EXHIBIT 2 (AR A.8)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND - REGION I
FIVE POST OFFICE SQUARE, SUITE 100
BOSTON, MASSACHUSETTS 02109-3912

FACT SHEET

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES

PUBLIC NOTICE START AND END DATES: October 5, 2011 – December 3, 2011

PUBLIC NOTICE NUMBER: NH-009-11

CONTENTS: 50 pages including Attachments A through D

NPDES PERMIT NO.: NH0100196

NAME AND MAILING ADDRESS OF APPLICANT:

Town of Newmarket
186 Main Street
Newmarket, NH 03857

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Newmarket Wastewater Treatment Facility
Young Lane
Newmarket, NH 03857

RECEIVING WATER: Lamprey River (Hydrologic Basin Code: 010600030709)

CLASSIFICATION: B

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I. Proposed Action, Type of Facility and Discharge Location

The Town of Newmarket has requested that the U.S. Environmental Protection Agency, Region 1, reissue the Town's NPDES permit to discharge treated wastewater effluent from its 0.85 million gallons per day (MGD) POTW into the Lamprey River. The Newmarket Wastewater Treatment Facility collects and treats municipal wastewater. It provides secondary treatment using trickling filters. Treated wastewater is disinfected using chlorine and then dechlorinated before being discharged to the Lamprey River. Sludge from the facility is sent off-site for disposal.

The Town's existing permit was issued on April 27, 2000, modified on July 8, 2002 and expired on June 11, 2005. It has been administratively extended as the applicant filed a complete application for permit reissuance within the prescribed time period under 40 Code of Federal Regulations (CFR) § 122.6.

The location of facility and receiving water are shown in Attachment A.

II. Description of Discharge

Quantitative descriptions of the discharge in terms of significant effluent parameters based on the permit application and recent effluent-monitoring data (January 2000 through October 2010) are shown in Attachment B.

III. Limitations and Conditions

The draft permit contains limitations for five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), total nitrogen, pH, fecal coliform, enterococci bacteria, total residual chlorine (TRC), and whole effluent toxicity (WET). It also contains monitoring requirements for flow, hardness, and certain metals. The effluent limitations and monitoring requirements are found in PART I of the draft NPDES permit. The basis for each limit and condition is discussed below in Section VI of this Fact Sheet.

IV. Statutory and Regulatory Authority

A. General Statutory and Regulatory Background

Congress enacted the Clean Water Act (CWA or Act), "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 the waters of the United States from any point source, except as authorized by specified permitting sections of the Act, one of which is Section 402. CWA §§ 301(a), 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 Act, EPA may "issue a permit for the discharge of any pollutant, or combination of pollutants" in accordance with certain conditions. CWA § 402(a).

NPDES permits generally contain discharge limitations and establish related monitoring and reporting requirements. 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. CWA §§ 301, 303, 304(b); 40 CFR 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. 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, on the other hand, are designed to ensure that state water quality standards are achieved, irrespective of the technological or economic considerations that inform technology-based limits. Under the CWA, states must 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 applicable New Hampshire water quality standards are in Surface Water Quality Regulations, Chapter Env-Wq 1700 et seq (NH Standards). See generally, Title 50, Water Management and Protection, Chapter 485A, Water Pollution and Waste Disposal Section 485-A.

Under NPDES regulations, a permit must include limits for 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 CFR §122.44(d)(1). An excursion occurs if the projected or actual in-stream concentration exceeds the applicable criterion. An NPDES permit must contain effluent limitations and conditions in order to ensure that the discharge does not cause or contribute to water quality standard violations. Section 301(b)(1)(C) (requiring achievement of "any more stringent limitation, including those necessary to meet water quality standards...established pursuant to any State law or regulation...."); 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") and 122.44(d)(5) (in part providing that a permit incorporate any more stringent limits required by Section 301(b)(1)(C) of the CWA).

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 the 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.

Where a State has not established a numeric water quality criterion for a specific chemical 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 Section 304(a) recommended water quality criteria, supplemented as necessary by other relevant information; or, in certain circumstances, based on an "indicator parameter." 40 CFR § 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. 40 CFR § 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. NH Standards do not authorize schedules of compliance to achieve water quality-based effluent limitations.

The regulations governing EPA's NPDES permit program are generally found in 40 CFR Parts 122, 124, 125 and 136.

B. *Development of Water Quality-based Limits*

1. *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 application, monthly discharge monitoring reports (DMRs), 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 water quality standards (RSA 485-A:8,VI, Env-Wq 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. Available dilution for tidal waters is based on conditions that result in dilution that is exceeded 99 percent of the time.

C. *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. Unless certain limited exceptions are met, "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). Unless applicable anti-backsliding requirements are met, the limits and conditions in the reissued permit must be at least as stringent as those in the previous permit.

D. 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. 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, 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," 40 C.F.R. 124.53(e)(3).

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. 40 C.F.R. §§ 122.44(d)(1) and (5). 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.

V. Description of Receiving Water

The Newmarket facility discharges to the Lamprey River, within the estuarine portion of the river, about 1.6 miles above its mouth, where it enters Great Bay. The Lamprey River at the point of the discharge is a Class B water. Class B waters must be acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies (where applicable).

Section 303(d) of the Clean Water Act requires states to identify 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. New Hampshire's 2008 List of Threatened or Impaired Waters that Require a TMDL contains the portion of the Lamprey River which receives the effluent from the Newmarket Wastewater Treatment Facility. A summary of these impairments and sources are provided in the table below. The assessment unit for this stretch of the Lamprey River is NHEST600030709-01.

Section 303(d) Listing Parameters for the Lamprey River Assessment Unit NHEST600030709-01		
Use Description	**Impairment**	**Source**
Aquatic Life	2-Methylnaphthalene	Petroleum/Natural Gas Activities Source Unknown
	Anthracene	Petroleum/Natural Gas Activities Source Unknown
	Benzo (a) pyrene (PAHs)	Petroleum/Natural Gas Activities Source Unknown
	Benzo (a) anthracene	Petroleum/Natural Gas Activities Source Unknown
	Chrysene (C1 – C4)	Petroleum/Natural Gas Activities Source Unknown
	DDD	Source Unknown
	DDE	Source Unknown
	DDT	Source Unknown
	Dibenz(a, h)anthracene	Petroleum/Natural Gas Activities Source Unknown
	Dissolved Oxygen Saturation	Source Unknown
	Estuarine Bioassessments	Source Unknown
	Fluoranthene	Petroleum/Natural Gas Activities Source Unknown
	Fluorene	Petroleum/Natural Gas Activities Source Unknown
	Naphthalene	Petroleum/Natural Gas Activities Source Unknown
	Dissolved Oxygen	Source Unknown
	Pyrene	Petroleum/Natural Gas Activities Source Unknown
	pH	Source Unknown
Fish Consumption	Mercury	Atmospheric Deposition - Toxics Source Unknown
	Polychlorinated biphenyls	Source Unknown
Primary Contact Recreation	Chlorophyll-a	Source Unknown
	Enterococcus	Source Unknown Wet Weather Discharges
	Nitrogen (total)	Source Unknown
Secondary Contact Recreation	Enterococcus	Source Unknown
Shellfishing	Dioxin (including 2,3,7,8 TCDD)	Source Unknown
	Mercury	Atmospheric Deposition – Toxics Source Unknown
	Polychlorinated biphenyls	Source Unknown

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 Lamprey River is also 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. Detailed information pertaining to nitrogen impacts can be found below in Section VI.C.3.

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VI. Permit Basis and Explanation of Effluent Limitation Derivation

A. Flow

Effluent flow must be continuously measured. If the effluent discharged for a period of three consecutive months exceeds 80 percent of the 0.85 MGD design flow (0.68 MGD), the permittee must notify EPA and NHDES-WD, and implement a program for maintaining satisfactory treatment levels. Part I.A.6 of the proposed Draft Permit.

The facility's design flow rate of 0.85 MGD is used to calculate the mass and concentration limits for five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS), as discussed below.

B. Conventional Pollutants

1. *Five-Day Biological Oxygen Demand (BOD_5) and Total Suspended Solids (TSS)*

Average monthly and average weekly concentration-based limits of 30 mg/l and 45 mg/l for BOD_5 and of 30 mg/l and 45 mg/l for TSS are based on requirements under Section 301(b)(1)(B) of the CWA and Secondary Treatment Standards in 40 CFR §§133.102(a) and (b).

Furthermore, the average monthly and average weekly mass-based limits for BOD_5 and TSS in the draft permit are based on 40 CFR § 122.45(f). Average monthly, average weekly and maximum daily allowable mass-based (load) limitations for BOD_5 and TSS in the draft permit are calculated using the POTW's daily design flow of 0.85 MGD and, as the case may be, the monthly, weekly or daily concentration-based limit. See Attachment C for the equation used to calculate each of these mass-based limits.

The existing permit and the draft permit require 85% removal for both BOD_5 and TSS based on 40 CFR §§ 133.102(a)(3) and (b)(3).

BOD_5 and TSS must be monitored twice per week.

2. *Fecal Coliform and Enterococci Bacteria*

The existing permit includes an average monthly effluent limit for *fecal coliform* bacteria, and reporting requirements for maximum daily *fecal coliform* bacteria. The draft permit includes average monthly and maximum daily effluent limits for both *fecal coliform* bacteria and *enterococci* bacteria.

Bacteria criteria applicable to the marine waters (tidal portion of Lamprey River) in the vicinity of the Newmarket WWTF outfall are found in NH RSA 485-A:8.V, which states:

> *Tidal waters utilized for swimming purposes shall contain not more than either a geometric mean based on at least 3 samples obtained over a 60-day period of 35 enterococci per 100 milliliters, or 104 enterococci per 100 milliliters in any one sample, unless naturally occurring. Those tidal waters used for growing or taking of*

shellfish for human consumption shall, in addition to the foregoing requirements, be in accordance with the criteria recommended under the National Shellfish Program Manual of Operation, United States Department of Food and Drug Administration.

The draft permit includes average monthly and maximum daily limits for enterococci bacteria for protection of swimming uses in the receiving water. The NHDES-WD has determined that the geometric mean water quality standard of 35 enterococci per 100 milliliters applies to the receiving water as an average monthly geometric mean limit and the single sample maximum standard of 104 enterococci per 100 milliliters applies as a maximum daily limit. The criteria have been incorporated as end-of-pipe effluent limitations (i.e., no dilution) in accordance with the NH Standards (see NH Code of Administrative Rules, Part Env-Wq 1703.06)

The draft permit also includes average monthly and maximum daily limits for fecal coliform bacteria for protection of shellfishing uses. The Shellfish Program Manual referenced in NH RSA 485-A: 8.V includes recommended criteria for either total coliform bacteria or fecal coliform bacteria. The draft permit is based on the fecal coliform bacteria recommendations in the Shellfish Program Manual, which requires that the geometric mean fecal coliform most probable number (MPN) not exceed 14 per 100 milliliters and not more than 10 percent of the samples exceed an MPN of 43 per 100 milliliters for a 5-tube decimal dilution test. The NHDES-WD has determined that the geometric mean fecal coliform value of 14 colonies per 100 milliliters applies to receiving waters as an average monthly geometric mean limit, and the requirement that not more than 10 percent of the samples exceed an MPN of 43 per 100 milliliters applies as a maximum daily limit. The average monthly value is determined by calculating the geometric mean of the daily sample values. The fecal coliform criteria have been incorporated as end-of-pipe effluent limitations (i.e., no dilution) in accordance with the NH Standards (see NH Code of Administrative Rules, Part Env-Wq 1703.06)

3. pH

The limit for pH is based upon State Certification Requirements and RSA 485-A:8, which states that "The pH range for said (Class B) waters shall be 6.5 to 8.0 except when due to natural causes."

A change in the pH range in the draft permit due to in-stream dilution would be considered at the request of the permittee provided the permittee can demonstrate that the in-stream standards for pH would be protected. If the State approves results from a pH demonstration study, this permit's pH limit range can be relaxed in accordance with 40 CFR § 122.44(l)(2)(i)(B). The pH range may not, however, be modified to be less stringent than 6.0 – 9.0 S.U. specified by secondary treatment standards at 40 CFR §133.102.

Accordingly, a special condition has been carried forward from the existing permit into the draft permit that allows for a modification to the pH limit(s) using a certified letter from EPA-New England.

C. Non-Conventional and Toxic Pollutants

Water quality-based limits for specific toxic pollutants such as chlorine and metals are 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 acute aquatic life criteria to protect against short term aquatic life effects, such as death; chronic aquatic life criteria to protect against long term aquatic life effects, such as poor reproduction or impaired growth; and human health criteria to protect water and fish consumption uses. 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 pollutant-specific draft permit limits.

1. *Available Dilution*

The Newmarket WWTF outfall is a forty-port diffuser, which was constructed in the tidal portion of the Lamprey River in 2002. The diffuser is 65.6 feet long, and has twenty "T" shaped risers spaced 3.44 feet apart. Each riser pipe has two opposing branches with discharge ports oriented parallel to the direction of flow. Each port has an elastomeric check valve, which provides a discharge velocity of 11.29 feet per second at the facility's average daily design flow of 0.85 mgd. Underwood Engineers, Inc performed modeling of the diffuser using the Cornell Mixing Zone Expert System (CORMIX) software in 2000, prior to construction of the outfall diffuser. The modeling results were reviewed by the NHDES, which indicated in a letter dated October 18, 2000 that the diffuser design will achieve a dilution factor of 55 at the facility's average daily WWTF design flow of 0.85 mgd. The 2002 Newmarket WWTF permit modification and this draft permit are based on this dilution factor.

2. *Total Residual Chlorine*

The TRC average monthly and maximum daily limitations, 0.41 and 0.;72 mg/l, respectively, are based on the chronic and acute marine aquatic-life criteria found in New Hampshire's Surface Water Quality Regulations (Env-Ws 1703.21, Table 1703.1). As detailed in Attachment C, the existing permit limits were calculated by multiplying the chronic criterion (0.0075 mg/L) and acute criterion (0.013 mg/L) by the dilution factor (55). As shown in Attachment B, the applicant has been able to achieve consistent compliance with the existing limitations.

3. *Total Nitrogen*

EPA has concluded that at existing levels, nitrogen in the Newmarket facility's effluent discharge contribute to water quality violations at the point of discharge in the Lamprey River, as well as further downstream in Great Bay. EPA's analysis of available information, including the NHDES report "Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non Point Sources in the Great Bay Estuary Watershed-Draft," shows that the facility's nitrogen discharge has a reasonable potential to cause or contribute to a violation of water quality standards and that a total nitrogen effluent limitation of 3 mg/l, coupled with significant reductions in nonpoint 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 21 lbs/day for the months of April through October. This mass limit is based on the monthly average concentration limit and the design flow of the facility.

EPA believes the combination of concentration and mass limits is reasonable and warranted given the degree of existing nitrogen impairments in the receiving waters. 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 protective approach 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 nitrogen loading reduction analysis is a year round analysis, EPA has opted not to include nitrogen limits for November through March because these months are not the most critical period for phytoplankton and macro algae growth. EPA is, however, imposing a condition requiring the permittee to optimize nitrogen removal during the wintertime, in order to reduce nitrogen loading year round. 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 any 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: Great Bay; Lamprey River

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. 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).

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. 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. 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 Lamprey River is one of five tidal rivers that discharge directly into Great Bay. The Lamprey River (below the tidal dam) drains a watershed covering approximately 1.7 square miles (NHDES, 2010) and includes portions of the town of Newmarket. The Lamprey River (above the tidal dam) drains a watershed covering approximately 212 square miles (NHDES, 2010) and includes the towns of Newmarket, Newfields, Exeter, Brentwood, Fremont, Epping, Durham, Lee, Barrington, Nottingham, Raymond, Candia, Deerfield, and Northwood.

The Lamprey River watershed receives nitrogen loading from point sources (two wastewater treatment plants), "non-point" sources (e.g., unregulated stormwater runoff and septic) and atmospheric deposition. The Newmarket treatment plant discharges into the tidal portion of the Lamprey River below the tidal dam, located within the Town. The Epping treatment plant, a 0.5 mgd facility, discharges to the freshwater portion of the Lamprey River, approximately 19 river miles upstream of the tidal dam.

2. Estuarine Systems Generally; Effects of Nutrients on Estuarine Water Quality

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 recreation values such as swimming, boating, fishing, and bird watching. Estuaries in addition 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 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.

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.

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.

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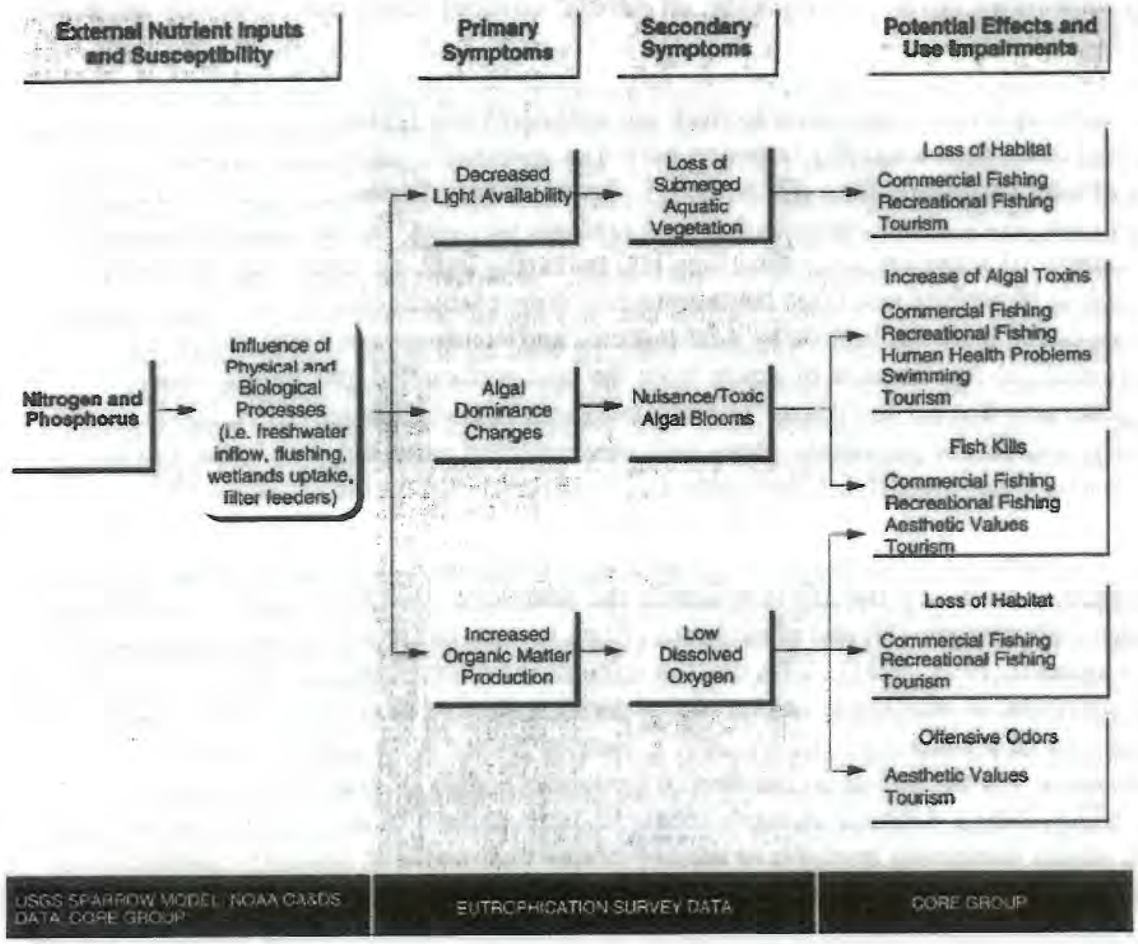
Figure 1



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 used 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 attenuation, 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; and EPA, 2001).

3. Water Quality Standards Applicable to Lamprey 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. 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. Env-Wq 1703.07(b).

Regardless of classification, NH Standards furthermore require that all surface waters meet certain general water quality criteria. 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 Lamprey 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 Lamprey 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 Lamprey River is impaired for dissolved oxygen and biological and aquatic community integrity. According to the 303(d) list, the indicators showing dissolved oxygen impairment are chlorophyll *a*, nitrogen, and instream dissolved oxygen monitoring. The indicators showing biological and aquatic community integrity impairment are estuarine bioassessments for eelgrass, light attenuation coefficient, and nitrogen.

Relative to the dissolved oxygen criteria (Env-Wq 1703.07), sufficient data were available for dissolved oxygen, dissolved oxygen saturation, total nitrogen, and chlorophyll-a for analysis. All of these indicators were categorized as impaired (Non Support) based on their individual criteria. There were no conflicting results between the indicators. Therefore, following the decision matrix in Table 2, nitrogen concentrations in the Lamprey River were categorized as Non Supporting (Category 5-M) 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), 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 indicators. Therefore, following the decision matrix in Table 2, nitrogen concentrations in the Lamprey River were categorized as Not Supporting (Category 5-P) relative to preventing significant eelgrass loss. (NHDES(a), 2009)

According to the 303(d) list there can be only one category assigned to nitrogen for the Aquatic Life designated use. The lower (i.e., worse) category of the two, Category 5-P 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 Lamprey River show 53.4 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 cause of the eelgrass loss is unknown. Dredging is not a possible cause as the last channel dredge occurred in 1903 (USACE, 2005). There are no major mooring fields in this assessment zone. Per the assessment methodology, the Lamprey River should be considered impaired for significant eelgrass loss. The previous assessment by DES (DES, 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 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 increasing impairments in the Great Bay Estuary due to rising nitrogen levels. 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."[1]

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."

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1 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.

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% in the past 28 years. Eelgrass 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.

FIGURE 2: GRADIENT OF NITROGEN CONCENTRATIONS
(Bars indicate range of 10th-90th percentile of samples; dark line indicates median value)

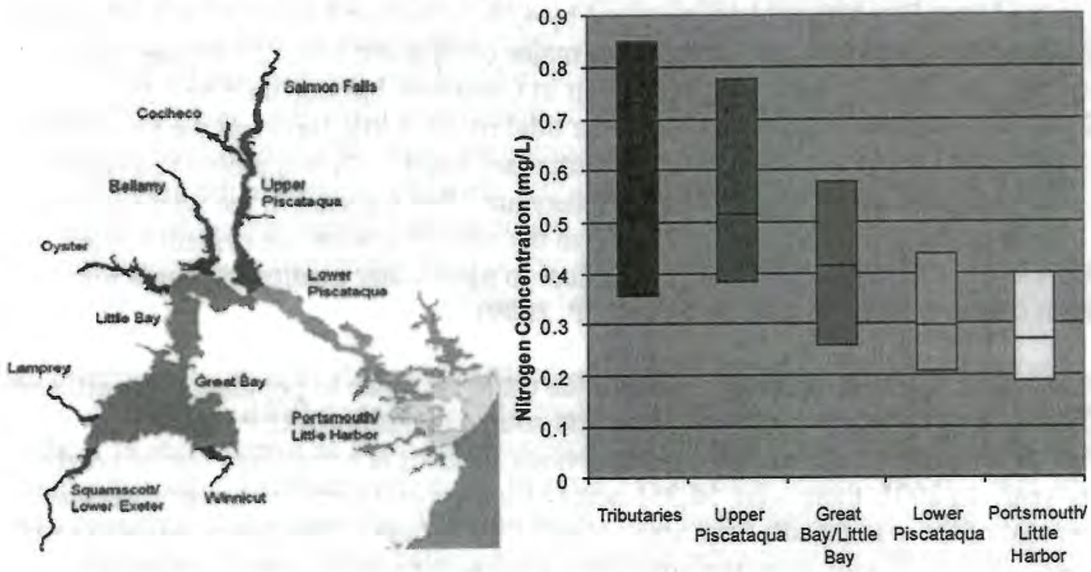
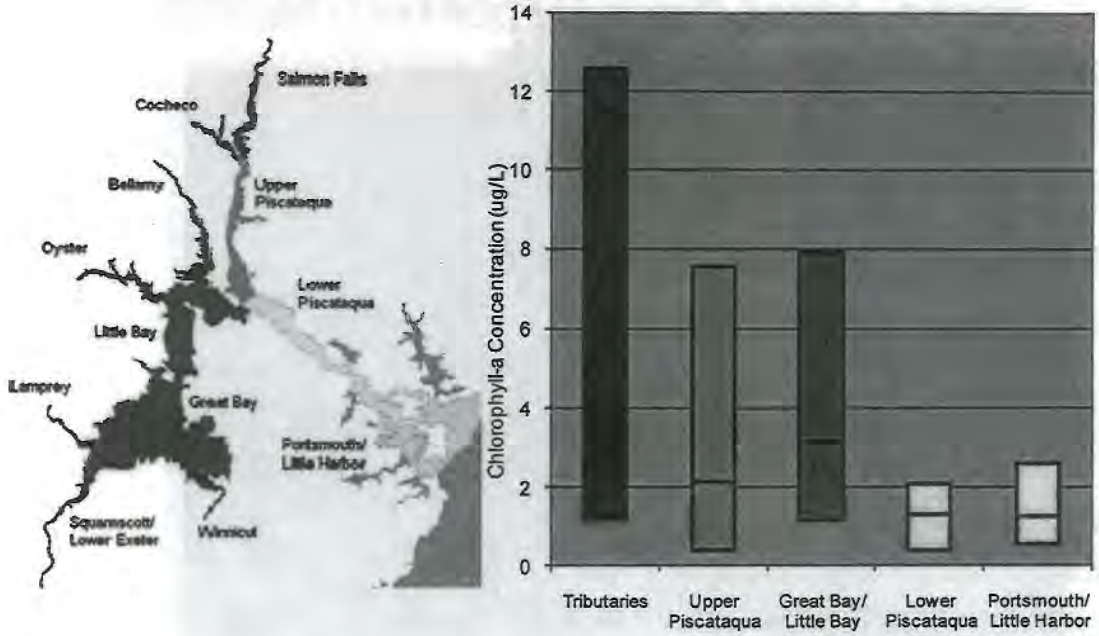


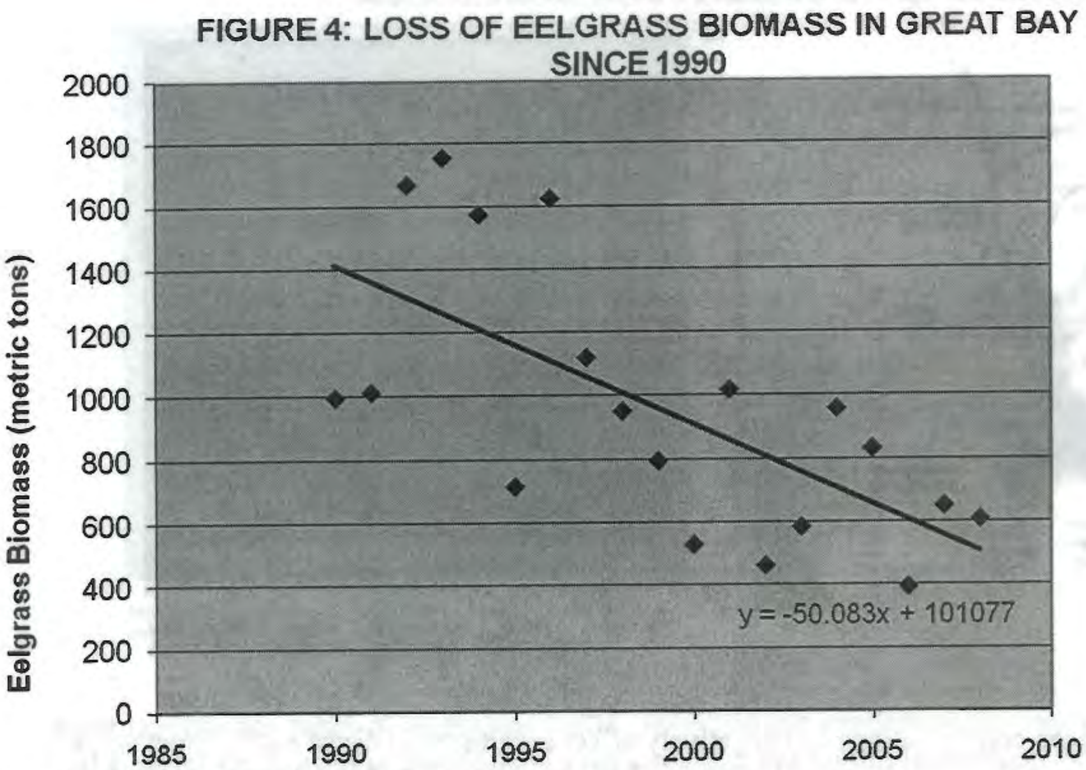
Figure 3 shows the gradient of chloroplyll *a* concentrations in Great Bay. With increasing algal blooms the clarity of the water decreases and this can promote the growth of epiphytes and macroalgae species on and around eelgrass (Burkholder, et al, 2007). Increased levels of algae can also have effects 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 the GRBLR Datasonde (just upstream of the Newmarket discharge) in the tidal portion of the Lamprey River is 0.1021 mg/l nitrate – N (Data obtained from the "Great Bay National Estuarine Research Reserve System Wide Monitoring Program" summary statistics for all data collected from 2000-2008).

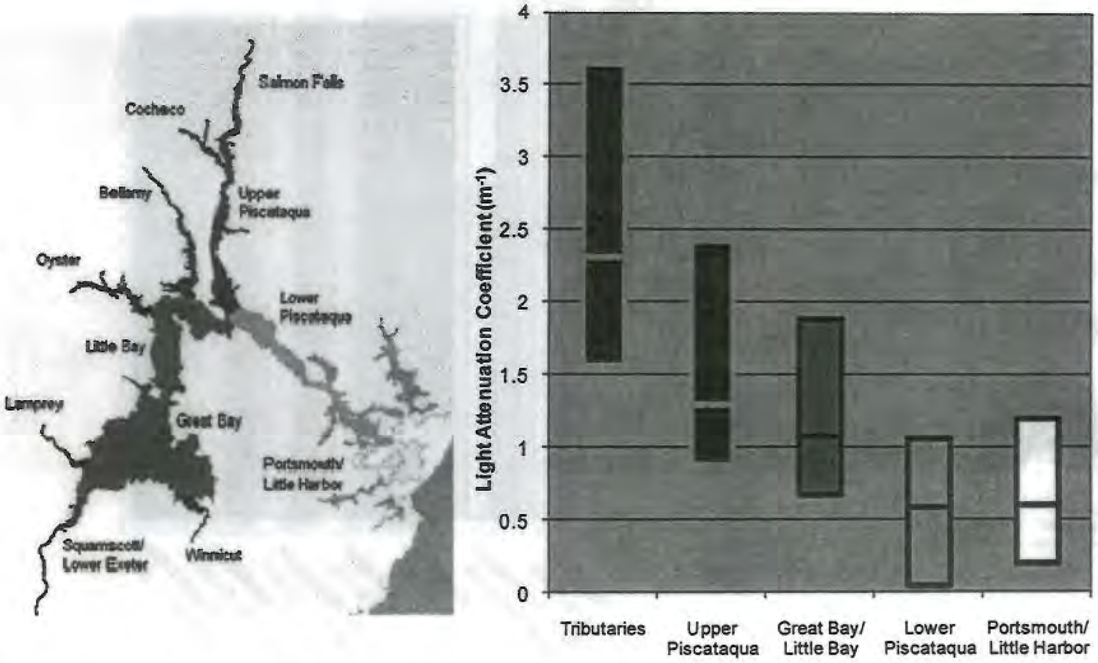
Nitrogen and eelgrass trends in the Great Bay Estuary appear to bear out this relationship. As nitrogen levels have been increasing throughout the estuary for a number of years, eelgrass has been also declining (both total acreage and biomass). Dissolved inorganic nitrogen concentrations have increased by 44 percent in the last 28 years (PREP, 2009). See Figure 4.



Source: PREP 2009 Environmental Indicators Report

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 increased 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.

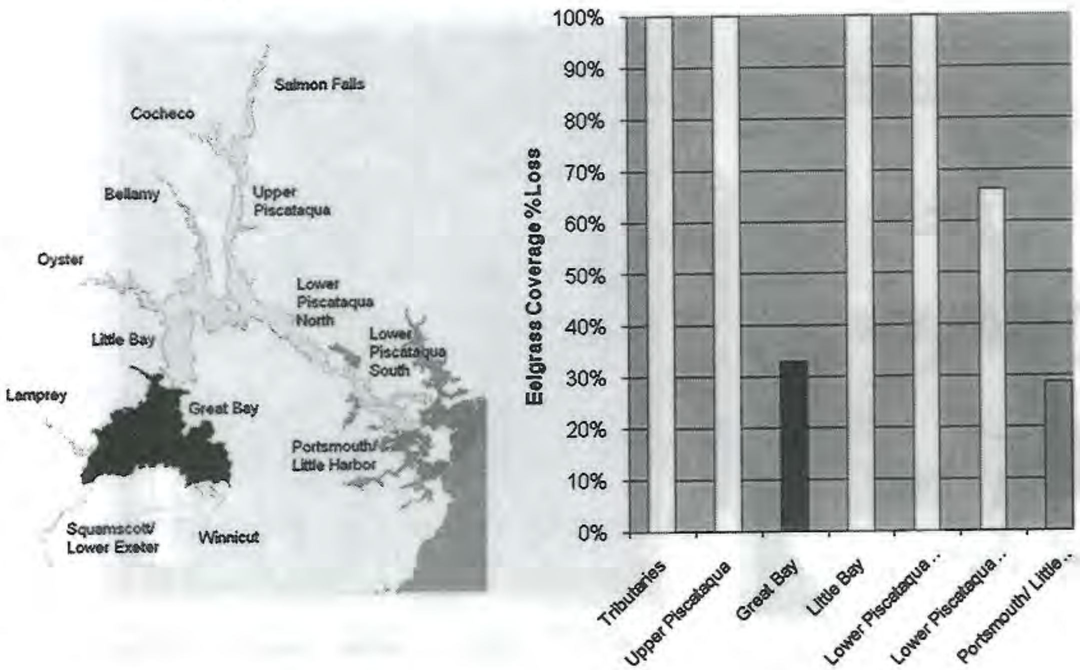
FIGURE 5: GRADIENT OF LIGHT ATTENUATION
(Bars indicate range of 90th-10th percentile of samples; dark line indicates median value)



*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.

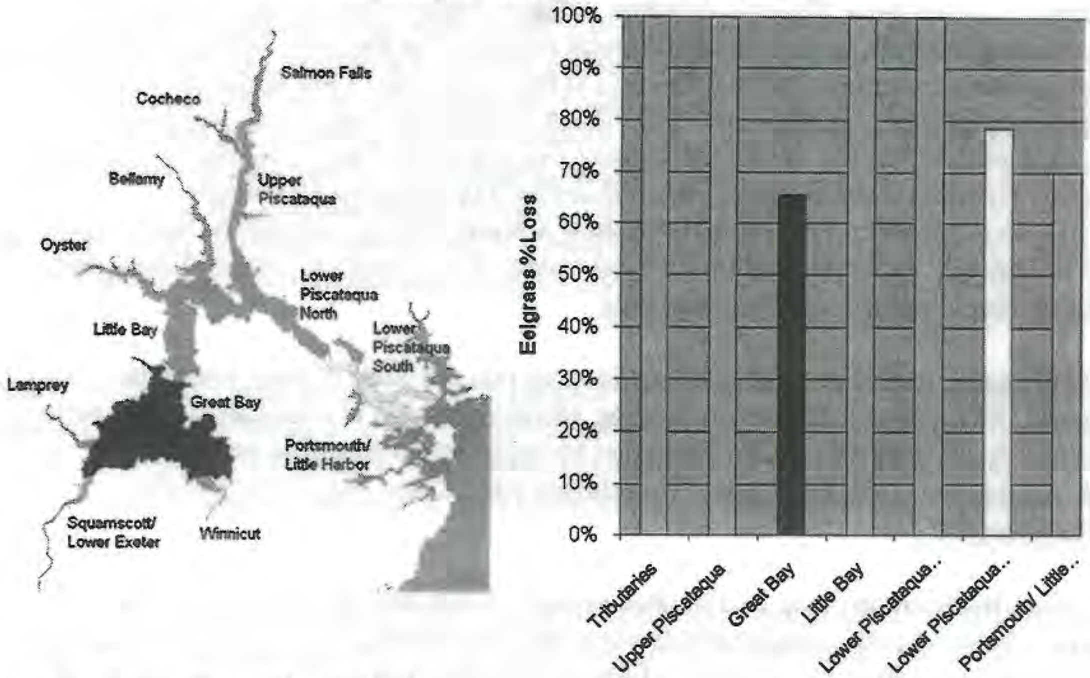
FIGURE 6: LOSS OF EELGRASS COVERAGE IN THE GREAT BAY ESTUARY
(Percent loss from peak annual values from 1990 to 2008 values)



Source: PREP 2009 Environmental Indicators Report

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, root 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 tidal portion of the Lamprey River were analyzed for 413 days. The minimum dissolved oxygen criteria of 5.0 mg/l was violated on 55 days (13.3% of the time). With respect to dissolved oxygen saturation, 50 days out of 352 (14.2%) failed to meet the dissolved oxygen saturation standard of 75% (NHDES(a), 2009).

The Lamprey River has lost 100% of its eelgrass cover. No eelgrass has been documented in the Lamprey River since 2003 when the river contained 2.2 acres. In 1948 the Lamprey River contained 53.4 acres of eelgrass (NHDES(a), 2009).

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, 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 guidance. NHDES 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 Lamprey River, for aquatic life use support, the proposed total nitrogen criteria for maintaining dissolved oxygen levels is 0.45 mg/l and for maintaining eelgrass habitats is 0.30 mg/l.

The Lamprey 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 Lamprey 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.

For the development of *Numeric Nutrient Criteria for the Great Bay Estuary* report (NHDES(b), 2009), all available water quality data for the Lamprey River collected between 2000 and 2008 were analyzed by NHDES. The median total nitrogen concentration in the river was 0.45 mg/l. The median chlorophyll *a* was 3.1 ug/l with range of 0.33 - 145 ug/l. These values are similar to nitrogen and chlorophyll *a* values measured in Great Bay and Little Bay and relatively high compared to other portions of the 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).

A summary of median total nitrogen and chlorophyll *a* data for Lamprey 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 is also on the 303(d) list for dissolved oxygen concentration impairments.

TABLE 1

Location	Total Nitrogen Median (mg/l)	Total Nitrogen Range (mg/l)	Chlorophyll *a* Median (ug/l)	Chlorophyll *a* Range (ug/l)
Lamprey River	0.45	0.27 – 0.97	3.1	0.33 – 145
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 Newmarket discharge from February – November 2008 was 30 mg/l. The average discharge flow for this time period was 0.68 mgd resulting in an average total nitrogen discharge load of 171 lbs/day (31 tons/yr) (New Hampshire Estuaries Project, 2008). At the design flow of 0.85 mgd the total nitrogen discharge load would be 214 lbs/day (39 tons/yr).

The increase in receiving water total nitrogen concentration currently caused by the Newmarket treatment plant at the point of discharge can be estimated by dividing the effluent concentration by the dilution factor. At a discharge concentration of 30 mg/l and a dilution factor of 55, the resulting receiving water concentration after initial mixing is 0.55 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 Lamprey River, upstream of and uninfluenced by the Newmarket discharge but downstream of the effluent discharge from Epping, shows that median total nitrogen concentration in the Lamprey River is 0.39 mg/l (PREP, 2010 and 2009).

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 0.05 mg/l (3/55), 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 non-point source loadings of total nitrogen would also need to occur.

Discharges from the Newmarket 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.

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 21 lbs/day based on the concentration limit and the design flow of the treatment facility. EPA has determined that an initial effluent limitation equal to the limit of technology combined with a reopener is an appropriate permitting structure at this juncture given the EPA and NHDES's shared preference to address all sources of nutrient pollution to the Great Bay estuary—both point source loading and the far greater component of non-point source loading—in a coordinated and comprehensive fashion, to the extent possible. (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 - 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 ensure that the discharge from the facility does 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.

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 Lamprey River watershed that protects all designated uses (both dissolved oxygen and eelgrass habitat) is a total nitrogen load of 140.1 tons per year while the current total nitrogen load is estimated to be 238.9 tons per year on average (34.7 tons per year point source and 204.1 tons per year non-point source). A 41% reduction in the total load is required to meet applicable criteria in the Lamprey River watershed. Based upon flow and nitrogen concentration data from 2008 the Newmarket Wastewater Treatment Facility discharges 31 tons/year of nitrogen to the Lamprey River and the Great Bay Estuary. With the effluent concentration reduced to 3.0 mg/l the facility would discharge 3.1 tons/year (a reduction of 27.9 tons/year) based on 2008 flows and at design flow the facility would discharge 3.9 tons/year (a reduction of 27.1 tons/year).

The 2010 analysis performed by NHDES to estimate the necessary total nitrogen reductions looked at the tidal portions of the Squamcott and Lamprey Rivers as one assessment unit each, not as two assessment units each which is being proposed for the 305(b) and 303(d) listing cycle in 2012.

Since eelgrass was present in the Lamprey River from the Lower Narrows down to Great Bay, the applicable total nitrogen criteria to ensure its recovery is 0.30 mg/l. From 2000 to 2008, the median total nitrogen concentration in the Lamprey River was 0.45 mg/l (NHDES(b), 2009) which is significantly higher than the recommended criteria 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 (ideally less than 0.3) used by the MADEP is also exceeded.

In a letter dated August 8, 2011, the NHDES advised EPA that the tidal portion of the Lamprey River would be split into two assessment units for the 2012 305(b) and 303(d) listing cycle. Currently the tidal portion of the Lamprey River is one assessment unit from the dam at the head of tide to the where the river empties into Great Bay. This portion of the Lamprey River will now consist of two assessment units consisting of the Lamprey River north and south. The split between the two assessment units will be at the Lower Narrows. Two assessment units have been created because eelgrass has not existed throughout all tidal portions of the Lamprey River. Historically, eelgrass has existed in the southern assessment unit up to the Lower Narrows. Therefore the draft total nitrogen criteria for dissolved oxygen (0.45 mg/l TN) would apply to the northern assessment unit and the draft total nitrogen criteria for protecting eelgrass habitat (0.3 mg/l TN) and dissolved oxygen would apply to the southern assessment unit, rather than the eelgrass criteria of 0.3 mg/l applying to the entire assessment unit. .

EPA considered whether the division of the receiving waters into two assessment units would change the determination regarding the proposed total nitrogen effluent limit. We have determined that it does not. The modeling conducted by NHDES is partly based on the average salinity within the estuary. The nitrogen loading threshold calculation was completed in three steps. First, fresh water inputs to each subestuary were computed. Second, ocean water inputs to each subestuary were estimated using the average salinity at a station in the subestuary and the fresh water inputs. Finally, the total water flushing rate was combined with the numeric criteria for total nitrogen to calculate the nitrogen loading thresholds to support designated uses (NHDES, 2010). For the Lamprey River, the modeling was performed using the average salinity at the Lamprey River datasonde station (GRBLR) which is located approximately 300 meters downstream of the dam at the head of tide. This station was chosen because it had the largest number of salinity measurements in the upper part of the tidal Lamprey River. The proposed break in the Lamprey River assessment unit at the Lower Narrows would be less than one-half mile downstream of the Lamprey River datasonde and would correspond to the farthest extent of eelgrass habitat. The average salinity at station GRBLR and at stations in the Lower Narrows were similar in 2003-2004 (NHDES, 2010, Appendix B). Therefore, based on the relative close proximity of the datasonde and the Lower Narrows and data provided in Appendix B of the NHDES 2010 analysis, EPA believes the difference in salinity at the two locations in negligible. Because of this, the nitrogen load reductions to protect eelgrass in the tidal portion of the Lamprey River from the NHDES 2010 analysis are also the appropriate nitrogen load reductions for the new southern assessment unit of the Lamprey River.

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.

4. __Metals__

EPA's review of the available metals monitoring data indicates that metals concentrations in the plant's effluent do not have "reasonable potential" to exceed the applicable water quality criteria in the NH Standards. The table below shows the acute and chronic criteria for each metal (converted to total recoverable), the maximum allowable acute and chronic effluent concentrations (the criteria multiplied by the dilution factor) and the average and maximum metal concentrations in the effluent during the review period (March 2005 to September 2010).

	Cadmium	Copper	Chromium	Lead	Nickel	Zinc
Acute Criteria Dissolved (mg/l)	0.042	0.0048	1.1	0.21	0.74	0.09
Chronic Criteria Dissolved (mg/l)	0.0093	0.0031	0.05	0.0081	0.082	0.081
Total Recoverable Conversion Factor	0.994	0.83	0.993	0.951	0.99	0.946
Acute Total Recoverable Criteria (mg/l)	0.04225	0.00578	1.10775	0.22082	0.74747	0.09514
Chronic Total Recoverable Criteria (mg/l)	0.00936	0.00373	0.05035	0.00852	0.08283	0.08562
Dilution Factor	55	55	55	55	55	55
Acute Allowable Concentration (mg/l)	2.32	0.32	60.93	12.15	41.11	5.23
Chronic Allowable Concentration (mg/l)	0.51	0.21	2.77	0.47	4.56	4.71
Average Concentration in Effluent (mg/l)	0.00036	0.0267	0.0009	0.0031	0.0044	0.1120
Maximum Concentration in Effluent (mg/l)	0.00100	0.1400	0.0030	0.0110	0.0400	0.6500

Based upon the data presented above, the effluent metal concentrations would not cause or contribute to an exceedance of water quality criteria, so there is no reasonable potential for these pollutants to cause or contribute to an exceedance of either acute or chronic criterion. Thus, the draft permit does not include metals limits. Monitoring will continue to be required 4 times per year for each metal as part of the whole effluent toxicity (WET) testing requirements.

5. ***Other Parameters***

Section V above described the receiving water and the parameters which have resulted in the receiving water being placed on the 303(d) list. Among these pollutants, and not previously discussed in this fact sheet, are:

- 2-Methylnaphthalene
- Anthracene
- Benzo(a)pyrene (PAHs)
- Benzo(a)anthracene
- Chrysene (C1-C4)
- DDD
- DDE
- DDT
- Bibenz(a,h)anthracene
- Fluroanthene
- Fluorene
- Naphthalene
- Pyrene
- Dioxin (including 2,3,7,8 TCDD)
- Polychlorinated biphenyls

Because the design flow of the treatment plant is less than 1 mgd, EPA regulations do not require the permittee to submit expanded monitoring with its permit application. As a result, EPA does not have information to determine whether the facility has reasonable potential to cause or contribute to the water quality standards violations with respect to these pollutants. Therefore, during the first year of the permit, the permittee shall complete three scans for the pollutants listed above. The information from these scans shall be utilized to determine whether the discharge has a reasonable potential to cause or contribute to water quality standard violations for these parameters. If reasonable potential is found for any of these parameters the permit may be modified. Testing methods for these parameters shall be consistent with methods found in 40 CFR §136.

D. Whole Effluent Toxicity (WET)

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 the Nation's waterways. EPA-New England adopted this "integrated strategy" on July 1, 1991, for use 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 an "overall" or "aggregate" toxicity assessment of the effluent. Furthermore, WET measures the "additivity" 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.

New Hampshire law states that, "all surface 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;...." (N.H. RSA 485-A:8, VI and the N.H. Code of Administrative Rules, PART Env-Ws 1730.21(a)(1)). 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 criterion for toxicity. Furthermore, results of these toxicity tests will demonstrate compliance of the POTW's discharge with the "no toxic provision of the NH Standards."

Accordingly, to fully implement the "integrated strategy" and to protect the "no toxic provision of the NH Standards," EPA-New England requires toxicity testing in all municipal permits. The effluent limitation in the draft permit for LC50 is the same as the existing permit.

The LC50 is defined as the percentage of effluent that would be lethal to 50 % of the test organisms during an exposure of 48 hours (static acute toxicity test). The existing and draft permit establish the LC50 limit at 100%, meaning a sample of 100 % effluent shall have no greater than a 50 % mortality rate in that effluent sample. The existing and draft permit require the permittee to collect and test effluent samples quarterly (calendar quarters ending March 31st, June 30th, September 30th and December 31st) using two species, *Menidia beryllina* and *Mysidopsis bahia*.

Monitoring data submitted by the permittee has shown consistent compliance with the Mysid LC50, but has not shown consistent compliance with the Menidia LC50 limit. The LC50 for Menidia was reported as a violation 35% of the time (8 violations out of 23 tests) between March 2005 and September 2010. The draft permit requires the permittee to continue quarterly WET testing. If future testing indicates a failure to consistently meet the LC50 for the Menidia, the permittee may be required to conduct a Toxicity Reduction Evaluation.

The WET limits in the draft permit include conditions to allow EPA-Region 1 to modify, [or alternatively, revoke and reissue] 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 CFR §122.62(a)(2). Alternately, if a permittee has consistently demonstrated on a maximum daily basis that its discharge, based on data for the most recent one-year period, or four sampling events, whichever is longer, causes no acute and chronic toxicity, the permitted limits will be considered eligible for a reduced frequency of toxicity testing. This reduction in testing frequency is evaluated on a case-by-case basis.

Accordingly, a special condition has been carried forward from the existing permit into the draft permit that allows for a reduced frequency of WET testing using a certified letter from EPA-Region 1. This permit provision anticipates the time when the permittee requests a reduction in WET testing that is approvable by both EPA-Region 1 and the NHDES-WD. The Region's current policy is that after completion of a minimum of four consecutive WET tests all of which must be valid tests and must demonstrate compliance with the permit limits for whole effluent toxicity, the permittee may submit a written request to the Region seeking a review of the toxicity test results. The Region's policy is to reduce the frequency of toxicity testing to no less than one (one-species) test per year. The permittee is required to continue testing at the frequency specified in the permit until the permit is either formally modified or until the permittee receives a certified letter from the Region indicating a change in the permit condition. This special condition does not affect the permittee's right to request a permit modification at any time prior to the permit expiration.

This draft permit, as in the existing permit, requires the permittee to continue reporting selected parameters from the chemical analysis of the WET tests' 100 percent effluent sample. Specifically, hardness, total recoverable aluminum, cadmium, chromium, copper, lead, nickel and zinc are to be reported on the appropriate DMR for entry into EPA's Permit Compliance System's Data Base. Reporting these constituents is already required with the submission of each toxicity testing report.

E. Sludge

Section 405(d) of the Clean Water Act (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 is subject to Part 503 technical and to State Env-Ws 800 standards. Part 503 regulations have a self-implementing provision, however, the CWA requires implementation through permits. Domestic sludge which is disposed of in municipal solid waste landfills are in compliance with Part 503 regulations provided the sludge meets the quality criteria of the landfill and the landfill meets the requirements of 40 CFR Part 258.

The Newmarket Wastewater Treatment Facility generates approximately 36 dry metric tons of sludge each year. This sludge is handled by Waste Management Inc. for disposal in the Turnkey Landfill in Rochester, NH. The draft permit has been conditioned to ensure that sewage sludge use and disposal practices meet the CWA Section 405(d) Technical Standards

The permittee is required to submit an annual report to EPA-New England and NHDES-WD, by February 19th each year, containing the information specified in the Sludge Compliance Guidance document for their chosen method of sewage sludge use or disposal practices.

F. Industrial Users (Pretreatment Program)

The permittee is not required to administer a pretreatment program based on the authority granted under 40 CFR §122.44(j), 40 CFR §403 and §307 of the CWA. However, the draft permit contains conditions that are necessary to allow Region 1 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-New England and NHDES-WD whenever a process wastewater discharge to the facility from a primary industrial category (See 40 CFR §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-New England and NHDESWD the name(s) of all industrial users subject to Categorical Pretreatment Standards under 40 CFR §403.6 and 40 CFR 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-Ws904) who commence discharge to the POTW after the effective date of the permit, and (2) submit copies of Baseline Monitoring Reports and other pretreatment reports submitted by industrial users to EPA-New England and NHDES-WD.

G. 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 violation 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.

H. Antidegradation

This draft permit is being reissued with flow, BOD_5, TSS, TRC, pH and fecal coliform (monthly average) effluent limitations identical to those in the current permit, and additional limitations for fecal coliform (daily maximum), enterococci bacteria, and total nitrogen, with no change in outfall location. The State of New Hampshire has indicated that there is no lowering of water quality and no loss of existing water uses and that no additional antidegradation review is warranted at this time.

I. Monitoring Requirements and Conditions

The effluent monitoring requirements in the draft permit have been established to yield data representative of the discharge in accordance with the CWA and applicable regulations. Section 308(a), 402(a); 40 CFR §§ 122.41(j), 122.44(i) and 122.48. In the draft permit, compliance monitoring frequency and sample type for flow, BOD_5, TSS, total nitrogen, pH, total residual chlorine, fecal coliform, and enterococci bacteria have been established in accordance with the latest version of EPA/NHDES-WD's Effluent Monitoring Guidance (EMG) mutually agreed upon and first implemented in March 1993 and last revised on July 19, 1999. In addition, the WET test monitoring requirements have been set according to EPA-New England's Municipal Toxicity Policy.

The remaining conditions of the permit are based on the NPDES regulations 40 CFR, Parts 122 through 125, and consist primarily of standard requirements common to all permits.

J. 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 Lamprey 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 toxicity testing four (4) times per year 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 prohibits the discharge of any pollutant or combination of pollutants in toxic amounts; and
- The permit contains water quality-based limits for total residual chlorine and total nitrogen.

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.

K. Endangered Species

Section 7(a) of the Endangered Species Act of 1973, as amended, (ESA) grants authority to and imposes requirements upon Federal agencies regarding endangered or threatened species of fish, wildlife, or plants ("listed species") and habitat of such species that has been designated as critical (a "critical habitat"). The ESA requires every Federal agency, in consultation with and with the assistance of the Secretary of Interior, to insure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The United States Fish and Wildlife Service (USFWS) administers Section 7 consultations for freshwater species. The National Marine Fisheries Service (NOAA Fisheries) administers Section 7 consultations for marine species and anadromous fish.

With respect to marine species and anadromous fish, NOAA Fisheries has advised EPA that there are no species listed under the ESA in the vicinity of Newmarket's discharge. Additionally, based on information currently available from USFWS there are no federally listed or proposed threatened or endangered species or critical habitat are known to occur in the project area.

VII. Monitoring and Reporting; NetDMR

The effluent monitoring requirements have been established to yield data representative of the discharge, as authorized by the CWA and applicable regulations. 40 CFR §§122.41 (j), 122.44 (l), and 122.48.

The Draft Permit includes new permit administration provisions related to Discharge Monitoring Report (DMR) submittals to EPA and the State. The draft permit requires that, no later than one year after the effective date of the permit, the permittee submit all monitoring data and other reports required by the permit to EPA using NetDMR, unless the permittee is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports ("opt-out request").

In the interim (until one year from the effective date of the permit), the permittee may either submit monitoring data and other reports to EPA in hard copy form, or report electronically using NetDMR.

NetDMR is a national web-based tool for regulated Clean Water Act permittees to submit discharge monitoring reports (DMRs) electronically via a secure Internet application to U.S. EPA through the Environmental Information Exchange Network. NetDMR allows participants to discontinue mailing in hard copy forms under 40 CFR § 122.41 and § 403.12. NetDMR is accessed from the following url: http://www.epa.gov/netdmr. Further information about NetDMR, including contacts for EPA Region 1, is provided on this website.

EPA currently conducts free training on the use of NetDMR, and anticipates that the availability of this training will continue to assist permittees with the transition to use of NetDMR. To participate in upcoming trainings, visit http://www.epa.gov/netdmr for contact information for New Hampshire.

The Draft Permit requires the permittee to report monitoring results obtained during each calendar month using NetDMR, no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA or to NHDES.

The Draft Permit also includes an "opt-out" request process. Permittees who believe they cannot use NetDMR must demonstrate the reasonable basis that precludes the use of NetDMR, such as technical or administrative infeasiblity. These permittees must submit a written justification to EPA at least sixty (60) days prior to the date the facility would otherwise be required to begin using NetDMR. Opt-outs become effective upon the date of written approval by EPA and are valid for twelve (12) months from the date of EPA approval. The opt-outs expire at the end of this twelve (12) month period. Upon expiration, the permittee must submit DMRs and reports to EPA using NetDMR, unless the permittee submits a renewed opt-out request sixty (60) days prior to expiration of its opt-out, and the request is approved by EPA.

Until electronic reporting using NetDMR begins, or for those permittees that receive written approval from EPA to continue to submit hard copies of DMRs, the Draft Permit requires that submittal of DMRs and other reports required by the permit continue in hard copy format. Hard copies of DMRs must be postmarked no later than the 15th day of the month following the completed reporting period.

VIII. State Certification Requirements

EPA may not issue a permit unless the State in which the discharge originates either certifies , or waives its right to certify, the permit as set forth in 40 CFR §124.53. **The only exception to this is that sludge conditions/requirements are not part of the Section 401 State Certification.** The staff of the NHDES-WD has reviewed the draft permit and advised Region 1 that the limitations are adequate to protect water quality. EPA-Region 1 has requested permit certification by the State and expects that the draft permit will be certified. Regulations governing state certification are set forth in 40 CFR §§ 124.53 and §124.55.

IX. 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, Region 1 (New England), 5 Post Office Square - Suite 100, Mail Code OEP06-1, Boston, MA 02109-3912.**

Any person, prior to such date, may submit a request in writing for a public hearing to consider the draft permit to EPA-New England and the State Agency. The request shall state the nature of the issues proposed to be raised in the hearing. A public hearing may be held after at least thirty days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest.

Following the close of the comment period, and after a public hearing, if such hearing is held, the Regional Administrator will issue a final permit and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice. 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-New England's Boston office.

X. EPA-New England/State Contacts

Additional information concerning the draft permit may be obtained between the hours of 9:00 A.M. and 5:00 P.M. (8:00 A.M. and 4:00 P.M. for the state), Monday through Friday, excluding holidays from:

Dan Arsenault
U.S. Environmental Protection Agency
Office of Ecosystem Protection
5 Post Office Square
Suite 100, Mail Code: OEP06-1
Boston, Massachusetts 02109-3912
Telephone No.: (617) 918-1562
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9/26/11
Date:

Stephen S. Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

REFERENCES

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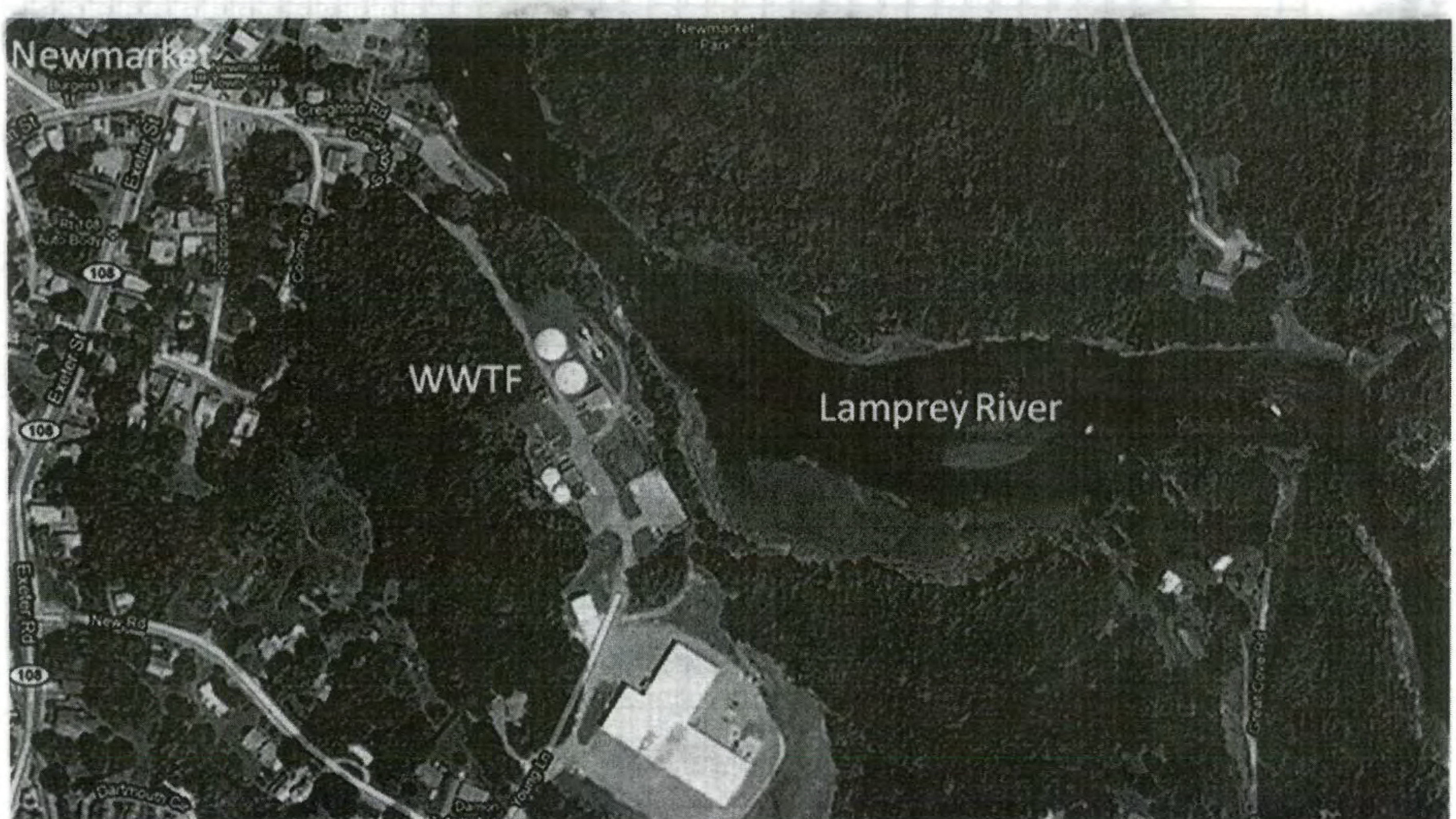
EXHIBIT 2 (AR A.8)

ATTACHMENT A – LOCATION OF NEWMARKET WWTF



Aerial Image obtained from Google Maps (http://maps.google.com)

EXHIBIT 2 (AR A.8)

ATTACHMENT B - DMR DATA SUMMARY (OUTFALL 001)

Monitoring Period End Date	BOD$_5$ Mon. Ave. (lb/day)	BOD$_5$ Max. Day (lb/day)	BOD$_5$ Mon. Ave. (mg/l)	BOD$_5$ Max. Day (mg/l)	TSS Mon. Ave. (lb/day)	TSS Max. Day (lb/day)	TSS Mon. Ave. (mg/l)	TSS Max. Day (mg/l)	TRC Mon. Ave. (mg/l)	TRC Max Day (mg/l)
1/31/2005	139.	185.	29.	31.5	85.	121.	17.4	20.4	0.000	0.000
2/28/2005	150.	225.	27.7	32.5	89.	147.	16.2	20.6	0.000	0.000
3/31/2005	179.	408.	25.1	28.1	110.	340.	13.6	21.4	0.000	0.000
4/30/2005	195.	209.	26.4	29.2	125.	195.	17.5	23.8	0.000	0.000
5/31/2005	169.	316.	24.2	33.8	125.	208.	20.5	27.6	0.000	0.000
6/30/2005	131.	190.	23.	28.9	117.	149.	20.8	23.8	0.000	0.000
7/31/2005	77.	99.	18.9	23.6	87.	105.	21.2	25.5	0.000	0.000
8/31/2005	79.	130.	19.4	31.3	79.	109.	18.9	24.5	0.000	0.000
9/30/2005	59.	62.	15.1	15.7	63.	138.	16.9	37.8	0.000	0.000
10/31/2005	115.	262.	15.1	19.7	97.	220.	13.3	16.6	0.000	0.000
11/30/2005	149.	217.	24.2	32.6	138.	271.	22.9	40.6	0.000	0.000
12/31/2005	154.	250.	27.	29.7	120.	160.	20.9	25.	0.000	0.000
1/31/2006	174.	238.	28.1	33.8	142.	194.	22.2	25.2	0.050	0.320
2/28/2006	164.	186.	29.5	36.2	102.	133.	18.6	21.2	0.010	0.380
3/31/2006	130.	162.	28.8	37.5	69.	89.	15.3	16.8	0.000	0.650
4/30/2006	123.	146.	23.8	29.2	92.	106.	17.9	21.6	0.000	0.000
5/31/2006	153.	186.	20.1	26.8	208.	789.	20.2	25.2	0.000	0.000
6/30/2006	154.	343.	21.2	24.7	156.	386.	21.3	26.2	0.000	0.000
7/31/2006	83.	121.	18.	21.9	67.	107.	14.3	18.6	0.000	0.000
8/31/2006	69.	110.	17.4	28.5	67.	245.	13.2	26.8	0.000	0.660
9/30/2006	72.	86.	18.2	20.9	44.	53.	11.1	14.2	0.000	0.000
10/31/2006	90.	136.	18.3	19.2	84.	166.	16.7	22.6	0.000	0.300
11/30/2006	153.	256.	20.6	25.8	153.	302.	20.	26.4	0.050	0.450
12/31/2006	100.	117.	20.6	21.5	104.	124.	21.4	23.6	0.120	0.700
1/31/2007	99.	123.	20.9	26.	74.	116.	15.	20.	0.050	0.540
2/28/2007	95.	130.	26.4	33.6	44.	49.	12.1	13.	0.060	0.680
3/31/2007	125.	157.	26.7	28.3	72.	100.	14.3	16.	0.000	0.320
4/30/2007	157.	238.	20.9	30.1	128.	239.	16.3	21.2	0.000	0.240
5/31/2007	122.	156.	22.3	30.6	116.	144.	20.	30.8	0.000	0.000
6/30/2007	97.	121.	20.4	24.8	88.	120.	19.	23.2	0.000	0.540
7/31/2007	68.	86.	17.9	21.2	56.	81.	14.2	20.	0.000	0.110
8/31/2007	98.	132.	27.7	36.8	70.	98.	19.6	27.5	0.000	0.290
9/30/2007	121.	177.	29.8	32.7	89.	204.	21.6	33.	0.060	0.690
10/31/2007	93.	117.	24.7	31.8	51.	76.	13.9	20.6	0.000	0.260
11/30/2007	106.	154.	24.3	31.8	62.	95.	14.5	19.6	0.000	0.670
12/31/2007	112.	129.	29.1	32.5	78.	96.	19.8	21.5	0.060	0.460
1/31/2008	126.	152.	25.1	31.3	87.	124.	17.6	25.5	0.130	0.710
2/29/2008	194.	268.	24.7	30.4	127.	186.	15.9	19.	0.000	0.270
3/31/2008	188.	270.	23.5	32.2	107.	144.	13.2	17.2	0.000	0.230
4/30/2008	167.	197.	21.1	26.	108.	195.	15.8	24.6	0.000	0.000
5/31/2008	113.	157.	22.9	32.6	94.	198.	18.4	30.	0.000	0.350

EXHIBIT 2 (AR A.8)

6/30/2008	91.	106.	23.3	26.2	81.	96.	20.6	22.4	0.000	0.000
7/31/2008	62.	75.	16.1	21.8	62.	99.	15.5	23.	0.000	0.330
8/31/2008	70.	87.	15.6	20.3	41.	60.	10.5	14.4	0.000	0.440
9/30/2008	62.1	71.	14.1	16.2	54.	77.	12.6	16.8	0.000	0.000
10/31/2008	84.6	91.9	15.6	20.4	103.5	115.9	16.	21.2	0.000	0.000
11/30/2008	122.6	233.51	22.4	25.5	111.8	190.47	21.8	27.6	0.000	0.490
12/31/2008	136.1	164.55	20.9	25.	145.7	187.8	21.2	24.	0.050	0.660
1/31/2009	122.4	132.39	28.8	34.9	112.3	143.78	26.	27.	0.000	0.340
2/28/2009	158.3	212.52	**32.1**	37.7	134.8	199.2	27.9	30.8	0.000	0.140
3/31/2009	175.9	245.5	25.1	35.8	143.7	185.51	20.7	29.	0.000	0.590
4/30/2009	145.1	249.59	21.8	25.9	152.5	258.71	23.1	28.2	0.000	0.050
5/31/2009	95.6	140.54	20.2	23.7	89.9	143.76	18.9	23.2	0.000	0.000
6/30/2009	110.8	215.8	22.8	41.6	92.8	147.32	20.1	28.4	0.000	0.000
7/31/2009	73.4	89.17	15.3	16.8	74.2	152.73	15.3	25.4	0.000	0.000
8/31/2009	57.8	59.07	15.6	16.4	50.4	76.98	11.6	14.4	0.000	0.220
9/30/2009	59.1	77.94	15.2	18.6	42.4	62.72	10.96	15.8	0.000	0.180
10/31/2009	74.7	92.37	18.	21.3	51.9	58.77	12.6	16.2	0.000	0.000
11/30/2009	81.9	105.36	19.2	22.7	64.4	84.14	15.	19.	0.000	0.080
12/31/2009	123.7	154.25	22.	27.4	106.1	123.85	18.8	22.	0.000	0.470
1/31/2010	142.7	154.54	27.2	31.3	113.9	189.56	23.1	41.4	0.000	0.430
2/28/2010	209.6	482.57	29.4	32.6	165.7	470.61	21.8	23.8	0.000	0.200
3/31/2010	**230.**	**474.83**	22.3	28.1	199.5	**443.35**	18.9	26.2	0.000	0.080
4/30/2010	190.41	343.47	28.	34.5	151.7	331.65	21.7	25.6	0.000	0.680
5/31/2010	127.2	198.8	26.6	32.8	97.8	185.	20.3	27.4	0.000	0.070
6/30/2010	78.2	96.9	20.	22.3	69.	90.85	17.3	20.4	0.000	0.000
7/31/2010	88.4	221.3	23.8	**61.**	55.	116.09	14.9	32.	0.000	0.050
8/31/2010	55.6	72.5	16.3	21.1	49.5	118.2	13.9	34.	0.000	0.000
9/30/2010	58.1	74.46	16.8	20.9	37.2	65.37	10.7	18.4	0.000	0.000
10/31/2010	73.1	110.9	17.9	25.1	64.9	93.2	15.9	22.8	0.000	0.340
Permit Limit	**213**	**354**	**30**	**50**	**213**	**354**	**30**	**50**	**0.41**	**0.72**
Average	118.6	---	22.3	---	95.6	---	17.6	---	0.009	---
Maximum	230.0	482.6	32.1	61.0	208.0	789.0	27.9	41.4	0.130	0.710
Minimum	55.6	---	14.1	---	37.2	---	10.5	---	0.000	---
Standard Deviation	42.9	90.9	4.6	7.2	37.7	115.4	3.8	5.8	0.03	0.2
# of Measurements	70	70	70	70	70	70	70	70	70	70
# Exceeds Limit	1	2	1	1	0	3	0	0	0	0

EXHIBIT 2 (AR A.8)

Monitoring Period End Date	Fecal Col. Mon. Ave. (#/100ml)	Fecal Col. Max. Day (#/100ml)	pH Minimum (s.u.)	pH Maximum (s.u.)	Flow Mon. Ave. (mgd)	Flow Max. Day (mgd)	BOD Removal (%)	TSS Removal (%)
1/31/2005	1	8	7.0	7.3	0.5942	1.2330	90	94
2/28/2005	1	10	6.5	7.3	0.6315	0.8910	92	94
3/31/2005	2	8	6.8	7.3	0.7780	2.0370	92	95
4/30/2005	3	10	6.7	7.2	**0.9114**	2.0590	90	93
5/31/2005	1	12	6.6	7.2	**0.8800**	1.9400	89	92
6/30/2005	1	6	6.7	7.0	0.6447	0.8750	89	88
7/31/2005	4	28	6.8	7.2	0.5258	0.7070	94	94
8/31/2005	4	26	6.9	7.3	0.4900	0.5700	94	95
9/30/2005	8	690	6.9	7.3	0.4580	0.5430	95	93
10/31/2005	3	16	6.9	7.2	0.8336	1.7970	95	95
11/30/2005	1	10	6.9	7.2	0.7182	1.1860	91	92
12/31/2005	1	10	6.9	7.3	0.7497	1.2850	93	93
1/31/2006	2	30	7.0	7.4	0.7430	0.9450	88	90
2/28/2006	2	10	6.9	7.3	0.7277	1.3929	90	92
3/31/2006	1	10	7.1	7.4	0.5370	0.6480	89	94
4/30/2006	1	10	7.0	7.3	0.6100	1.0100	89	92
5/31/2006	2	20	6.6	7.2	**1.2756**	3.9850	93	93
6/30/2006	3	138	6.7	7.0	**0.9354**	1.7680	89	88
7/31/2006	6	100	6.9	7.2	0.5301	0.7610	95	95
8/31/2006	6	48	7.0	7.4	0.5157	1.0970	95	96
9/30/2006	7	38	7.1	7.4	0.4956	0.7060	94	96
10/31/2006	7	38	7.0	7.4	0.6446	1.3410	95	95
11/30/2006	3	16	7.0	7.4	**0.8866**	1.5340	90	91
12/31/2006	2	10	7.0	7.5	0.6197	0.9770	93	92
1/31/2007	1	18	7.1	7.6	0.6058	1.0000	91	93
2/28/2007	2	8	7.4	7.7	0.4341	0.4980	91	95
3/31/2007	5	20	7.1	7.6	0.6353	0.9010	88	94
4/30/2007	5	22	6.9	7.4	**1.0589**	3.6660	88	93
5/31/2007	2	20	6.9	7.3	0.7007	0.9970	92	93
6/30/2007	3	18	6.8	7.2	0.5715	1.0840	90	92
7/31/2007	5	72	6.8	7.4	0.4448	0.5530	94	93
8/31/2007	7	56	7.0	7.5	0.4227	0.4950	90	92
9/30/2007	4	92	7.3	7.6	0.4385	0.7430	91	94
10/31/2007	7	21	7.3	7.6	0.4689	0.6280	93	96
11/30/2007	4	306	7.2	7.6	0.5158	0.6750	89	93
12/31/2007	2	6	7.1	7.4	0.4943	0.6910	89	92
1/31/2008	2	21	6.8	7.3	0.6657	1.1900	90	92
2/29/2008	2	10	6.8	7.3	**0.8975**	1.5130	87	89
3/31/2008	2	9	6.8	7.2	**1.0550**	1.9010	87	92
4/30/2008	2	7	6.8	7.2	0.7765	1.1180	91	92
5/31/2008	2	25	6.8	7.3	0.5935	0.9480	91	93
6/30/2008	3	34	6.8	7.1	0.4605	0.5500	91	92
7/31/2008	4	163	6.9	7.2	0.5537	1.8500	94	94
8/31/2008	---	---	6.8	7.3	0.5685	0.8710	94	96

EXHIBIT 2 (AR A.8)

9/30/2008	4	82	6.8	7.3	0.6189	1.1530	93	95
10/31/2008	2	7	6.9	7.4	0.5992	0.8270	93	94
11/30/2008	2	4	7.0	7.4	0.6312	1.0980	91	94
12/31/2008	2	87	7.0	7.8	**0.8616**	1.2990	89	92
1/31/2009	2	7	7.0	7.5	0.5459	0.7930	89	89
2/28/2009	2	6	7.0	7.4	0.6347	0.9680	88	90
3/31/2009	2	5	6.9	7.3	0.8482	1.1030	87	92
4/30/2009	2	12	7.0	7.3	0.7835	1.1750	88	89
5/31/2009	2	62	6.9	7.3	0.5657	0.7430	91	91
6/30/2009	3	320	6.8	7.3	0.5613	0.7710	91	94
7/31/2009	3	12	6.8	7.1	0.6158	1.1040	93	95
8/31/2009	3	80	6.9	7.2	0.5353	0.8020	93	95
9/30/2009	2	34	7.1	7.4	0.4684	0.5620	95	96
10/31/2009	2	7	7.2	7.4	0.5104	0.7300	95	96
11/30/2009	2	25	7.0	7.4	0.5730	1.0950	93	94
12/31/2009	2	7	7.1	7.5	0.6982	1.0300	91	92
1/31/2010	3	720	7.0	7.4	0.5826	1.0200	89	89
2/28/2010	2	7	6.8	7.6	0.7205	2.3900	91	91
3/31/2010	5	805	6.7	7.3	**1.3700**	3.4700	**83**	87
4/30/2010	2	150	6.7	7.2	0.8092	1.8410	88	90
5/31/2010	2	17	6.9	7.3	0.5287	0.9170	91	93
6/30/2010	2	10	6.8	7.0	0.4875	0.6370	94	95
7/31/2010	5	30	6.8	7.3	0.4451	0.5930	92	96
8/31/2010	3	102	7.0	7.3	0.4385	0.9830	95	96
9/30/2010	4	48	7.0	7.4	0.4177	0.5000	94	97
10/31/2010	2	4	7.0	7.5	0.4900	0.7460	94	95
Permit Limit	**14**	**Report**	**6.5**	**8.0**	**0.8500**	**Report**	**85**	**85**
Average	3	---	---	---	0.6491	---	91	93
Maximum	8	805	---	7.8	1.3700	3.9850	95	97
Minimum	1	---	6.5	---	0.4177	---	83	87
Standard Deviation	1.7	155.5	0.2	0.2	0.2	0.7	2.6	2.2
# of Measurements	69	69	70	70	70	70	70	70
# Exceeds Limit	0	N/A	0	0	10	0	1	0

EXHIBIT 2 (AR A.8)

Monitoring Period End Date	LC50 Menidia (% effleunt)	LC50 Mysid (% effleunt)	Cd Tot. Rec. (mg/l)	Cu Tot. Rec. (mg/l)	Cr Tot. Rec. (mg/l)	Pb Tot. Rec. (mg/l)	Ni Tot. Rec. (mg/l)	Zn Tot. Rec. (mg/l)	NH3 - N (mg/l)
3/31/2005	100.00	100	0.00100	0.016	0.0020	0.0050	0.0030	0.052	17
6/30/2005	100.00	100	0.00100	0.025	0.0020	0.0060	0.0160	0.067	12
9/30/2005	100.00	100	0.00067	0.023	0.0000	0.0029	0.0023	0.240	21
12/31/2005	100.00	100	0.00100	0.024	0.0022	0.0110	0.0064	0.060	15
3/31/2006	73.00	100	0.00100	0.025	0.0020	0.0050	0.0030	0.078	22
6/30/2006	100.00	100	0.00100	0.026	0.0020	0.0050	0.0030	0.061	16
9/30/2006	97.70	100	0.00100	0.022	0.0020	0.0090	0.0030	0.073	15
12/31/2006	85.50	100	0.00100	0.021	0.0020	0.0050	0.0030	0.065	20
3/31/2007	100.00	100	0.00000	0.025	0.0020	0.0000	0.0030	0.073	17
6/30/2007	100.00	100	0.00000	0.022	0.0000	0.0000	0.0000	0.061	11
9/30/2007	74.40	100	0.00000	0.032	0.0030	0.0070	0.0400	0.076	30
12/31/2007	68.60	100	0.00000	0.014	0.0000	0.0000	0.0000	0.053	30
3/31/2008	100.00	100	0.00000	0.003	0.0000	0.0000	0.0000	0.420	9
6/30/2008	100.00	100	0.00000	0.018	0.0000	0.0013	0.0000	0.650	15
9/30/2008	99.63	100	0.00000	0.140	0.0000	0.0010	0.0020	0.046	17
12/31/2008	100.00	100	0.00000	0.019	0.0000	0.0010	0.0000	0.035	12
3/31/2009	100.00	100	0.00050	0.018	0.0020	0.0010	0.0020	0.076	13
6/30/2009	100.00	100	0.00000	0.015	0.0000	0.0010	0.0030	0.041	15
9/30/2009	100.00	100	0.00000	0.021	0.0000	0.0012	0.0030	0.074	16
12/31/2009	100.00	100	0.00000	0.014	0.0000	0.0020	0.0000	0.033	17
3/31/2010	55.30	100	0.00000	0.048	0.0000	0.0030	0.0020	0.130	29
6/30/2010	100.00	100	0.00000	0.026	0.0000	0.0020	0.0030	0.060	18
9/30/2010	67.70	100	0.00000	0.017	0.0000	0.0010	0.0030	0.052	18
Permit Limit	100	100	Report	Report	Report	Report	Report	Report	Report
Average	92.25	100	0.00036	0.027	0.0009	0.0031	0.0044	0.112	17.6
Maximum	100.00	100	0.00100	0.140	0.0030	0.0110	0.0400	0.650	30.0
Minimum	55.30	100	0.00000	0.003	0.0000	0.0000	0.0000	0.033	9.0
Standard Deviation	13.9	0.0	0.0005	0.026	0.001	0.003	0.008	0.1	5.7
# of Measurements	23	23	23	23	23	23	23	23	23
# Exceeds Limit	8	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

ATTACHMENT C – EFFLUENT LIMIT DERIVATIONS

DERIVATION OF MASS-BASED LIMITS

Calculations of maximum allowable loads for BOD_5, TSS and Total Nitrogen are based on the following equation.

$$L = C \times Q_{PDF} \times 8.345$$

where:

- L = Maximum allowable load, in lbs/day, rounded to nearest 1 lbs/day.
- C = Maximum allowable effluent concentration for reporting period, in mg/L.
- Q_{PDF} = Treatment plant's design flow, in MGD
- 8.345 = Factor to convert effluent concentration, in mg/L, and plant's design flow, in MGD, to lbs/day.

DERIVATION OF WATER QUALITY CRITERIA-BASED LIMITS

Equation used to calculate average monthly and maximum daily Total Residual Chlorine limits.

Chlorine Limit = Dilution Factor x Water Quality Standard

where water quality standards for chlorine are:

0.0075 = Chronic Marine Aquatic-Life Criterion, in mg/L.
0.013 = Acute Marine Aquatic-Life Criterion, in mg/L.

EXHIBIT 2 (AR A.8)

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 ‰).

M = The EFH designation for this species includes the mixing water/brackish salinity zone of this bay (0.5 ‰ < salinity < 25.0 ‰).

F = The EFH designation for this species includes the tidal freshwater salinity zone of this bay or estuary (0.0 ‰ < or = salinity < or = 0.5 ‰)

n/a = The species does not have this lifestage in its life history or has not EFH designated for this lifestage.