protection of shellfishing while enterococci is for the protection of tidal waters utilized for swimming purposes. Both the fecal and enterococci sampling have been incorporated into the permit to protect each of these uses. Because both fecal and enterococci sampling is required to be consistent with State of New Hampshire‘s water quality standards EPA and NHDES do not believe that sampling for one can be used as sampling for the other.

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References

Barnard, J. 2006. Biological Nutrient Removal: Where We Have Been, Where We Are Going? WEFTEC 2006. Water Environment Federation.

Beem, N. and F.T. Short. 2009. Subtidal Eelgrass Declines in the Great Bay Estuary, NH-ME. *Estuaries and Coasts* 32: 202-205.

Bricker, S., B. Longstaff, W. Dennison, A. Jones, K. Boicourt, C. Wicks, and J. Woerner. 2007. Effects of Nutrient Enrichment In the Nation‘s Estuaries: A Decade of Change. NOAA Coastal Ocean Program Decision Analysis Series No. 26. National Centers for Coastal Ocean Science, Silver Spring, MD. 328 pp. Published Online: http://ccma.nos.noaa.gov/publications/eutroupdate/.

Boynton W. 2010. Letter to Dr. Michael Paul re ―Numeric Nutrient Criteria for the Great Bay Estuary (May 29, 2010). Included as appendix to NHDES (2009a).

Burkholder, J.A., D.A. Tomasko, and B.W. Touchette. 2007. Seagrasses and eutrophication. *Journal of Experimental Marine Biology and Ecology* 350: 46-72.

Burkholder J.M., K.M. Mason, and H.B. Glasgow. 1992. Water-column nitrate enrichment promotes decline of eelgrass (*Zostera marina* L.): Evidence from seasonal mesocosm experiments. *Marine Ecology Progress Series* 81:163-178.

Cloern, J.E. 2001. Our evolving conceptual model of the coastal eutrophication problem. *Marine Ecology Progress Series* 210: 223-253.

Environmental Protection Agency. 2010. Using Stressor-response Relationships to Derive Numeric Nutrient Criteria. U.S. Environmental Protection Agency, Office of Water, EPA-820-S-10-001. November 2010. Published Online: http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/upload/Using-Stressor-response-Relationships-to-Derive-Numeric-Nutrient-Criteria-PDF.pdf

Environmental Protection Agency. 2008a. Nutrient Criteria Technical Guidance Manual. Wetlands. EPA-822-B-08-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

Environmental Protection Agency. 2008b. Municipal Nutrient Removal Technologies Reference Document. EPA-832-R-08- 006. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

Environmental Protection Agency. 2006. Peer Review Handbook, 3rd Edition. EPA/100/B-06/002, U.S. Environmental Protection Agency, Washington, DC.

DOVER 005348

Environmental Protection Agency. 2001. Nutrient Criteria Technical Guidance Manual: Estuarine and Coastal Marine Waters. U.S. Environmental Protection Agency, Office of Water, EPA-822-B-01-001. October 2001. Published Online: http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/marine/index.cfm

Environmental Protection Agency. 2000a. Nutrient Criteria Technical Guidance Manual: Rivers and Streams. U.S. Environmental Protection Agency, Office of Water and Office of Science and Technology, EPA-822-B-00-002. July 2000. Published Online: http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/rivers/index.cfm

Environmental Protection Agency. 2000b. Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs. U.S. Environmental Protection Agency, Office of Water and Office of Science and Technology, EPA-822-B00-001. April 2000. Published Online: http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/lakes/index.cfm

Environmental Protection Agency. 1992. Clarifications Regarding Certain Aspects of EPA's Surface Water Toxics Control Regulations. U.S. Environmental Protection Agency, Office of Water. (August 14, 1992). Published Online: http://www.epa.gov/npdes/pubs/owm0098.pdf

Environmental Protection Agency. 1988. Guidance for State Implementation of Water Quality Standards for CWA Section 303(c)(2)(B). December 1988.

Filippino, K.C., M. Mulholland, P. Bernhardt, G. Boneillo, R. Morse, M. Semcheski, H. Marshall, N. Love, Q. Roberts, D. Bronk. The Bioavailability of Effluent-derived Organic Nitrogen along an Estuarine Salinity Gradient, *Estuaries and Coasts* (2010), 34(2): 269-280.

Hanlon, J. 2004. MEMORANDUM: Annual Permit Limits for Nitrogen and Phosphorus for Permits Designed to Protect Chesapeake Bay and its tidal tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System. U.S. Environmental Protection Agency, Office of Water, Washington, DC. (March 3, 2004). Published Online: http://www.epa.gov/reg3wapd/npdes/pdf/ches_bay_nutrients_hanlon.pdf

Howarth, R. 2010. Review of ―Numeric Nutrient Criteria for the Great Bay Estuary." Included as appendix to NHDES (2009a).

Howarth, R.W., and R. Marino. 2006. Nitrogen as the limiting nutrient for eutrophication in coastal marine ecosystems: evolving views over three decades. *Limnology and Oceanography* 51: 364-376.

HydroQual. 2012. Technical Memorandum – Squamscott River, August to September 2011 Field Studies. March 20, 2012

Jones, S. 2007. Impacts of Wastewater Treatment Facilities on Receiving Water Quality. A Final Report to the New Hampshire Estuarine Project. April 2007. Published Online: http://www.prep.unh.edu/resources/pdf/impacts_of_wastewater-unh-07.pdf

DOVER 005349

Koch, E.W. 2001. Beyond light: Physical, geological, and geochemical parameters as possible submersed aquatic vegetation requirements. *Estuaries* 24: 1-17.

Latimer, J.S., P. Trowbridge and M. Charpentier. 2009. Estimating Historic Nitrogen Loading Rates to the Great Bay Estuary, NH/ME. Powerpoint presentation. CERF 2009.

Liebman, M., G. Benoy, J.S. Latimer and S. Bricker. 2012. Eutrophication: State of the Gulf of Maine Report. Gulf of Maine Council on the Marine Environment. http://www.gulfofmaine.org/2/resources/state-of-the-gulf-of-maine-report/

Liebman, M. 2010. Review of: Numeric Nutrient Criteria for the Great Bay Estuary, in light of comments made by John C. Hall and Thomas Gallager (2010).

McGlathery, K.J, K. Sundback, and I.C. Anderson. 2007. Eutrophication in shallow coastal bays and lagoons: the role of plants in the coastal filter. *Marine Ecology Progress Series* 348:1-18.

Madej, M. 2005. The role of organic matter in sediment budgets in forested terrain. *Sediment Budgets 2*.

Massachusetts Estuaries Project. 2006. Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Pleasant Bay System, Towns of Orleans, Chatham, Brewster and Harwich, Massachusetts. Published Online: http://www.oceanscience.net/estuaries/Pleasant_Bay.htm

Morrison, J.R., T.K. Gregory, S. Pe‘eri, W. McDowell, P. Trowbridge. 2008. Using Moored Arrays and Hyperspectral Aerial Imagery to Develop Nutrient Criteria for New Hampshire‘s Estuaries. A Final Report to the Piscataqua Region Estuaries Partnership from the University of New Hampshire, Durham, NH. http://ccom.unh.edu/sites/default/files/publications/Morrison_2010_Report_Using_Moored_Arrays_and_Hyperspecral_Areial_Imagery_to_Develop_Nutrient_Criteria_NH_Estuaries.pdf

National Research Council. 2000. Clean Coastal Waters: Understanding and Reducing the Effects of Nutrient Pollution. National Academy Press, Washington DC.
New Hampshire Department of Environmental Services. 2012a. Response to Public Comment on the Draft 2012 Consolidated Assessment and Listing Methodology. April 20, 2012. Published Online: http://des.nh.gov/organization/divisions/water/wmb/swqa/2012/documents/2012-resp-comnts-draft-calm.pdf

New Hampshire Department of Environmental Services. 2012b. New Hampshire‘s 2012 Section 305(b)/303(d) List – Technical Support Document – Assessments of Aquatic Life Use Support in the Great Bay Estuary for Chlorophyll-a, Dissolved Oxygen, Water Clarity, Eelgrass Habitat, and Nitrogen. WD Doc R-WD-12-5. Watershed Management Bureau, Concord, NH. April 20, 2012. Published Online: http://des.nh.gov/organization/divisions/water/wmb/swqa/2012/documents/gbnitrogen-2012-303d-tsd.pdf

DOVER 005350

New Hampshire Department of Environmental Services. 2012c. Draft 2012 Section 303(d) Surface Water Quality List. NHDES-R-WD-12-1. April 20, 2012. Published Online: http://des.nh.gov/organization/divisions/water/wmb/swqa/2012/index.htm

New Hampshire Department of Environmental Services. 2011. Comments from the New Hampshire Department of Environmental Services On HydroQual's Technical Memorandum, dated January 10, 2011.

New Hampshire Department of Environmental Services. 2010. Draft Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed. WD Doc R-WD-10-22. Watershed Management Bureau, Concord, NH. December, 2010. Published Online: http://des.nh.gov/organization/divisions/water/wmb/coastal/documents/gb_nitro_load_analysis.pdf

New Hampshire Department of Environmental Services. 2009a. Numeric Nutrient Criteria for the Great Bay Estuary. WD Doc R-WD-09-12. Watershed Management Bureau, Concord, NH. June, 2009. Published Online: http://des.nh.gov/organization/divisions/water/wmb/wqs/documents/20090610_estuary_criteria.pdf.

New Hampshire Department of Environmental Services. 2009b. Amendment to the New Hampshire 2008 Section 303(d) List Related to Nitrogen and Eelgrass in the Great Bay Estuary. WD Doc R-WD-09-14. Watershed Management Bureau, Concord, NH. Published Online: http://des.nh.gov/organization/divisions/water/wmb/swqa/2008/documents/20090813_303d_list_update.pdf

New Hampshire Department of Environmental Services. 2008. 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. WD Doc R-WD-08-18. Watershed Management Bureau, Concord, NH. August 11, 2008. Published Online: http://des.nh.gov/organization/divisions/water/wmb/swqa/2008/documents/appendix_05_eelgrass_calm.pdf.

Office of Management and Budget. 2005. OMB Peer Review Bulletin. 70 Fed. Reg. 2664, 2670 (January 14, 2005)

Peschel, D. 2012. Letter to New Hampshire Department of Environmental Services (March 23, 2012).

PREP. 2012. Draft Environmental Data Report. Piscataqua Region Estuaries Partnership, University of New Hampshire, Durham, NH. (July 16, 2012).

PREP. 2009a. 2009 State of the Estuaries. Piscataqua Region Estuaries Partnership, University of New Hampshire, Durham, NH. Published Online: http://www.prep.unh.edu/resources/pdf/2009_state_of_the-prep-09.pdf.

PREP. 2009b. Environmental Indicators Report. Piscataqua Region Estuaries Partnership, University of New Hampshire, Durham, NH. Published Online: http://www.nhep.unh.edu/resources/pdf/environmental_indicators_report-prep-09.pdf.

PREP. 2009c. Nitrogen, Phosphorus and Suspended Solids Concentration in Tributaries to the Great Bay Estuary Watershed in 2008. Piscataqua Region Estuaries Partnership, University of New Hampshire, Durham, NH.

PREP. 2006. 2006 State of the Estuaries. Piscataqua Region Estuaries Partnership, University of New Hampshire, Durham, NH.

Science Advisory Board. 2010. Review of Empirical Approaches for Nutrient Criteria Derivation. EPA-SAB-10-006. (April 27, 2010). http://yosemite.epa.gov/sab/sabproduct.nsf/0/e09317ec14cb3f2b85257713004bed5f/$FILE/EPA-SAB-10-006-unsigned.pdf

Sedell J.R., R. Naiman, K. Cummins, G. Minshall and R. Vannote. 1978. Transport of particulate organic matter in streams as a function of physical processes. *Verhandlungen der Internationalen Vereinigung fur Theoretische und Angewandte Limnologie* 20, 1366-1375

Sedlak, D.L., J. Jeong and H.D. Stensel. 2011. Bioavailability of Dissolved Organic Nitrogen in Wastewater Effluent as Determined by Resin Separation. *Nutrient Recovery and Management 2011*. Water Environment Federation.

Short, F.T. 2011. Eelgrasss Distribution in the Great Bay Estuary for 2010. A Final Report submitted to the Piscataqua Region Estuaries Partnership. June 15, 2011. Published Online: http://www.prep.unh.edu/resources/pdf/eelgrass_mapping_in_unh-10.pdf.

Short, F.T, D.M. Burdick, J.S. Wolf and G.E. Jones. 1993. Eelgrass in Estuarine Research Reserves Along the East Coast, USA. Jackson Estuarine Laboratory, University of New Hampshire, Durham, NH. Published Online: http://www2.coastalscience.noaa.gov/publications/cscor/detail.aspx?resource=JABPfyJXs/Wdv+xkQtAAirOeDZUeXa7zOM+AmRhbtH8=

Stoddard, J. L., D. P. Larsen, C. P. Hawkins, R. K. Johnson, and R. H. Norris. 2006. Setting expectations for the ecological condition of streams: the concept of reference condition. Ecological Applications 16:1267 – 1276.

Trowbridge, P. 2012. Great Bay Nitrogen Pollution Source Study. Power point presentation at NEIWPCC Annual Non-Point Source Conference. Portsmouth, NH. May 15 & 16, 2012.

USGS. 2007. Methods for and Estimates of 2003 and Projected Water Use in the Seacoast Region, Southeastern New Hampshire

DOVER 005352

Valiela, I. and Kinney, E. 2011. Memoradum to Tom Irwin. Submitted with Conservation Law Foundation Comments on Draft Permit. (July 28, 2011).

Valiela, I., G. Collins, J. Kremer, K. Lathja, M. Geist, B. Seely, J. Brawley, and C.H. Sham. 1997. Nitrogen loading from coastal watersheds to receiving estuaries: new methods and application. *Ecological Applications*, 7, 358-380.

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