

AUTHORIZATION TO DISCHARGE UNDER THE  
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act, as amended, (33 U.S.C. §§1251 et seq.; the "CWA"), and the Massachusetts Clean Waters Act, as amended, (M.G.L. Chap. 21, §§ 26-53),

**Town of Middleborough  
Town Hall  
10 Nickerson Avenue  
Middleborough, MA 02346**

is authorized to discharge from the facility located at

**Middleborough Water Pollution Control Facility (WPCF)  
Joe Ciaglo Way  
Middleborough, MA 02346**

to receiving water named: **Nemasket River (Taunton River Basin, State Code - MA62-26)**

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

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

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

This permit supersedes the permit issued on September 26, 2003.

This permit consists of **Part I** (18 pages including effluent limitations and monitoring requirements); **Attachments A** (USEPA Region 1 Freshwater Chronic Toxicity Test Procedure and Protocol (March, 2013)), **B** (Freshwater Acute Toxicity Test Procedure and Protocol, February 2011), **C** (Reassessment of Technically Based Industrial Discharge Limits) and **D** (NPDES Permit Requirement For Industrial Pretreatment Annual Report) and **Part II** (25 pages including NPDES Part II Standard Conditions).

Signed this 5th day of May, 2014  
/S/SIGNATURE ON FILE

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Ken Moraff, Director  
Office of Ecosystem Protection  
Environmental Protection Agency  
Boston, MA

/S/SIGNATURE ON FILE

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David Ferris, Director  
Massachusetts Wastewater Management Program  
Department of Environmental Protection  
Commonwealth of Massachusetts  
Boston, MA

## PART I

A.1. During the period beginning on the effective date and lasting through expiration, the permittee is authorized to discharge treated effluent from outfall serial number 001 to the Nemasket River. Such discharges shall be limited and monitored as specified below.

<u>EFFLUENT CHARACTERISTIC</u>		<u>EFFLUENT LIMITS</u>			<u>MONITORING REQUIREMENTS<sup>1</sup></u>		
<u>PARAMETER</u>	<u>AVERAGE MONTHLY</u>	<u>AVERAGE WEEKLY</u>	<u>AVERAGE MONTHLY</u>	<u>AVERAGE WEEKLY</u>	<u>MAXIMUM DAILY</u>	<u>MEASUREMENT FREQUENCY</u>	<u>SAMPLE TYPE</u>
FLOW <sup>2</sup>	*****	*****	2.16 MGD	*****	Report MGD	CONTINUOUS	RECORDER
FLOW <sup>2</sup>	*****	*****	Report MGD	*****	*****	CONTINUOUS	RECORDER
CBOD <sub>5</sub> <sup>3</sup>	126 lbs/Day	180 lbs/Day	7.0 mg/l	10 mg/l	15 mg/l	2/WEEK	24-HOUR COMPOSITE <sup>4</sup>
TSS <sup>3</sup>	126 lbs/Day	180 lbs/Day	7.0 mg/l	10 mg/l	15 mg/l	2/WEEK	24-HOUR COMPOSITE <sup>4</sup>
pH RANGE <sup>5</sup>	6.5 - 8.3 SU (SEE PERMIT PARAGRAPH I.A.1.b.)					1/DAY	GRAB
TOTAL RESIDUAL CHLORINE <sup>5,6</sup>	*****	*****	21 ug/l	*****	36 ug/l	1/DAY	GRAB
ESCHERICHIA COLI <sup>5,7</sup> (April 1-October 31)	*****	*****	126 cfu/100 ml	*****	409 cfu/100 ml	1/WEEK	GRAB
TOTAL RECOVERABLE COPPER	*****	*****	34 ug/l	*****	49 ug/l	1/MONTH	24-HOUR COMPOSITE <sup>4</sup>
TOTAL RECOVERABLE LEAD <sup>8</sup>	*****	*****	1.3 ug/l	*****	*****	1/MONTH	24-HOUR COMPOSITE <sup>4</sup>
TOTAL RECOVERABLE CADMIUM <sup>8</sup>	*****	*****	0.7 ug/l	*****	*****	1/MONTH	24-HOUR COMPOSITE <sup>4</sup>
TOTAL RECOVERABLE ALUMINUM	*****	*****	112 ug/l	*****	*****	1/MONTH	24-HOUR COMPOSITE <sup>4</sup>
DISSOLVED OXYGEN (April 1 - October 31)	NOT LESS THAN 6.0 mg/l					1/DAY	GRAB

Sampling Location: Composite samples within post-aeration basin; grab samples at end of post-aeration.

CONTINUED FROM PREVIOUS PAGE

A.1. During the period beginning the effective date and lasting through expiration, the permittee is authorized to discharge from treated effluent from outfall serial number **001** to the Nemasket River. Such discharges shall be limited and monitored as specified below.

<u>EFFLUENT CHARACTERISTIC</u>		<u>EFFLUENT LIMITS</u>				<u>MONITORING REQUIREMENTS <sup>1</sup></u>	
<u>PARAMETER</u>	<u>AVERAGE MONTHLY</u>	<u>AVERAGE WEEKLY</u>	<u>AVERAGE MONTHLY</u>	<u>AVERAGE WEEKLY</u>	<u>MAXIMUM DAILY</u>	<u>MEASUREMENT FREQUENCY</u>	<u>SAMPLE TYPE</u>
PHOSPHORUS, TOTAL <sup>13</sup> (April 1 – October 31)	2.7 lbs/Day	*****	0.15 mg/l	*****	*****	2/WEEK	24-HOUR COMPOSITE <sup>4</sup>
PHOSPHORUS, TOTAL (November 1 – March 31)	18 lbs/Day	*****	1.0 mg/l	*****	*****	1/MONTH	24-HOUR COMPOSITE <sup>4</sup>
AMMONIA-NITROGEN (June 1 - October 31)	18 lbs/Day	18 lbs/Day	1 mg/l	1 mg/l	2 mg/l	1/WEEK	24-HOUR COMPOSITE <sup>4</sup>
AMMONIA-NITROGEN (November 1 - May 31)	Report lbs/Day	*****	Report mg/l	*****	Report mg/l	1/MONTH	24-HOUR COMPOSITE <sup>4</sup>
TOTAL NITROGEN <sup>13</sup> (May 1 – October 31)	90 lbs/day	*****	Report mg/l	*****	Report mg/l	2/WEEK	24-HOUR COMPOSITE <sup>5</sup>
TOTAL NITRATE NITROGEN	Report lbs/day		Report mg/l		Report mg/l		
TOTAL NITRITE NITROGEN	Report lbs/day		Report mg/l		Report mg/l		
TOTAL KJELDAHL NITROGEN	Report lbs/day		Report mg/l		Report mg/l		
TOTAL NITROGEN <sup>13,14</sup> (November 1 – April 30)	Report lbs/day	*****	Report mg/l	*****	Report mg/	1/MONTH	24-HOUR COMPOSITE <sup>5</sup>
TOTAL NITRATE NITROGEN	Report lbs/day		Report mg/l		Report mg/l		
TOTAL NITRITE NITROGEN	Report lbs/day		Report mg/l		Report mg/l		
TOTAL KJELDAHL NITROGEN	Report lbs/day		Report mg/l		Report mg/l		
WHOLE EFFLUENT TOXICITY <sup>9, 10, 11, 12</sup>	Acute LC <sub>50</sub> ≥ 100% Chronic C-NOEC ≥ 53%					4/YEAR	24-HOUR COMPOSITE <sup>4</sup>
Hardness <sup>15</sup>	*****	*****	*****	*****	Report mg/l	4/YEAR	24-HR COMP <sup>4</sup>
Ammonia Nitrogen as N <sup>15</sup>	*****	*****	*****	*****	Report mg/l	4/YEAR	24-HR COMP <sup>4</sup>
Total Recoverable Aluminum <sup>15</sup>	*****	*****	*****	*****	Report mg/l	4/YEAR	24-HR COMP <sup>4</sup>
Total Recoverable Cadmium <sup>15</sup>	*****	*****	*****	*****	Report mg/l	4/YEAR	24-HR COMP <sup>4</sup>
Total Recoverable Copper <sup>15</sup>	*****	*****	*****	*****	Report mg/l	4/YEAR	24-HR COMP <sup>4</sup>
Total Recoverable Lead <sup>15</sup>	*****	*****	*****	*****	Report mg/l	4/YEAR	24-HR COMP <sup>4</sup>
Total Recoverable Nickel <sup>15</sup>	*****	*****	*****	*****	Report mg/l	4/YEAR	24-HR COMP <sup>4</sup>
Total Recoverable Zinc <sup>15</sup>	*****	*****	*****	*****	Report mg/l	4/YEAR	24-HR COMP <sup>4</sup>

## Footnotes:

1. Effluent sampling shall be of the discharge and shall be collected at the point specified on page 2. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

A routine sampling program shall be developed in which samples are taken at the same location, same time and same days of the week each month. Occasional deviations from the routine sampling program are allowed, but the reason for the deviation shall be documented in correspondence appended to the applicable discharge monitoring report.

All samples shall be tested using the analytical methods found in 40 CFR § 136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR § 136.

2. Report annual average, monthly average, and the maximum daily flow. The limit is an annual average, which shall be reported as a rolling average. The value will be calculated as the arithmetic mean of the monthly average flow for the reporting month and the monthly average flows of the previous eleven months.
3. Sampling required for influent and effluent.
4. 24-hour composite samples will consist of at least twenty-four (24) grab samples taken during one consecutive 24-hour period, either collected at equal intervals and combined proportional to flow or continuously collected proportionally to flow.
5. Required for State Certification.
6. Total residual chlorine (TRC) monitoring is required whenever chlorine is added to the treatment process (i.e. TRC sampling is not required if chlorine is not added for disinfection or other purpose). The limitations are in effect year-round.

The minimum level (ML) for total residual chlorine is defined as 20 ug/l. This value is the minimum level for chlorine using EPA approved methods found in the most currently approved version of Standard Methods for the Examination of Water and Wastewater, Method 4500 CL-E and G. One of these methods must be used to determine total residual chlorine. Sample results of 20 ug/l or less shall be reported as zero on the discharge monitoring report.

Chlorination and dechlorination systems shall include an alarm system for indicating system interruptions or malfunctions. Any interruption or malfunction of the chlorine dosing system that may have resulted in levels of chlorine that were inadequate for achieving effective disinfection, or interruptions or malfunctions of the dechlorination system that may have resulted in excessive levels of chlorine in the final effluent shall be reported with the monthly DMRs. The report shall include the date and time of the

interruption or malfunction, the nature of the problem, and the estimated amount of time that the reduced levels of chlorine or dechlorination chemicals occurred.

7. The monthly average limit for E. coli is expressed as a geometric mean. E. coli monitoring shall be conducted concurrently with a total residual chlorine sample.
8. The minimum level (ML) for cadmium and lead is defined as 0.5 ug/l. This value is the minimum level using the Furnace Atomic Absorption analytical method (EPA Method 220.2). This method or other EPA-approved method with an equivalent or lower ML shall be used. Sampling results equal to or less than the ML shall be reported as zero on the Discharge Monitoring Report.
9. The permittee shall conduct chronic and acute toxicity tests *four* times per year. The permittee shall test the *Ceriodaphnia dubia*. Toxicity test samples shall be collected during the **second week of the months of February, May, August and November**. The test results shall be submitted by the last day of the month following the completion of the test. The results are due March 31, June 30, September 30 and December 31, respectively. The chronic test must be performed in accordance with test procedures and protocols specified in **Attachment A** of this permit. The acute test must be performed in accordance with test procedures and protocols specified in **Attachment B** of this permit.

Test Dates Second Week in	Submit Results By:	Test Species	Acute Limit LC <sub>50</sub>	Chronic Limit C-NOEC
February May August November	March 31 June 30 September 30 December 31	<i>Ceriodaphnia dubia</i> (daphnid)  <i>Pimephales promelas</i> (fathead minnow)	≥ 100%	≥ 53%

After submitting **one year** and a **minimum** of four consecutive sets of WET test results, all of which demonstrate compliance with the WET permit limits, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from the EPA that the WET testing requirement has been changed.

10. The LC<sub>50</sub> is the concentration of effluent which causes mortality to 50% of the test organisms. Therefore, a 100% limit means that a sample of 100% effluent (no dilution) shall cause no more than a 50% mortality rate.

11. C-NOEC (chronic-no observed effect concentration) is defined as the highest concentration of toxicant or effluent to which organisms are exposed in a life cycle or partial life cycle test which causes no adverse effect on growth, survival, or reproduction, based on a statistically significant difference from dilution control, at a specific time of observation as determined from hypothesis testing. As described in the EPA *WET Method Manual EPA 821-R-02-013*, Section 10.2.6.2, all test results are to be reviewed and reported in accordance with EPA guidance on the evaluation of the concentration-response relationship. The "53% or greater" limit is defined as a sample which is composed of 53% (or greater) effluent, the remainder being dilution water.
12. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall either follow procedures outlined in **Attachment A (Toxicity Test Procedure and Protocol) Section IV., DILUTION WATER** in order to obtain an individual approval for use of an alternate dilution water, or the permittee shall follow the Self-Implementing Alternative Dilution Water Guidance, which may be used to obtain automatic approval of an alternate dilution water, including the appropriate species for use with that water. This guidance is found in Attachment G of *NPDES Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, which may be found on the EPA Region I web site at <http://www.epa.gov/Region1/enforcementandassistance/dmr.html>. If this guidance is revoked, the permittee shall revert to obtaining individual approval as outlined in **Attachment A**. Any modification or revocation to this guidance will be transmitted to the permittees. However, at any time, the permittee may choose to contact EPA-New England directly using the approach outlined in **Attachment A**.
13. The permittee shall comply with the new 0.15 mg/l total phosphorus limit and the 90 lb/day total nitrogen limit (and the optimization requirement of footnote 14) in accordance with the schedule contained in Section F below. The prior permit total phosphorus limit of 0.2 mg/l (April 1 to October 31) shall remain in effect as an interim limit until the date specified in Section F for compliance with the new 0.15 mg/l total phosphorus limit. Upon the effective date of the permit, and until the date specified in Section F below for compliance with the total nitrogen final limit of 90 lb/day, monitoring for total nitrogen and other nitrogen parameters in the May 1 to October 31 period shall be conducted once per week.
14. The permittee shall operate the treatment facility to reduce the discharge of total nitrogen during the months of November to April to the maximum extent possible. All available treatment equipment in place at the facility shall be operated unless equal or better performance can be achieved in a reduced operational mode. The addition of a carbon source that may be necessary in order to meet the total nitrogen limit during the months of May to October is not required during the months of November to April. The permittee shall comply with this optimization requirement in accordance with the schedule contained in Section F below.
15. For each whole effluent toxicity test the permittee shall report on the appropriate

discharge monitoring report, (DMR), the concentrations of the hardness, total recoverable aluminum, cadmium, nickel, and zinc found in the 100 percent effluent sample. All these aforementioned chemical parameters shall be determined to at least the minimum quantification level shown in **Attachment A**. Also the permittee should note that all chemical parameter results must still be reported in the appropriate toxicity report.

**Part I.A.1. (Continued)**

- a. The discharge shall not cause a violation of the water quality standards of the receiving waters.
  - b. The pH of the effluent shall not be less than 6.5 or greater than 8.3 at any time.
  - c. The discharge shall not cause objectionable discoloration of the receiving waters.
  - d. The effluent shall not contain a visible oil sheen, foam, or floating solids at any time.
  - e. The permittee's treatment facility shall maintain a minimum of 85 percent removal of both total suspended solids and biochemical oxygen demand. The percent removal shall be based on monthly average values.
  - f. The permittee shall minimize the use of chlorine while maintaining adequate bacterial control.
  - g. The results of sampling for any parameter done in accordance with EPA approved methods above its required frequency must also be reported.
  - h. If the average annual flow in any calendar year exceeds 80 percent of the facility's design flow, the permittee shall submit a report to MassDEP by March 31 of the following calendar year describing its plans for further flow increases and describing how it will maintain compliance with the flow limit and all other effluent limitations and conditions.
2. All POTWs must provide adequate notice to the Director of the following:
- a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the Clean Water Act if it were directly discharging those pollutants; and
  - b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
  - c. For purposes of this paragraph, adequate notice shall include information on:

- (1) The quantity and quality of effluent introduced into the POTW; and
  - (2) Any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.
3. Prohibitions Concerning Interference and Pass Through:
  - a. Pollutants introduced into POTW's by a non-domestic source (user) shall not pass through the POTW or interfere with the operation or performance of the works.
4. Toxics Control
  - a. The permittee shall not discharge any pollutant or combination of pollutants in toxic amounts.
  - b. Any toxic components of the effluent shall not result in any demonstrable harm to aquatic life or violate any state or federal water quality standard which has been or may be promulgated. Upon promulgation of any such standard, this permit may be revised or amended in accordance with such standards.
5. Numerical Effluent Limitations for Toxicants

EPA or MassDEP may use the results of the toxicity tests and chemical analyses conducted pursuant to this permit, as well as national water quality criteria developed pursuant to Section 304(a)(1) of the Clean Water Act (CWA), state water quality criteria, and any other appropriate information or data, to develop numerical effluent limitations for any pollutants, including but not limited to those pollutants listed in Appendix D of 40 CFR Part 122.

## **B. UNAUTHORIZED DISCHARGES**

The permittee is authorized to discharge only in accordance with the terms and conditions of this permit and only from the outfall(s) listed in Part I.A.1. of this permit. Discharges of wastewater from any other point sources, including sanitary sewer overflows (SSOs), are not authorized by this permit and shall be reported to EPA and MassDEP in accordance with Section D.1.e.(1) of the General Requirements of this permit (Twenty-four hour reporting).

Notification of SSOs to MassDEP shall be made on its SSO Reporting Form (which includes DEP Regional Office telephone numbers). The reporting form and instruction for its completion may be found on-line at <http://www.mass.gov/eea/agencies/massdep/service/approvals/sanitary-sewer-overflow-bypass-backup-notification.html>.

## **C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM**

Operation and maintenance (O & M) of the sewer system shall be in compliance with the

General Requirements of Part II and the following terms and conditions. The permittee is required to complete the following activities for the collection system which it owns:

1. Maintenance Staff

The permittee shall provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit. Provisions to meet this requirement shall be described in the Collection System O & M Plan required pursuant to Section C.5. below.

2. Preventive Maintenance Program

The permittee shall maintain an ongoing preventive maintenance program to prevent overflows and bypasses caused by malfunctions or failures of the sewer system infrastructure. The program shall include an inspection program designed to identify all potential and actual unauthorized discharges. Plans and programs to meet this requirement shall be described in the Collection System O & M Plan required pursuant to Section C.5. below.

3. Infiltration/Inflow

The permittee shall control infiltration and inflow (I/I) into the sewer system as necessary to prevent high flow related unauthorized discharges from their collection systems and high flow related violations of the wastewater treatment plant's effluent limitations. Plans and programs to control I/I shall be described in the Collection System O & M Plan required pursuant to Section C.5. below.

4. Collection System Mapping

**Within 30 months of the effective date of this permit**, the permittee shall prepare a map of the sewer collection system it owns (see page 1 of this permit for the effective date). The map shall be on a street map of the community, with sufficient detail and at a scale to allow easy interpretation. The collection system information shown on the map shall be based on current conditions and shall be kept up to date and available for review by federal, state, or local agencies. Such map(s) shall include, but not be limited to the following:

- a. All sanitary sewer lines and related manholes;
- b. All combined sewer lines, related manholes, and catch basins;
- c. All combined sewer regulators and any known or suspected connections between the sanitary sewer and storm drain systems (e.g. combination manholes);
- d. All outfalls, including the treatment plant outfall(s), combined sewer overflows (CSOs), and any known or suspected SSOs, including stormwater outfalls that are connected to combination manholes;
- e. All pump stations and force mains;
- f. The wastewater treatment facility(ies);

- g. All surface waters (labeled);
- h. Other major appurtenances such as inverted siphons and air release valves;
- i. A numbering system which uniquely identifies manholes, catch basins, overflow points, regulators and outfalls;
- j. The scale and a north arrow; and
- k. The pipe diameter, date of installation, type of material, distance between manholes, and the direction of flow.

5. Collection System Operation and Maintenance Plan

The permittee shall develop and implement a Collection System Operation and Maintenance Plan.

- a. Within six (6) months of the effective date of the permit, the permittee shall submit to EPA and MassDEP:
  - (1) A description of the collection system management goals, staffing, information management, and legal authorities;
  - (2) A description of the collection system and the overall condition of the collection system including a list of all pump stations and a description of recent studies and construction activities; and
  - (3) A schedule for the development and implementation of the full Collection System O & M Plan including the elements in paragraphs b.1. through b.8. below.
- b. The full Collection System O & M Plan shall be completed, implemented and submitted to EPA and MassDEP within twenty-four (24) months from the effective date of this permit. The Plan shall include:
  - (1) The required submittal from paragraph 5.a. above, updated to reflect current information;
  - (2) A preventive maintenance and monitoring program for the collection system;
  - (3) Description of sufficient staffing necessary to properly operate and maintain the sanitary sewer collection system and how the operation and maintenance program is staffed;
  - (4) Description of funding, the source(s) of funding and provisions for funding sufficient for implementing the plan;
  - (5) Identification of known and suspected overflows and back-ups, including manholes. A description of the cause of the identified overflows and back-ups, corrective actions taken, and a plan for addressing the overflows and back-ups consistent with the requirements of this permit;
  - (6) A description of the permittee's programs for preventing I/I related effluent violations and all unauthorized discharges of wastewater, including overflows and by-passes and the ongoing program to identify and remove sources of I/I. The program shall include an inflow

identification and control program that focuses on the disconnection and redirection of illegal sump pumps and roof down spouts;

- (7) An educational public outreach program for all aspects of I/I control, particularly private inflow; and
- (8) An Overflow Emergency Response Plan to protect public health from overflows and unanticipated bypasses or upsets that exceed any effluent limitation in the permit.

#### 6. Annual Reporting Requirement

The permittee shall submit a summary report of activities related to the implementation of its Collection System O & M Plan during the previous calendar year. The report shall be submitted to EPA and MassDEP annually by March 31. The summary report shall, at a minimum, include:

- a. A description of the staffing levels maintained during the year;
- b. A map and a description of inspection and maintenance activities conducted and corrective actions taken during the previous year;
- c. Expenditures for any collection system maintenance activities and corrective actions taken during the previous year;
- d. A map with areas identified for investigation/action in the coming year;
- e. If treatment plant flow has reached 80% of its design flow (1.73 MGD) based on the annual average flow during the reporting year, or there have been capacity related overflows, submit a calculation of the maximum daily, weekly, and monthly infiltration and the maximum daily, weekly, and monthly inflow for the reporting year; and
- f. A summary of unauthorized discharges during the past year and their causes and a report of any corrective actions taken as a result of the unauthorized discharges reported pursuant to the Unauthorized Discharges section of this permit.

#### 7. Alternate Power Source

In order to maintain compliance with the terms and conditions of this permit, the permittee shall provide an alternative power source(s) sufficient to operate the portion of the publicly owned treatment works<sup>1</sup> it owns and operates.

#### D. SLUDGE CONDITIONS

1. The permittee shall comply with all existing federal and state laws and regulations that apply to sewage sludge use and disposal practices, including EPA regulations promulgated at 40 CFR Part 503, which prescribe “Standards for the Use or Disposal of Sewage Sludge” pursuant to Section 405(d) of the CWA, 33 U.S.C. § 1345(d).
2. If both state and federal requirements apply to the permittee’s sludge use and/or disposal practices, the permittee shall comply with the more stringent of the applicable

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<sup>1</sup> As defined at 40 CFR §122.2, which references the definition at 40 CFR §403.3

requirements.

3. The requirements and technical standards of 40 CFR Part 503 apply to the following sludge use or disposal practices.
  - a. Land application - the use of sewage sludge to condition or fertilize the soil
  - b. Surface disposal - the placement of sewage sludge in a sludge only landfill
  - c. Sewage sludge incineration in a sludge only incinerator
4. The requirements of 40 CFR Part 503 do not apply to facilities which dispose of sludge in a municipal solid waste landfill. 40 CFR § 503.4. These requirements also do not apply to facilities which do not use or dispose of sewage sludge during the life of the permit but rather treat the sludge (e.g. lagoons, reed beds), or are otherwise excluded under 40 CFR § 503.6.
5. The 40 CFR. Part 503 requirements including the following elements:
  - General requirements
  - Pollutant limitations
  - Operational Standards (pathogen reduction requirements and vector attraction reduction requirements)
  - Management practices
  - Record keeping
  - Monitoring
  - Reporting

Which of the 40 C.F.R. Part 503 requirements apply to the permittee will depend upon the use or disposal practice followed and upon the quality of material produced by a facility. The EPA Region 1 Guidance document, "EPA Region 1 - NPDES Permit Sludge Compliance Guidance" (November 4, 1999), may be used by the permittee to assist it in determining the applicable requirements.<sup>2</sup>

6. The sludge shall be monitored for pollutant concentrations (all Part 503 methods) and pathogen reduction and vector attraction reduction (land application and surface disposal) at the following frequency. This frequency is based upon the volume of sewage sludge generated at the facility in dry metric tons per year

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<sup>2</sup>This guidance document is available upon request from EPA Region 1 and may also be found at: <http://www.epa.gov/region1/npdes/permits/generic/sludgeguidance.pdf>

less than 290	1/ year
290 to less than 1,500	1 /quarter
1,500 to less than 15,000	6 /year
15,000 +	1 /month

Sampling of the sewage sludge shall use the procedures detailed in 40 CFR 503.8.

7. Under 40 CFR § 503.9(r), the permittee is a “person who prepares sewage sludge” because it “is ... the person who generates sewage sludge during the treatment of domestic sewage in a treatment works ...” If the permittee contracts with *another* “person who prepares sewage sludge” under 40 CFR § 503.9(r) – i.e., with “a person who derives a material from sewage sludge” – for use or disposal of the sludge, then compliance with Part 503 requirements is the responsibility of the contractor engaged for that purpose. If the permittee does not engage a “person who prepares sewage sludge,” as defined in 40 CFR § 503.9(r), for use or disposal, then the permittee remains responsible to ensure that the applicable requirements in Part 503 are met. 40 CFR § 503.7. If the ultimate use or disposal method is land application, the permittee is responsible for providing the person receiving the sludge with notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.
  
8. The permittee shall submit an annual report containing the information specified in the 40 CFR Part 503 requirements (§ 503.18 (land application), § 503.28 (surface disposal), or § 503.48 (incineration)) by **February 19** (*see also* “EPA Region 1 - NPDES Permit Sludge Compliance Guidance”). Reports shall be submitted to the address contained in the reporting section of the permit. If the permittee engages a contractor or contractors for sludge preparation and ultimate use or disposal, the annual report need contain only the following information:
  - a. Name and address of contractor(s) responsible for sludge preparation, use or disposal
  - b. Quantity of sludge (in dry metric tons ) from the POTW that is transferred to the sludge contractor(s), and the method(s) by which the contractor will prepare and use or dispose of the sewage sludge.

#### **E. INDUSTRIAL USERS AND PRETREATMENT PROGRAM**

1. The permittee shall develop and enforce specific effluent limits (local limits) for Industrial User(s), and all other users, as appropriate, which together with appropriate changes in the POTW Treatment Plant's Facilities or operation, are necessary to ensure continued compliance with the POTW's NPDES permit or sludge use or disposal practices. Specific local limits shall not be developed and enforced without individual notice to persons or groups who have requested such notice and an opportunity to respond. Within (120 days of the effective date of this permit), the permittee shall prepare and submit a written technical evaluation to the EPA analyzing the need to revise local limits. As part of this evaluation, the permittee shall assess how the POTW performs with respect to influent and

effluent of pollutants, water quality concerns, sludge quality, sludge processing concerns/inhibition, biomonitoring results, activated sludge inhibition, worker health and safety and collection system concerns. In preparing this evaluation, the permittee shall complete and submit the attached form (Attachment B) with the technical evaluation to assist in determining whether existing local limits need to be revised. Justifications and conclusions should be based on actual plant data if available and should be included in the report. Should the evaluation reveal the need to revise local limits, the permittee shall complete the revisions within 120 days of notification by EPA and submit the revisions to EPA for approval. The Permittee shall carry out the local limits revisions in accordance with EPA's Local Limit Development Guidance (July 2004).

2. The permittee shall implement the Industrial Pretreatment Program in accordance with the legal authorities, policies, procedures, and financial provisions described in the permittee's approved Pretreatment Program, and the General Pretreatment Regulations, 40 CFR 403. At a minimum, the permittee must perform the following duties to properly implement the Industrial Pretreatment Program (IPP):
  - a. Carry out inspection, surveillance, and monitoring procedures which will determine independent of information supplied by the industrial user, whether the industrial user is in compliance with the Pretreatment Standards. At a minimum, all significant industrial users shall be sampled and inspected at the frequency established in the approved IPP but in no case less than once per year and maintain adequate records.
  - b. Issue or renew all necessary industrial user control mechanisms within 90 days of their expiration date or within 180 days after the industry has been determined to be a significant industrial user.
  - c. Obtain appropriate remedies for noncompliance by any industrial user with any pretreatment standard and/or requirement.
  - d. Maintain an adequate revenue structure for continued implementation of the Pretreatment Program.
3. The permittee shall provide the EPA and MassDEP with an annual report describing the permittee's pretreatment program activities for the twelve (12) month period ending 60 days prior to the due date in accordance with 403.12(i). The annual report shall be consistent with the format described in Attachment D of this permit and shall be submitted no later than **October 1** of each year.
4. The permittee must obtain approval from EPA prior to making any significant changes to the industrial pretreatment program in accordance with 40 CFR 403.18(c).
5. The permittee must assure that applicable National Categorical Pretreatment Standards are met by all categorical industrial users of the POTW. These standards are published in the Federal Regulations at 40 CFR 405 et. seq.

6. The permittee must modify its pretreatment program, if necessary, to conform to all changes in the Federal Regulations that pertain to the implementation and enforcement of the industrial pretreatment program. The permittee must provide EPA, in writing, within 180 days of this permit's effective date proposed changes, if applicable, to the permittee's pretreatment program deemed necessary to assure conformity with current Federal Regulations. At a minimum, the permittee must address in its written submission the following areas: (1) Enforcement response plan; (2) revised sewer use ordinances; and (3) slug control evaluations. The permittee will implement these proposed changes pending EPA Region I's approval under 40 CFR 403.18. This submission is separate and distinct from any local limits analysis submission described in Part I.E.1.

#### **F. COMPLIANCE SCHEDULE**

In order to comply with the new permit limits for total phosphorus (0.15 mg/l monthly average) and total nitrogen (90 lb/day monthly average), the permittee shall take the following actions:

1. Within one year of the effective date of the permit, the permittee shall complete design of the facility improvements required to achieve the new total phosphorus and total nitrogen permit limits and shall submit the design to MassDEP for written approval of the proposed improvements in accordance with a BRPWP68 application.
2. Within two years of the effective date of the permit, the permittee shall initiate construction of the facility improvements required to achieve the new total phosphorus and total nitrogen permit limits.
3. Within three years of the effective date of the permit, the permittee shall submit to EPA and MassDEP a status report relative to construction of the facility improvements required to achieve the new total phosphorus and total nitrogen permit limits.
4. Within four years of the effective date of the permit, the permittee shall complete construction of the facility improvements required to achieve the new total phosphorus and total nitrogen permit limits.
5. The new permit limits for total phosphorus and total nitrogen shall go into effect fifty-four (54) months from the effective date of the permit. Until such time the permittee shall meet an interim phosphorus limit of 0.2 mg/l (April to October). The permittee shall also, as an interim measure, investigate alternative operational approaches to reduce nitrogen discharges using its existing equipment and implement operational changes as appropriate to optimize nitrogen removal at the existing facility. A report describing the optimization investigation and including a schedule for implementing any recommended actions shall be submitted within one year of the effective date of the permit, and a report on the results of the implementation shall be submitted within three years of the effective date of the permit.

6. The permittee shall notify EPA and MassDEP of its compliance or noncompliance with the requirements of this part in writing no later than 14 days after each interim or final date of compliance.

## G. MONITORING AND REPORTING

1. **For a period of 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, a web-based tool that allows permittees to electronically submit discharge monitoring reports (DMRs) and other required reports via a secure internet connection. **Beginning no later than one year after the effective date of the permit**, the permittee shall begin reporting using NetDMR, unless the facility is able to demonstrate a reasonable basis that precludes the use of NetDMR for submitting DMRs and reports. Specific requirements regarding submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

- a. Submittal of Reports Using NetDMR

NetDMR is accessed from: <http://www.epa.gov/netdmr>. **Within one year of the effective date of this permit**, the permittee shall begin submitting DMRs and reports required under this permit electronically to EPA using NetDMR, unless the facility 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”).

DMRs shall be submitted electronically to EPA 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, including the MassDEP Monthly Operations and Maintenance Report, 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 and will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees shall continue to send hard copies of reports other than DMRs (including Monthly Operation and Maintenance Reports) to MassDEP until further notice from MassDEP.

As NetDMR requires that reports be submitted as attachments to a DMR, any report required under this permit shall be considered to be timely if it is electronically submitted with the next DMR submitted no later than the next DMR due date (15<sup>th</sup> of the month) following the permit-specified report due date.

- b. Submittal of NetDMR Opt-Out Requests

Opt-out requests must be submitted in writing to EPA for written approval at least sixty (60) days prior to the date a facility would be required under this permit to begin using NetDMR. This demonstration shall be valid for twelve (12) months

from the date of EPA approval and shall thereupon expire. At such time, DMRs and reports shall be submitted electronically to EPA unless the permittee submits a renewed opt-out request and such request be approved by EPA. All opt-out requests should be sent to the following addresses:

**Attn: NetDMR Coordinator**  
**U.S. Environmental Protection Agency, Water Technical Unit**  
**5 Post Office Square, Suite 100 (OES04-4)**  
**Boston, MA 02109-3912**

And

**Massachusetts Department of Environmental Protection**  
**Surface Water Discharge Permit Program**  
**627 Main Street, 2<sup>nd</sup> Floor**  
**Worcester, Massachusetts 01608**

c. Submittal of Reports in Hard Copy Form

While we do not anticipate the need for the permittee to submit hard copies of reports to EPA, any hard copies that are submitted to EPA shall be submitted to the Director at the following address:

**U.S. Environmental Protection Agency**  
**Water Technical Unit (OES04-SMR)**  
**5 Post Office Square - Suite 100**  
**Boston, MA 02109-3912**

Duplicate signed copies of all reports or notifications required above shall be submitted to the State at the following addresses:

**MassDEP – Southeast Region**  
**Bureau of Resource Protection (Municipal)**  
**20 Riverside Drive**  
**Lakeville, MA 02347**

Copies of toxicity tests and nitrogen optimization reports only to:

**Massachusetts Department of Environmental Protection**  
**Surface Water Discharge Permit Program**  
**627 Main Street, 2<sup>nd</sup> Floor**  
**Worcester, Massachusetts 01608**

Any verbal reports, if required in **Parts I** and/or **II** of this permit, shall be made to both EPA-New England and to MassDEP.

**H. STATE PERMIT CONDITIONS**

1. This authorization to discharge includes two separate and independent permit authorizations. The two permit authorizations are (i) a federal National Pollutant Discharge Elimination System permit issued by the U.S. Environmental Protection Agency (EPA) pursuant to the Federal Clean Water Act, 33 U.S.C. §§1251 et seq.; and (ii) an identical state surface water discharge permit issued by the Commissioner of the Massachusetts Department of Environmental Protection (MassDEP) pursuant to the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53, and 314 C.M.R. 3.00. All of the requirements contained in this authorization, as well as the standard conditions contained in 314 CMR 3.19, are hereby incorporated by reference into this state surface water discharge permit.
2. This authorization also incorporates the state water quality certification issued by MassDEP under § 401(a) of the Federal Clean Water Act, 40 C.F.R. 124.53, M.G.L. c. 21, § 27 and 314 CMR 3.07. All of the requirements (if any) contained in MassDEP's water quality certification for the permit are hereby incorporated by reference into this state surface water discharge permit as special conditions pursuant to 314 CMR 3.11.
3. Each agency shall have the independent right to enforce the terms and conditions of this permit. Any modification, suspension or revocation of this permit shall be effective only with respect to the agency taking such action, and shall not affect the validity or status of this permit as issued by the other agency, unless and until each agency has concurred in writing with such modification, suspension or revocation. In the event any portion of this permit is declared invalid, illegal or otherwise issued in violation of state law such permit shall remain in full force and effect under federal law as a NPDES Permit issued by the U.S. Environmental Protection Agency. In the event this permit is declared invalid, illegal or otherwise issued in violation of federal law, this permit shall remain in full force and effect under state law as a permit issued by the Commonwealth of Massachusetts.

# FRESHWATER CHRONIC TOXICITY TEST PROCEDURE AND PROTOCOL USEPA Region 1

## I. GENERAL REQUIREMENTS

The permittee shall be responsible for the conduct of acceptable chronic toxicity tests using three fresh samples collected during each test period. The following tests shall be performed as prescribed in Part 1 of the NPDES discharge permit in accordance with the appropriate test protocols described below. (Note: the permittee and testing laboratory should review the applicable permit to determine whether testing of one or both species is required).

- **Daphnid (Ceriodaphnia dubia) Survival and Reproduction Test.**
- **Fathead Minnow (Pimephales promelas) Larval Growth and Survival Test.**

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

## II. METHODS

Methods to follow are those recommended by EPA in: Short Term Methods For Estimating The Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms, Fourth Edition, October 2002. United States Environmental Protection Agency. Office of Water, Washington, D.C., EPA 821-R-02-013. The methods are available on-line at <http://www.epa.gov/waterscience/WET/> . Exceptions and clarification are stated herein.

## III. SAMPLE COLLECTION AND USE

A total of three fresh samples of effluent and receiving water are required for initiation and subsequent renewals of a freshwater, chronic, toxicity test. The receiving water control sample must be collected immediately upstream of the permitted discharge's zone of influence. Fresh samples are recommended for use on test days 1, 3, and 5. However, provided a total of three samples are used for testing over the test period, an alternate sampling schedule is acceptable. The acceptable holding times until initial use of a sample are 24 and 36 hours for on-site and off-site testing, respectively. A written waiver is required from the regulating authority for any hold time extension. All test samples collected may be used for 24, 48 and 72 hour renewals after initial use. All samples held for use beyond the day of sampling shall be refrigerated and maintained at a temperature range of 0-6° C.

All samples submitted for chemical and physical analyses will be analyzed according to Section VI of this protocol.

Sampling guidance dictates that, where appropriate, aliquots for the analysis required in this protocol shall be split from the samples, containerized and immediately preserved, or analyzed as per 40 CFR Part 136. EPA approved test methods require that samples collected for metals analyses be preserved immediately after collection. Testing for the presence of total residual chlorine (TRC) must be analyzed immediately or as soon as possible, for all effluent samples, prior to WET testing. TRC analysis may be performed on-site or by the toxicity testing laboratory and the samples must be dechlorinated, as necessary, using sodium thiosulfate prior to sample use for toxicity testing.

If any of the renewal samples are of sufficient potency to cause lethality to 50 percent or more of the test organisms in any of the test treatments for either species or, if the test fails to meet its permit limits, then chemical analysis for total metals (originally required for the initial sample only in Section VI) will be required on the renewal sample(s) as well.

#### IV. DILUTION WATER

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

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

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

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

If the receiving water diluent is found to be, or suspected to be toxic or unreliable an ADW of known quality with hardness similar to that of the receiving water may be substituted. Substitution is species specific meaning that the decision to use ADW is made for each species and is based on the toxic response of that particular species. Substitution to an ADW is authorized in two cases. The first is the case where repeating a test due to toxicity in the site dilution water requires an **immediate decision** for ADW use be made by the permittee and toxicity testing laboratory. The second is in the case where two of the most recent documented incidents of unacceptable site dilution water toxicity requires ADW use in future WET testing.

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

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

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

and

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

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

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

## **V. TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA**

Method specific test conditions and TAC are to be followed and adhered to as specified in the method guidance document, EPA 821-R-02-013. If a test does not meet TAC the test must be repeated with fresh samples within 30 days of the initial test completion date.

### **V.1. Use of Reference Toxicity Testing**

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

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

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

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

#### V.1.a. Use of Concurrent Reference Toxicity Testing

In the case where concurrent reference toxicity testing is required due to a low frequency of testing with a particular method, if the reference toxicity test results fall slightly outside of laboratory established control limits, but the primary test met the TAC, the results of the primary test will be considered acceptable. However, if the results of the concurrent test fall well outside the established **upper** control limits i.e.  $\geq 3$  standard deviations for IC25 values and  $\geq$  two concentration intervals for NOECs, and even though the primary test meets TAC, the primary test will be considered unacceptable and must be repeated.

V.2. For the *C. dubia* test, the determination of TAC and formal statistical analyses must be performed using only the first three broods produced.

V.3. Test treatments must include 5 effluent concentrations and a dilution water control. An additional test treatment, at the permitted effluent concentration (% effluent), is required if it is not included in the dilution series.

## VI. CHEMICAL ANALYSIS

As part of each toxicity test's daily renewal procedure, pH, specific conductance, dissolved oxygen (DO) and temperature must be measured at the beginning and end of each 24-hour period in each test treatment and the control(s).

The additional analysis that must be performed under this protocol is as specified and noted in the table below.

<u>Parameter</u>	Effluent	Receiving Water	ML (mg/l)
Hardness <sup>1, 4</sup>	x	x	0.5
Total Residual Chlorine (TRC) <sup>2, 3, 4</sup>	x		0.02
Alkalinity <sup>4</sup>	x	x	2.0
pH <sup>4</sup>	x	x	--
Specific Conductance <sup>4</sup>	x	x	--
Total Solids <sup>6</sup>	x		--
Total Dissolved Solids <sup>6</sup>	x		--
Ammonia <sup>4</sup>	x	x	0.1
Total Organic Carbon <sup>6</sup>	x	x	0.5
Total Metals <sup>5</sup>			
Cd	x	x	0.0005
Pb	x	x	0.0005
Cu	x	x	0.003
Zn	x	x	0.005
Ni	x	x	0.005
Al	x	x	0.02

Other as permit requires

#### Notes:

1. Hardness may be determined by:

- APHA Standard Methods for the Examination of Water and Wastewater , 21st Edition
    - Method 2340B (hardness by calculation)
    - Method 2340C (titration)
2. Total Residual Chlorine may be performed using any of the following methods provided the required minimum limit (ML) is met.
    - APHA Standard Methods for the Examination of Water and Wastewater , 21st Edition
      - Method 4500-CL E Low Level Amperometric Titration
      - Method 4500-CL G DPD Colorimetric Method
    - USEPA 1983. Manual of Methods Analysis of Water and Wastes
      - Method 330.5
  3. Required to be performed on the sample used for WET testing prior to its use for toxicity testing
  4. Analysis is to be performed on samples and/or receiving water, as designated in the table above, from all three sampling events.
  5. Analysis is to be performed on the initial sample(s) only unless the situation arises as stated in Section III, paragraph 4
  6. Analysis to be performed on initial samples only

## **VII. TOXICITY TEST DATA ANALYSIS AND REVIEW**

### **A. Test Review**

#### **1. Concentration / Response Relationship**

A concentration/response relationship evaluation is required for test endpoint determinations from both Hypothesis Testing and Point Estimate techniques. The test report is to include documentation of this evaluation in support of the endpoint values reported. The dose-response review must be performed as required in Section 10.2.6 of EPA-821-R-02-013. Guidance for this review can be found at <http://water.epa.gov/scitech/methods/cwa/> . In most cases, the review will result in one of the following three conclusions: (1) Results are reliable and reportable; (2) Results are anomalous and require explanation; or (3) Results are inconclusive and a retest with fresh samples is required.

#### **2. Test Variability (Test Sensitivity)**

This review step is separate from the determination of whether a test meets or does not meet TAC. Within test variability is to be examined for the purpose of evaluating test sensitivity. This evaluation is to be performed for the sub-lethal hypothesis testing endpoints reproduction and growth as required by the permit. The test report is to include documentation of this evaluation to support that the endpoint values reported resulted from a toxicity test of adequate sensitivity. This evaluation must be performed as required in Section 10.2.8 of EPA-821-R-02-013.

To determine the adequacy of test sensitivity, USEPA requires the calculation of test percent minimum significant difference (PMSD) values. In cases where NOEC determinations are made based on a non-parametric technique, calculation of a test PMSD value, for the sole purpose of assessing test sensitivity, shall be calculated using a comparable parametric statistical analysis technique. The calculated test PMSD is then compared to the upper and lower PMSD bounds shown for freshwater tests in Section 10.2.8.3, p. 52, Table 6 of EPA-821-R-02-013. The comparison will yield one of the following determinations.

- The test PMSD exceeds the PMSD upper bound test variability criterion in Table 6, the test results are considered highly variable and the test may not be sensitive enough to determine the presence of toxicity at the permit limit concentration (PLC). If the test results indicate that the discharge is not toxic at the PLC, then the test is considered insufficiently sensitive and must be repeated within 30 days of the initial test completion using fresh samples. If the test results indicate that the discharge is toxic at the PLC, the test is considered acceptable and does not have to be repeated.
- The test PMSD falls below the PMSD lower bound test variability criterion in Table 6, the test is determined to be very sensitive. In order to determine which treatment(s) are statistically significant and which are not, for the purpose of reporting a NOEC, the relative percent difference (RPD) between the control and each treatment must be calculated and compared to the lower PMSD boundary. See *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the NPDES Program*, EPA 833-R-00-003, June 2002, Section 6.4.2. The following link: [Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the NPDES Program](#) can be used to locate the USEPA website containing this document. If the RPD for a treatment falls below the PMSD lower bound, the difference is considered statistically insignificant. If the RPD for a treatment is greater than the PMSD lower bound, then the treatment is considered statistically significant.
- The test PMSD falls within the PMSD upper and lower bounds in Table 6, the sub-lethal test endpoint values shall be reported as is.

## B. Statistical Analysis

### 1. General - Recommended Statistical Analysis Method

Refer to general data analysis flowchart, EPA 821-R-02-013, page 43

For discussion on Hypothesis Testing, refer to EPA 821-R-02-013, Section 9.6

For discussion on Point Estimation Techniques, refer to EPA 821-R-02-013, Section 9.7

### 2. *Pimephales promelas*

Refer to survival hypothesis testing analysis flowchart, EPA 821-R-02-013, page 79

Refer to survival point estimate techniques flowchart, EPA 821-R-02-013, page 80

Refer to growth data statistical analysis flowchart, EPA 821-R-02-013, page 92

### 3. *Ceriodaphnia dubia*

Refer to survival data testing flowchart, EPA 821-R-02-013, page 168

Refer to reproduction data testing flowchart, EPA 821-R-02-013, page 173

## VIII. TOXICITY TEST REPORTING

A report of results must include the following:

- Test summary sheets (2007 DMR Attachment F) which includes:
  - Facility name
  - NPDES permit number
  - Outfall number
  - Sample type
  - Sampling method
  - Effluent TRC concentration
  - Dilution water used
  - Receiving water name and sampling location
  - Test type and species
  - Test start date
  - Effluent concentrations tested (%) and permit limit concentration
  - Applicable reference toxicity test date and whether acceptable or not
  - Age, age range and source of test organisms used for testing
  - Results of TAC review for all applicable controls
  - Test sensitivity evaluation results (test PMSD for growth and reproduction)
  - Permit limit and toxicity test results
  - Summary of test sensitivity and concentration response evaluation

In addition to the summary sheets the report must include:

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

# USEPA REGION 1 FRESHWATER ACUTE TOXICITY TEST PROCEDURE AND PROTOCOL

## I. GENERAL REQUIREMENTS

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

- **Daphnid (Ceriodaphnia dubia) definitive 48 hour test.**
- **Fathead Minnow (Pimephales promelas) definitive 48 hour test.**

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

## II. METHODS

The permittee shall use 40 CFR Part 136 methods. Methods and guidance may be found at:

[http://water.epa.gov/scitech/methods/cwa/wet/disk2\\_index.cfm](http://water.epa.gov/scitech/methods/cwa/wet/disk2_index.cfm)

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

## III. SAMPLE COLLECTION

A discharge sample shall be collected. Aliquots shall be split from the sample, containerized and preserved (as per 40 CFR Part 136) for chemical and physical analyses required. The remaining sample shall be measured for total residual chlorine and dechlorinated (if detected) in the laboratory using sodium thiosulfate for subsequent toxicity testing. (Note that EPA approved test methods require that samples collected for metals analyses be preserved immediately after collection.) Grab samples must be used for pH, temperature, and total residual chlorine (as per 40 CFR Part 122.21).

Standard Methods for the Examination of Water and Wastewater describes dechlorination of samples (APHA, 1992). Dechlorination can be achieved using a ratio of 6.7 mg/L anhydrous sodium thiosulfate to reduce 1.0 mg/L chlorine. If dechlorination is necessary, a thiosulfate control (maximum amount of thiosulfate in lab control or receiving water) must also be run in the WET test.

All samples held overnight shall be refrigerated at 1- 6°C.

#### IV. DILUTION WATER

A grab sample of dilution water used for acute toxicity testing shall be collected from the receiving water at a point immediately upstream of the permitted discharge's zone of influence at a reasonably accessible location. Avoid collection near areas of obvious road or agricultural runoff, storm sewers or other point source discharges and areas where stagnant conditions exist. In the case where an alternate dilution water has been agreed upon an additional receiving water control (0% effluent) must also be tested.

If the receiving water diluent is found to be, or suspected to be toxic or unreliable, an alternate standard dilution water of known quality with a hardness, pH, conductivity, alkalinity, organic carbon, and total suspended solids similar to that of the receiving water may be substituted **AFTER RECEIVING WRITTEN APPROVAL FROM THE PERMIT ISSUING AGENCY(S)**. Written requests for use of an alternate dilution water should be mailed with supporting documentation to the following address:

Director  
Office of Ecosystem Protection (CAA)  
U.S. Environmental Protection Agency-New England  
5 Post Office Sq., Suite 100 (OEP06-5)  
Boston, MA 02109-3912

and

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

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

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

It may prove beneficial to have the proposed dilution water source screened for suitability prior to toxicity testing. EPA strongly urges that screening be done prior to set up of a full definitive toxicity test any time there is question about the dilution water's ability to support acceptable performance as outlined in the 'test acceptability' section of the protocol.

#### V. TEST CONDITIONS

The following tables summarize the accepted daphnid and fathead minnow toxicity test conditions and test acceptability criteria:

**EPA NEW ENGLAND EFFLUENT TOXICITY TEST CONDITIONS FOR THE DAPHNID, CERIODAPHNIA DUBIA 48 HOUR ACUTE TESTS<sup>1</sup>**

1.	Test type	Static, non-renewal
2.	Temperature (°C)	20 ± 1°C or 25 ± 1°C
3.	Light quality	Ambient laboratory illumination
4.	Photoperiod	16 hour light, 8 hour dark
5.	Test chamber size	Minimum 30 ml
6.	Test solution volume	Minimum 15 ml
7.	Age of test organisms	1-24 hours (neonates)
8.	No. of daphnids per test chamber	5
9.	No. of replicate test chambers per treatment	4
10.	Total no. daphnids per test concentration	20
11.	Feeding regime	As per manual, lightly feed YCT and <u>Selenastrum</u> to newly released organisms while holding prior to initiating test
12.	Aeration	None
13.	Dilution water <sup>2</sup>	Receiving water, other surface water, synthetic water adjusted to the hardness and alkalinity of the receiving water (prepared using either Millipore Milli-Q <sup>R</sup> or equivalent deionized water and reagent grade chemicals according to EPA acute toxicity test manual) or deionized water combined with mineral water to appropriate hardness.
14.	Dilution series	≥ 0.5, must bracket the permitted RWC
15.	Number of dilutions	5 plus receiving water and laboratory water control and thiosulfate control, as necessary. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution

series.

- |                            |   |
|----------------------------|---|
| 16. Effect measured        | Mortality-no movement of body or appendages on gentle prodding  |
| 17. Test acceptability     | 90% or greater survival of test organisms in dilution water control solution  |
| 18. Sampling requirements  | For on-site tests, samples must be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples must first be used within 36 hours of collection. |
| 19. Sample volume required | Minimum 1 liter   |

---

Footnotes:

1. Adapted from EPA-821-R-02-012.
2. Standard prepared dilution water must have hardness requirements to generally reflect the characteristics of the receiving water.

**EPA NEW ENGLAND TEST CONDITIONS FOR THE FATHEAD MINNOW  
(PIMEPHALES PROMELAS) 48 HOUR ACUTE TEST<sup>1</sup>**

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1. Test Type	Static, non-renewal
2. Temperature (°C)	20 ± 1 ° C or 25 ± 1°C
3. Light quality	Ambient laboratory illumination
4. Photoperiod	16 hr light, 8 hr dark
5. Size of test vessels	250 mL minimum
6. Volume of test solution	Minimum 200 mL/replicate
7. Age of fish	1-14 days old and age within 24 hrs of each other
8. No. of fish per chamber	10
9. No. of replicate test vessels per treatment	4
10. Total no. organisms per concentration	40
11. Feeding regime	As per manual, lightly feed test age larvae using concentrated brine shrimp nauplii while holding prior to initiating test
12. Aeration	None, unless dissolved oxygen (D.O.) concentration falls below 4.0 mg/L, at which time gentle single bubble aeration should be started at a rate of less than 100 bubbles/min. (Routine D.O. check is recommended.)
13. dilution water <sup>2</sup>	Receiving water, other surface water, synthetic water adjusted to the hardness and alkalinity of the receiving water (prepared using either Millipore Milli-Q <sup>R</sup> or equivalent deionized and reagent grade chemicals according to EPA acute toxicity test manual) or deionized water combined with mineral water to appropriate hardness.
14. Dilution series	≥ 0.5, must bracket the permitted RWC

- |                            |  |
|----------------------------|--|
| 15. Number of dilutions    | 5 plus receiving water and laboratory water control and thiosulfate control, as necessary. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution series. |
| 16. Effect measured        | Mortality-no movement on gentle prodding   |
| 17. Test acceptability     | 90% or greater survival of test organisms in dilution water control solution   |
| 18. Sampling requirements  | For on-site tests, samples must be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples are used within 36 hours of collection.  |
| 19. Sample volume required | Minimum 2 liters   |

---

Footnotes:

1. Adapted from EPA-821-R-02-012
2. Standard dilution water must have hardness requirements to generally reflect characteristics of the receiving water.

## VI. CHEMICAL ANALYSIS

At the beginning of a static acute toxicity test, pH, conductivity, total residual chlorine, oxygen, hardness, alkalinity and temperature must be measured in the highest effluent concentration and the dilution water. Dissolved oxygen, pH and temperature are also measured at 24 and 48 hour intervals in all dilutions. The following chemical analyses shall be performed on the 100 percent effluent sample and the upstream water sample for each sampling event.

<u>Parameter</u>	Effluent	Receiving Water	ML (mg/l)
Hardness <sup>1</sup>	x	x	0.5
Total Residual Chlorine (TRC) <sup>2, 3</sup>	x		0.02
Alkalinity	x	x	2.0
pH	x	x	--
Specific Conductance	x	x	--
Total Solids	x		--
Total Dissolved Solids	x		--
Ammonia	x	x	0.1
Total Organic Carbon	x	x	0.5
Total Metals			
Cd	x	x	0.0005
Pb	x	x	0.0005
Cu	x	x	0.003
Zn	x	x	0.005
Ni	x	x	0.005
Al	x	x	0.02
Other as permit requires			

### Notes:

1. Hardness may be determined by:
  - APHA Standard Methods for the Examination of Water and Wastewater , 21st Edition
    - Method 2340B (hardness by calculation)
    - Method 2340C (titration)
2. Total Residual Chlorine may be performed using any of the following methods provided the required minimum limit (ML) is met.
  - APHA Standard Methods for the Examination of Water and Wastewater , 21st Edition
    - Method 4500-CL E Low Level Amperometric Titration
    - Method 4500-CL G DPD Colorimetric Method
3. Required to be performed on the sample used for WET testing prior to its use for toxicity testing.

## **VII. TOXICITY TEST DATA ANALYSIS**

### LC50 Median Lethal Concentration (Determined at 48 Hours)

Methods of Estimation:

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

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

### No Observed Acute Effect Level (NOAEL)

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

## **VIII. TOXICITY TEST REPORTING**

A report of the results will include the following:

- Description of sample collection procedures, site description
- Names of individuals collecting and transporting samples, times and dates of sample collection and analysis on chain-of-custody
- General description of tests: age of test organisms, origin, dates and results of standard toxicant tests; light and temperature regime; other information on test conditions if different than procedures recommended. Reference toxicant test data should be included.
- All chemical/physical data generated. (Include minimum detection levels and minimum quantification levels.)
- Raw data and bench sheets.
- Provide a description of dechlorination procedures (as applicable).
- Any other observations or test conditions affecting test outcome.

**EPA - New England**

**Reassessment of Technically Based Industrial Discharge Limits**

Under 40 CFR §122.21(j)(4), all Publicly Owned Treatment Works (POTWs) with approved Industrial Pretreatment Programs (IPPs) shall provide the following information to the Director: a written evaluation of the need to revise local industrial discharge limits under 40 CFR §403.5(c)(1).

Below is a form designed by the U.S. Environmental Protection Agency (EPA - New England) to assist POTWs with approved IPPs in evaluating whether their existing Technically Based Local Limits (TBLLs) need to be recalculated. The form allows the permittee and EPA to evaluate and compare pertinent information used in previous TBLLs calculations against present conditions at the POTW.

**Please read direction below before filling out form.**

**ITEM I.**

- \* In Column (1), list what your POTW's influent flow rate was when your existing TBLLs were calculated. In Column (2), list your POTW's present influent flow rate. Your current flow rate should be calculated using the POTW's average daily flow rate from the previous 12 months.
- \* In Column (1) list what your POTW's SIU flow rate was when your existing TBLLs were calculated. In Column (2), list your POTW's present SIU flow rate.
- \* In Column (1), list what dilution ratio and/or 7Q10 value was used in your old/expired NPDES permit. In Column (2), list what dilution ration and/or 7Q10 value is presently being used in your new/reissued NPDES permit.

The 7Q10 value is the lowest seven day average flow rate, in the river, over a ten year period. The 7Q10 value and/or dilution ratio used by EPA in your new NPDES permit can be found in your NPDES permit "Fact Sheet."

- \* In Column (1), list the safety factor, if any, that was used when your existing TBLLs were calculated.
- \* In Column (1), note how your bio-solids were managed when your existing TBLLs were calculated. In Column (2), note how your POTW is presently disposing of its biosolids and how your POTW will be disposing of its biosolids in the future.

**ITEM II.**

- \* List what your existing TBLLs are - as they appear in your current Sewer Use Ordinance (SUO).

**ITEM III.**

- \* Identify how your existing TBLLs are allocated out to your industrial community. Some pollutants may be allocated differently than others, if so please explain.

**ITEM IV.**

- \* Since your existing TBLLs were calculated, identify the following in detail:
  - (1) if your POTW has experienced any upsets, inhibition, interference or pass-through as a result of an industrial discharge.
  - (2) if your POTW is presently violating any of its current NPDES permit limitations - include toxicity.

**ITEM V.**

- \* Using current sampling data, list in Column (1) the average and maximum amount of pollutants (in pounds per day) received in the POTW's influent. Current sampling data is defined as data obtained over the last 24 month period.

All influent data collected and analyzed must be in accordance with 40 CFR §136. Sampling data collected should be analyzed using the lowest possible detection method(s), e.g. graphite furnace.

- \* Based on your existing TBLLs, as presented in Item II., list in Column (2), for each pollutant the Maximum Allowable Headwork Loading (MAHL) values derived from an applicable environmental criteria or standard, e.g. water quality, sludge, NPDES, inhibition, etc. For more information, please see p.,3-28 in EPA's Guidance Manual on the Development and Implementation of Local Limits Under the Pretreatment Program, 12/87.

**Item VI.**

- \* Using current sampling data, list in Column (1) the average and maximum amount of pollutants (in micrograms per liter) present your POTW's effluent. Current sampling data is defined as data obtained during the last 24 month period. All effluent data collected and analyzed must be in accordance with 40 CFR §136. Sampling data collected should be analyzed using the lowest possible detection method(s), e.g. graphite furnace.
- \* List in Column (2A) what the Water Quality Standards (WQS) were (in micrograms per liter) when your TBLLs were calculated, please note what hardness value was used at that

time. Hardness should be expressed in milligram per liter of Calcium Carbonate.

List in Column (2B) the current WQSs or "Chronic Gold Book" values for each pollutant multiplied by the dilution ratio used in your new/reissued NPDES permit. For example, with a dilution ratio of 25:1 at a hardness of 25 mg/l - Calcium Carbonate (copper's chronic WQS equals 6.54 ug/l) the chronic NPDES permit limit for copper would equal 156.25 ug/l.

**ITEM VII.**

- \* In Column (1), list all pollutants (in micrograms per liter) limited in your new/reissued NPDES permit. In Column (2), list all pollutants limited in your old/expired NPDES permit.

**ITEM VIII.**

- \* Using current sampling data, list in Column (1) the average and maximum amount of pollutants in your POTW's biosolids. Current data is defined as data obtained during the last 24 month period. Results are to be expressed as total dry weight.

All biosolids data collected and analyzed must be in accordance with 40 CFR §136.

In Column (2A), list current State and/or Federal sludge standards that your facility's biosolids must comply with. Also note how your POTW currently manages the disposal of its biosolids. If your POTW is planning on managing its biosolids differently, list in Column (2B) what your new biosolids criteria will be and method of disposal.

In general, please be sure the units reported are correct and all pertinent information is included in your evaluation. If you have any questions, please contact your pretreatment representative at EPA - New England.

**REASSESSMENT OF TECHNICALLY BASED LOCAL LIMITS  
(TBLLs)**

POTW Name & Address : \_\_\_\_\_

NPDES PERMIT # : \_\_\_\_\_

Date EPA approved current TBLLs : \_\_\_\_\_

Date EPA approved current Sewer Use Ordinance : \_\_\_\_\_

**ITEM I.**

<p>In Column (1) list the conditions that existed when your current TBLLs were calculated. In Column (2), list current conditions or expected conditions at your POTW.</p>		
	<p>Column (1) EXISTING TBLLs</p>	<p>Column (2) PRESENT CONDITIONS</p>
POTW Flow (MGD)		
Dilution Ratio or 7Q10 (from NPDES Permit)		
SIU Flow (MGD)		
Safety Factor		N/A
Biosolids Disposal Method(s)		

**ITEM II.**

EXISTING TBLLs			
POLLUTANT	NUMERICAL LIMIT (mg/l) or (lb/day)	POLLUTANT	NUMERICAL LIMIT (mg/l) or (lb/day)

**ITEM III.**

Note how your existing TBLLs, listed in Item II., are allocated to your Significant Industrial Users (SIUs), i.e. uniform concentration, contributory flow, mass proportioning, other. Please specify by circling.

**ITEM IV.**

Has your POTW experienced any upsets, inhibition, interference or pass-through from industrial sources since your existing TBLLs were calculated?

If yes, explain.

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Has your POTW violated any of its NPDES permit limits and/or toxicity test requirements?

If yes, explain.

---

**ITEM V.**

Using current POTW influent sampling data fill in Column (1). In Column (2), list your Maximum Allowable Headwork Loading (MAHL) values used to derive your TBLLs listed in Item II. In addition, please note the Environmental Criteria for which each MAHL value was established, i.e. water quality, sludge, NPDES etc.

Pollutant	Column (1) Influent Data Analyses		Column (2) MAHL Values (lb/day)	Criteria
	Maximum (lb/day)	Average (lb/day)		
Arsenic				
Cadmium				
Chromium				
Copper				
Cyanide				
Lead				
Mercury				
Nickel				
Silver				
Zinc				
Other (List)				

**ITEM VI.**

Using current POTW effluent sampling data, fill in Column (1). In Column (2A) list what the Water Quality Standards (Gold Book Criteria) were at the time your existing TBLLs were developed. List in Column (2B) current Gold Book values multiplied by the dilution ratio used in your new/reissued NPDES permit.

Pollutant	Column (1)		Columns (2A)                      (2B) Water Quality Criteria (Gold Book)	
	Effluent Data Analyses Maximum (ug/l)	Average (ug/l)	From TBLLs (ug/l)	Today (ug/l)
Arsenic				
*Cadmium				
*Chromium				
*Copper				
Cyanide				
*Lead				
Mercury				
*Nickel				
Silver				
*Zinc				
Other (List)				

\*Hardness Dependent (mg/l - CaCO<sub>3</sub>)



**ITEM VIII.**

Using current POTW biosolids data, fill in Column (1). In Column (2A), list the biosolids criteria that was used at the time your existing TBLLs were calculated. If your POTW is planing on managing its biosolids differently, list in Column (2B) what your new biosolids criteria would be and method of disposal.

Pollutant	Column (1)	Columns	
	Biosolids Data Analyses	(2A)	(2B)
	Average (mg/kg)	From TBLLs (mg/kg)	New (mg/kg)
Arsenic			
Cadmium			
Chromium			
Copper			
Cyanide			
Lead			
Mercury			
Nickel			
Silver			
Zinc			
Molybdenum			
Selenium			
Other (List)			

NPDES PERMIT REQUIREMENT  
FOR  
INDUSTRIAL PRETREATMENT ANNUAL REPORT

The information described below shall be included in the pretreatment program annual reports:

1. An updated list of all industrial users by category, as set forth in 40 C.F.R. 403.8(f)(2)(i), indicating compliance or noncompliance with the following:
  - baseline monitoring reporting requirements for newly promulgated industries
  - compliance status reporting requirements for newly promulgated industries
  - periodic (semi-annual) monitoring reporting requirements,
  - categorical standards, and
  - local limits;
2. A summary of compliance and enforcement activities during the preceding year, including the number of:
  - significant industrial users inspected by POTW (include inspection dates for each industrial user),
  - significant industrial users sampled by POTW (include sampling dates for each industrial user),
  - compliance schedules issued (include list of subject users),
  - written notices of violations issued (include list of subject users),
  - administrative orders issued (include list of subject users),
  - criminal or civil suits filed (include list of subject users) and,
  - penalties obtained (include list of subject users and penalty amounts);
3. A list of significantly violating industries required to be published in a local newspaper in accordance with 40 C.F.R. 403.8(f)(2)(vii);
4. A narrative description of program effectiveness including present and proposed changes to the program, such as funding, staffing, ordinances, regulations, rules and/or statutory authority;
5. A summary of all pollutant analytical results for influent, effluent, sludge and any toxicity or bioassay data from the wastewater treatment facility. The summary shall include a comparison of influent sampling results versus threshold inhibitory concentrations for the Wastewater Treatment System and effluent sampling results versus water quality standards. Such a comparison shall be based on the sampling program described in the paragraph below or any similar sampling program described in this Permit.

At a minimum, annual sampling and analysis of the influent and effluent of the Wastewater Treatment Plant shall be conducted for the following pollutants:

- |                    |                   |
|--------------------|-------------------|
| a.) Total Cadmium  | f.) Total Nickel  |
| b.) Total Chromium | g.) Total Silver  |
| c.) Total Copper   | h.) Total Zinc    |
| d.) Total Lead     | i.) Total Cyanide |
| e.) Total Mercury  | j.) Total Arsenic |

The sampling program shall consist of one 24-hour flow-proportioned composite and at least one grab sample that is representative of the flows received by the POTW. The composite shall consist of hourly flow-proportioned grab samples taken over a 24-hour period if the sample is collected manually or shall consist of a minimum of 48 samples collected at 30 minute intervals if an automated sampler is used. Cyanide shall be taken as a grab sample during the same period as the composite sample. Sampling and preservation shall be consistent with 40 CFR Part 136.

6. A detailed description of all interference and pass-through that occurred during the past year;
7. A thorough description of all investigations into interference and pass-through during the past year;
8. A description of monitoring, sewer inspections and evaluations which were done during the past year to detect interference and pass-through, specifying parameters and frequencies;
9. A description of actions being taken to reduce the incidence of significant violations by significant industrial users; and,
10. The date of the latest adoption of local limits and an indication as to whether or not the permittee is under a State or Federal compliance schedule that includes steps to be taken to revise local limits.

NPDES PART II STANDARD CONDITIONS  
(January, 2007)

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NPDES PART II STANDARD CONDITIONS  
(January, 2007)

PART II. A. GENERAL REQUIREMENTS

1. Duty to Comply

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

- a. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirements.
- b. The CWA provides that any person who violates Section 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any of such sections in a permit issued under Section 402, or any requirement imposed in a pretreatment program approved under Section 402 (a)(3) or 402 (b)(8) of the CWA is subject to a civil penalty not to exceed \$25,000 per day for each violation. Any person who negligently violates such requirements is subject to a fine of not less than \$2,500 nor more than \$25,000 per day of violation, or by imprisonment for not more than 1 year, or both. Any person who knowingly violates such requirements is subject to a fine of not less than \$5,000 nor more than \$50,000 per day of violation, or by imprisonment for not more than 3 years, or both.
- c. Any person may be assessed an administrative penalty by the Administrator for violating Section 301, 302, 306, 307, 308, 318, or 405 of the CWA, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the CWA. Administrative penalties for Class I violations are not to exceed \$10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed \$25,000. Penalties for Class II violations are not to exceed \$10,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed \$125,000.

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

2. Permit Actions

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

3. Duty to Provide Information

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

NPDES PART II STANDARD CONDITIONS  
(January, 2007)

4. Reopener Clause

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

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

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

5. Oil and Hazardous Substance Liability

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

6. Property Rights

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

7. Confidentiality of Information

- a. In accordance with 40 CFR Part 2, any information submitted to EPA pursuant to these regulations may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission in the manner prescribed on the application form or instructions or, in the case of other submissions, by stamping the words “confidential business information” on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the information will be treated in accordance with the procedures in 40 CFR Part 2 (Public Information).
- b. Claims of confidentiality for the following information will be denied:
  - (1) The name and address of any permit applicant or permittee;
  - (2) Permit applications, permits, and effluent data as defined in 40 CFR §2.302(a)(2).
- c. Information required by NPDES application forms provided by the Regional Administrator under 40 CFR §122.21 may not be claimed confidential. This includes information submitted on the forms themselves and any attachments used to supply information required by the forms.

NPDES PART II STANDARD CONDITIONS  
(January, 2007)

8. Duty to Reapply

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

9. State Authorities

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

10. Other Laws

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

PART II. B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

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

2. Need to Halt or Reduce Not a Defense

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

3. Duty to Mitigate

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

4. Bypass

a. Definitions

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

## NPDES PART II STANDARD CONDITIONS

(January, 2007)

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

### b. Bypass not exceeding limitations

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of Paragraphs B.4.c. and 4.d. of this section.

### c. Notice

- (1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.
- (2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in paragraph D.1.e. of this part (Twenty-four hour reporting).

### d. Prohibition of bypass

Bypass is prohibited, and the Regional Administrator may take enforcement action against a permittee for bypass, unless:

- (1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
- (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and
- (3)
  - i) The permittee submitted notices as required under Paragraph 4.c. of this section.
  - ii) The Regional Administrator may approve an anticipated bypass, after considering its adverse effects, if the Regional Administrator determines that it will meet the three conditions listed above in paragraph 4.d. of this section.

## 5. Upset

- a. Definition. *Upset* means an exceptional incident in which there is an unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.
- b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph B.5.c. of this section are met. No determination made during

NPDES PART II STANDARD CONDITIONS  
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administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

- c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
  - (1) An upset occurred and that the permittee can identify the cause(s) of the upset;
  - (2) The permitted facility was at the time being properly operated;
  - (3) The permittee submitted notice of the upset as required in paragraphs D.1.a. and 1.e. (Twenty-four hour notice); and
  - (4) The permittee complied with any remedial measures required under B.3. above.
- d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

**PART II. C. MONITORING REQUIREMENTS**

1. Monitoring and Records

- a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
- b. Except for records for monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application except for the information concerning storm water discharges which must be retained for a total of 6 years. This retention period may be extended by request of the Regional Administrator at any time.
- c. Records of monitoring information shall include:
  - (1) The date, exact place, and time of sampling or measurements;
  - (2) The individual(s) who performed the sampling or measurements;
  - (3) The date(s) analyses were performed;
  - (4) The individual(s) who performed the analyses;
  - (5) The analytical techniques or methods used; and
  - (6) The results of such analyses.
- d. Monitoring results must be conducted according to test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, unless other test procedures have been specified in the permit.
- e. The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000, or by

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imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than \$20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

### 2. Inspection and Entry

The permittee shall allow the Regional Administrator or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon presentation of credentials and other documents as may be required by law, to:

- a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
- b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
- c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
- d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the CWA, any substances or parameters at any location.

## PART II. D. REPORTING REQUIREMENTS

### 1. Reporting Requirements

- a. **Planned Changes.** The permittee shall give notice to the Regional Administrator as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is only required when:
  - (1) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR§122.29(b); or
  - (2) The alteration or addition could significantly change the nature or increase the quantities of the pollutants discharged. This notification applies to pollutants which are subject neither to the effluent limitations in the permit, nor to the notification requirements at 40 CFR§122.42(a)(1).
  - (3) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition or change may justify the application of permit conditions different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.
- b. **Anticipated noncompliance.** The permittee shall give advance notice to the Regional Administrator of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- c. **Transfers.** This permit is not transferable to any person except after notice to the Regional Administrator. The Regional Administrator may require modification or revocation and reissuance of the permit to change the name of the permittee and

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incorporate such other requirements as may be necessary under the CWA. (See 40 CFR Part 122.61; in some cases, modification or revocation and reissuance is mandatory.)

- d. Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.
- (1) Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the Director for reporting results of monitoring of sludge use or disposal practices.
  - (2) If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, or as specified in the permit, the results of the monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Director.
  - (3) Calculations for all limitations which require averaging or measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.
- e. Twenty-four hour reporting.
- (1) The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances.  
  
A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
  - (2) The following shall be included as information which must be reported within 24 hours under this paragraph.
    - (a) Any unanticipated bypass which exceeds any effluent limitation in the permit. (See 40 CFR §122.41(g).)
    - (b) Any upset which exceeds any effluent limitation in the permit.
    - (c) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Regional Administrator in the permit to be reported within 24 hours. (See 40 CFR §122.44(g).)
  - (3) The Regional Administrator may waive the written report on a case-by-case basis for reports under Paragraph D.1.e. if the oral report has been received within 24 hours.

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- f. Compliance Schedules. Reports of compliance or noncompliance with, any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.
- g. Other noncompliance. The permittee shall report all instances of noncompliance not reported under Paragraphs D.1.d., D.1.e., and D.1.f. of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in Paragraph D.1.e. of this section.
- h. Other information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Administrator, it shall promptly submit such facts or information.

2. Signatory Requirement

- a. All applications, reports, or information submitted to the Regional Administrator shall be signed and certified. (See 40 CFR §122.22)
- b. The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than 2 years per violation, or by both.

3. Availability of Reports.

Except for data determined to be confidential under Paragraph A.8. above, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the CWA, effluent data shall not be considered confidential. Knowingly making any false statements on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the CWA.

PART II. E. DEFINITIONS AND ABBREVIATIONS

1. Definitions for Individual NPDES Permits including Storm Water Requirements

*Administrator* means the Administrator of the United States Environmental Protection Agency, or an authorized representative.

*Applicable standards and limitations* means all, State, interstate, and Federal standards and limitations to which a “discharge”, a “sewage sludge use or disposal practice”, or a related activity is subject to, including “effluent limitations”, water quality standards, standards of performance, toxic effluent standards or prohibitions, “best management practices”, pretreatment standards, and “standards for sewage sludge use and disposal” under Sections 301, 302, 303, 304, 306, 307, 308, 403, and 405 of the CWA.

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*Application* means the EPA standard national forms for applying for a permit, including any additions, revisions, or modifications to the forms; or forms approved by EPA for use in “approved States”, including any approved modifications or revisions.

*Average* means the arithmetic mean of values taken at the frequency required for each parameter over the specified period. For total and/or fecal coliforms and Escherichia coli, the average shall be the geometric mean.

*Average monthly discharge limitation* means the highest allowable average of “daily discharges” over a calendar month calculated as the sum of all “daily discharges” measured during a calendar month divided by the number of “daily discharges” measured during that month.

*Average weekly discharge limitation* means the highest allowable average of “daily discharges” measured during the calendar week divided by the number of “daily discharges” measured during the week.

*Best Management Practices (BMPs)* means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of “waters of the United States.” BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

*Best Professional Judgment (BPJ)* means a case-by-case determination of Best Practicable Treatment (BPT), Best Available Treatment (BAT), or other appropriate technology-based standard based on an evaluation of the available technology to achieve a particular pollutant reduction and other factors set forth in 40 CFR §125.3 (d).

*Coal Pile Runoff* means the rainfall runoff from or through any coal storage pile.

*Composite Sample* means a sample consisting of a minimum of eight grab samples of equal volume collected at equal intervals during a 24-hour period (or lesser period as specified in the section on Monitoring and Reporting) and combined proportional to flow, or a sample consisting of the same number of grab samples, or greater, collected proportionally to flow over that same time period.

*Construction Activities* - The following definitions apply to construction activities:

- (a) Commencement of Construction is the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.
- (b) Dedicated portable asphalt plant is a portable asphalt plant located on or contiguous to a construction site and that provides asphalt only to the construction site that the plant is located on or adjacent to. The term dedicated portable asphalt plant does not include facilities that are subject to the asphalt emulsion effluent limitation guideline at 40 CFR Part 443.
- (c) Dedicated portable concrete plant is a portable concrete plant located on or contiguous to a construction site and that provides concrete only to the construction site that the plant is located on or adjacent to.

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- (d) Final Stabilization means that all soil disturbing activities at the site have been complete, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.
- (e) Runoff coefficient means the fraction of total rainfall that will appear at the conveyance as runoff.

*Contiguous zone* means the entire zone established by the United States under Article 24 of the Convention on the Territorial Sea and the Contiguous Zone.

*Continuous discharge* means a “discharge” which occurs without interruption throughout the operating hours of the facility except for infrequent shutdowns for maintenance, process changes, or similar activities.

*CWA* means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended by Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, and Pub. L. 97-117; 33 USC §§1251 et seq.

*Daily Discharge* means the discharge of a pollutant measured during the calendar day or any other 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the “daily discharge” is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the “daily discharge” is calculated as the average measurement of the pollutant over the day.

*Director* normally means the person authorized to sign NPDES permits by EPA or the State or an authorized representative. Conversely, it also could mean the Regional Administrator or the State Director as the context requires.

*Discharge Monitoring Report Form (DMR)* means the EPA standard national form, including any subsequent additions, revisions, or modifications for the reporting of self-monitoring results by permittees. DMRs must be used by “approved States” as well as by EPA. EPA will supply DMRs to any approved State upon request. The EPA national forms may be modified to substitute the State Agency name, address, logo, and other similar information, as appropriate, in place of EPA’s.

*Discharge of a pollutant* means:

- (a) Any addition of any “pollutant” or combination of pollutants to “waters of the United States” from any “point source”, or
- (b) Any addition of any pollutant or combination of pollutants to the waters of the “contiguous zone” or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation (See “Point Source” definition).

This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead

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to a treatment works; and discharges through pipes, sewers, or other conveyances leading into privately owned treatment works.

This term does not include an addition of pollutants by any “indirect discharger.”

*Effluent limitation* means any restriction imposed by the Regional Administrator on quantities, discharge rates, and concentrations of “pollutants” which are “discharged” from “point sources” into “waters of the United States”, the waters of the “contiguous zone”, or the ocean.

*Effluent limitation guidelines* means a regulation published by the Administrator under Section 304(b) of CWA to adopt or revise “effluent limitations”.

*EPA* means the United States “Environmental Protection Agency”.

*Flow-weighted composite sample* means a composite sample consisting of a mixture of aliquots where the volume of each aliquot is proportional to the flow rate of the discharge.

*Grab Sample* – An individual sample collected in a period of less than 15 minutes.

*Hazardous Substance* means any substance designated under 40 CFR Part 116 pursuant to Section 311 of the CWA.

*Indirect Discharger* means a non-domestic discharger introducing pollutants to a publicly owned treatment works.

*Interference* means a discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

- (a) Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
- (b) Therefore is a cause of a violation of any requirement of the POTW’s NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act (CWA), the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resources Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to Subtitle D of the SDWA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection Research and Sanctuaries Act.

*Landfill* means an area of land or an excavation in which wastes are placed for permanent disposal, and which is not a land application unit, surface impoundment, injection well, or waste pile.

*Land application unit* means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for treatment or disposal.

*Large and Medium municipal separate storm sewer system* means all municipal separate storm sewers that are either: (i) located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (these cities are listed in Appendices F and 40 CFR Part 122); or (ii) located in the counties with unincorporated urbanized

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populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships, or towns within such counties (these counties are listed in Appendices H and I of 40 CFR 122); or (iii) owned or operated by a municipality other than those described in Paragraph (i) or (ii) and that are designated by the Regional Administrator as part of the large or medium municipal separate storm sewer system.

*Maximum daily discharge limitation* means the highest allowable “daily discharge” concentration that occurs only during a normal day (24-hour duration).

*Maximum daily discharge limitation (as defined for the Steam Electric Power Plants only) when applied to Total Residual Chlorine (TRC) or Total Residual Oxidant (TRO)* is defined as “maximum concentration” or “Instantaneous Maximum Concentration” during the two hours of a chlorination cycle (or fraction thereof) prescribed in the Steam Electric Guidelines, 40 CFR Part 423. These three synonymous terms all mean “a value that shall not be exceeded” during the two-hour chlorination cycle. This interpretation differs from the specified NPDES Permit requirement, 40 CFR § 122.2, where the two terms of “Maximum Daily Discharge” and “Average Daily Discharge” concentrations are specifically limited to the daily (24-hour duration) values.

*Municipality* means a city, town, borough, county, parish, district, association, or other public body created by or under State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or an Indian tribe or an authorized Indian tribe organization, or a designated and approved management agency under Section 208 of the CWA.

*National Pollutant Discharge Elimination System* means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318, and 405 of the CWA. The term includes an “approved program”.

*New Discharger* means any building, structure, facility, or installation:

- (a) From which there is or may be a “discharge of pollutants”;
- (b) That did not commence the “discharge of pollutants” at a particular “site” prior to August 13, 1979;
- (c) Which is not a “new source”; and
- (d) Which has never received a finally effective NPDES permit for discharges at that “site”.

This definition includes an “indirect discharger” which commences discharging into “waters of the United States” after August 13, 1979. It also includes any existing mobile point source (other than an offshore or coastal oil and gas exploratory drilling rig or a coastal oil and gas exploratory drilling rig or a coastal oil and gas developmental drilling rig) such as a seafood processing rig, seafood processing vessel, or aggregate plant, that begins discharging at a “site” for which it does not have a permit; and any offshore rig or coastal mobile oil and gas exploratory drilling rig or coastal mobile oil and gas developmental drilling rig that commences the discharge of pollutants after August 13, 1979, at a “site” under EPA’s permitting jurisdiction for which it is not covered by an individual or general permit and which is located in an area determined by the Regional Administrator in the issuance of a final permit to be in an area of biological concern. In determining whether an area is an area of biological concern, the Regional Administrator shall consider the factors specified in 40 CFR §§125.122 (a) (1) through (10).

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An offshore or coastal mobile exploratory drilling rig or coastal mobile developmental drilling rig will be considered a “new discharger” only for the duration of its discharge in an area of biological concern.

*New source* means any building, structure, facility, or installation from which there is or may be a “discharge of pollutants”, the construction of which commenced:

- (a) After promulgation of standards of performance under Section 306 of CWA which are applicable to such source, or
- (b) After proposal of standards of performance in accordance with Section 306 of CWA which are applicable to such source, but only if the standards are promulgated in accordance with Section 306 within 120 days of their proposal.

*NPDES* means “National Pollutant Discharge Elimination System”.

*Owner or operator* means the owner or operator of any “facility or activity” subject to regulation under the NPDES programs.

*Pass through* means a Discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW’s NPDES permit (including an increase in the magnitude or duration of a violation).

*Permit* means an authorization, license, or equivalent control document issued by EPA or an “approved” State.

*Person* means an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

*Point Source* means any discernible, confined, and discrete conveyance, including but not limited to any pipe ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff (see 40 CFR §122.2).

*Pollutant* means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. §§2011 et seq.)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean:

- (a) Sewage from vessels; or
- (b) Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well is used either to facilitate production or for disposal purposes is approved by the authority of the State in which the well is located, and if the State determines that the injection or disposal will not result in the degradation of ground or surface water resources.

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*Primary industry category* means any industry category listed in the NRDC settlement agreement (Natural Resources Defense Council et al. v. Train, 8 E.R.C. 2120 (D.D.C. 1976), modified 12 E.R.C. 1833 (D. D.C. 1979)); also listed in Appendix A of 40 CFR Part 122.

*Privately owned treatment works* means any device or system which is (a) used to treat wastes from any facility whose operation is not the operator of the treatment works or (b) not a "POTW".

*Process wastewater* means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

*Publicly Owned Treatment Works (POTW)* means any facility or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature which is owned by a "State" or "municipality".

This definition includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.

*Regional Administrator* means the Regional Administrator, EPA, Region I, Boston, Massachusetts.

*Secondary Industry Category* means any industry which is not a "primary industry category".

*Section 313 water priority chemical* means a chemical or chemical category which:

- (1) is listed at 40 CFR §372.65 pursuant to Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) (also known as Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986);
- (2) is present at or above threshold levels at a facility subject to EPCRA Section 313 reporting requirements; and
- (3) satisfies at least one of the following criteria:
  - (i) are listed in Appendix D of 40 CFR Part 122 on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols), or Table V (certain toxic pollutants and hazardous substances);
  - (ii) are listed as a hazardous substance pursuant to Section 311(b)(2)(A) of the CWA at 40 CFR §116.4; or
  - (iii) are pollutants for which EPA has published acute or chronic water quality criteria.

*Septage* means the liquid and solid material pumped from a septic tank, cesspool, or similar domestic sewage treatment system, or a holding tank when the system is cleaned or maintained.

*Sewage Sludge* means any solid, semisolid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced wastewater treatment, scum, septage, portable toilet pumpings, Type III Marine Sanitation Device pumpings (33 CFR Part 159), and sewage sludge products. Sewage sludge does not include grit or screenings, or ash generated during the incineration of sewage sludge.

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*Sewage sludge use or disposal practice* means the collection, storage, treatment, transportation, processing, monitoring, use, or disposal of sewage sludge.

*Significant materials* includes, but is not limited to: raw materials, fuels, materials such as solvents, detergents, and plastic pellets, raw materials used in food processing or production, hazardous substance designated under section 101(14) of CERCLA, any chemical the facility is required to report pursuant to EPCRA Section 313, fertilizers, pesticides, and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

*Significant spills* includes, but is not limited to, releases of oil or hazardous substances in excess of reportable quantities under Section 311 of the CWA (see 40 CFR §110.10 and §117.21) or Section 102 of CERCLA (see 40 CFR § 302.4).

*Sludge-only facility* means any “treatment works treating domestic sewage” whose methods of sewage sludge use or disposal are subject to regulations promulgated pursuant to Section 405(d) of the CWA, and is required to obtain a permit under 40 CFR §122.1(b)(3).

*State* means any of the 50 States, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, the Trust Territory of the Pacific Islands.

*Storm Water* means storm water runoff, snow melt runoff, and surface runoff and drainage.

*Storm water discharge associated with industrial activity* means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant. (See 40 CFR §122.26 (b)(14) for specifics of this definition.

*Time-weighted composite* means a composite sample consisting of a mixture of equal volume aliquots collected at a constant time interval.

*Toxic pollutants* means any pollutant listed as toxic under Section 307 (a)(1) or, in the case of “sludge use or disposal practices” any pollutant identified in regulations implementing Section 405(d) of the CWA.

*Treatment works treating domestic sewage* means a POTW or any other sewage sludge or wastewater treatment devices or systems, regardless of ownership (including federal facilities), used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge. This definition does not include septic tanks or similar devices.

For purposes of this definition, “domestic sewage” includes waste and wastewater from humans or household operations that are discharged to or otherwise enter a treatment works. In States where there is no approved State sludge management program under Section 405(f) of the CWA, the Regional Administrator may designate any person subject to the standards for sewage sludge use and disposal in 40 CFR Part 503 as a “treatment works treating domestic sewage”, where he or she finds that there is a potential for adverse effects on public health and the environment from poor sludge quality or poor sludge handling, use or disposal practices, or where he or she finds that such designation is necessary to ensure that such person is in compliance with 40 CFR Part 503.

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*Waste Pile* means any non-containerized accumulation of solid, non-flowing waste that is used for treatment or storage.

*Waters of the United States* means:

- (a) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of tide;
- (b) All interstate waters, including interstate “wetlands”;
- (c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, “wetlands”, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:
  - (1) Which are or could be used by interstate or foreign travelers for recreational or other purpose;
  - (2) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
  - (3) Which are used or could be used for industrial purposes by industries in interstate commerce;
- (d) All impoundments of waters otherwise defined as waters of the United States under this definition;
- (e) Tributaries of waters identified in Paragraphs (a) through (d) of this definition;
- (f) The territorial sea; and
- (g) “Wetlands” adjacent to waters (other than waters that are themselves wetlands) identified in Paragraphs (a) through (f) of this definition.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the CWA (other than cooling ponds as defined in 40 CFR §423.11(m) which also meet the criteria of this definition) are not waters of the United States.

*Wetlands* means those areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

*Whole Effluent Toxicity (WET)* means the aggregate toxic effect of an effluent measured directly by a toxicity test. (See Abbreviations Section, following, for additional information.)

2. Definitions for NPDES Permit Sludge Use and Disposal Requirements.

*Active sewage sludge unit* is a sewage sludge unit that has not closed.

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*Aerobic Digestion* is the biochemical decomposition of organic matter in sewage sludge into carbon dioxide and water by microorganisms in the presence of air.

*Agricultural Land* is land on which a food crop, a feed crop, or a fiber crop is grown. This includes range land and land used as pasture.

*Agronomic rate* is the whole sludge application rate (dry weight basis) designed:

- (1) To provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land; and
- (2) To minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.

*Air pollution control device* is one or more processes used to treat the exit gas from a sewage sludge incinerator stack.

*Anaerobic digestion* is the biochemical decomposition of organic matter in sewage sludge into methane gas and carbon dioxide by microorganisms in the absence of air.

*Annual pollutant loading rate* is the maximum amount of a pollutant that can be applied to a unit area of land during a 365 day period.

*Annual whole sludge application rate* is the maximum amount of sewage sludge (dry weight basis) that can be applied to a unit area of land during a 365 day period.

*Apply sewage sludge or sewage sludge applied to the land* means land application of sewage sludge.

*Aquifer* is a geologic formation, group of geologic formations, or a portion of a geologic formation capable of yielding ground water to wells or springs.

*Auxiliary fuel* is fuel used to augment the fuel value of sewage sludge. This includes, but is not limited to, natural gas, fuel oil, coal, gas generated during anaerobic digestion of sewage sludge, and municipal solid waste (not to exceed 30 percent of the dry weight of the sewage sludge and auxiliary fuel together). Hazardous wastes are not auxiliary fuel.

*Base flood* is a flood that has a one percent chance of occurring in any given year (i.e. a flood with a magnitude equaled once in 100 years).

*Bulk sewage sludge* is sewage sludge that is not sold or given away in a bag or other container for application to the land.

*Contaminate an aquifer* means to introduce a substance that causes the maximum contaminant level for nitrate in 40 CFR §141.11 to be exceeded in ground water or that causes the existing concentration of nitrate in the ground water to increase when the existing concentration of nitrate in the ground water exceeds the maximum contaminant level for nitrate in 40 CFR §141.11.

*Class I sludge management facility* is any publicly owned treatment works (POTW), as defined in 40 CFR §501.2, required to have an approved pretreatment program under 40 CFR §403.8 (a) (including any POTW located in a state that has elected to assume local program responsibilities pursuant to 40 CFR §403.10 (e) and any treatment works treating domestic sewage, as defined in 40 CFR § 122.2,

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classified as a Class I sludge management facility by the EPA Regional Administrator, or, in the case of approved state programs, the Regional Administrator in conjunction with the State Director, because of the potential for sewage sludge use or disposal practice to affect public health and the environment adversely.

*Control efficiency* is the mass of a pollutant in the sewage sludge fed to an incinerator minus the mass of that pollutant in the exit gas from the incinerator stack divided by the mass of the pollutant in the sewage sludge fed to the incinerator.

*Cover* is soil or other material used to cover sewage sludge placed on an active sewage sludge unit.

*Cover crop* is a small grain crop, such as oats, wheat, or barley, not grown for harvest.

*Cumulative pollutant loading rate* is the maximum amount of inorganic pollutant that can be applied to an area of land.

*Density of microorganisms* is the number of microorganisms per unit mass of total solids (dry weight) in the sewage sludge.

*Dispersion factor* is the ratio of the increase in the ground level ambient air concentration for a pollutant at or beyond the property line of the site where the sewage sludge incinerator is located to the mass emission rate for the pollutant from the incinerator stack.

*Displacement* is the relative movement of any two sides of a fault measured in any direction.

*Domestic septage* is either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant.

*Domestic sewage* is waste and wastewater from humans or household operations that is discharged to or otherwise enters a treatment works.

*Dry weight basis* means calculated on the basis of having been dried at 105 degrees Celsius (°C) until reaching a constant mass (i.e. essentially 100 percent solids content).

*Fault* is a fracture or zone of fractures in any materials along which strata on one side are displaced with respect to the strata on the other side.

*Feed crops* are crops produced primarily for consumption by animals.

*Fiber crops* are crops such as flax and cotton.

*Final cover* is the last layer of soil or other material placed on a sewage sludge unit at closure.

*Fluidized bed incinerator* is an enclosed device in which organic matter and inorganic matter in sewage sludge are combusted in a bed of particles suspended in the combustion chamber gas.

*Food crops* are crops consumed by humans. These include, but are not limited to, fruits, vegetables, and tobacco.

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*Forest* is a tract of land thick with trees and underbrush.

*Ground water* is water below the land surface in the saturated zone.

*Holocene time* is the most recent epoch of the Quaternary period, extending from the end of the Pleistocene epoch to the present.

*Hourly average* is the arithmetic mean of all the measurements taken during an hour. At least two measurements must be taken during the hour.

*Incineration* is the combustion of organic matter and inorganic matter in sewage sludge by high temperatures in an enclosed device.

*Industrial wastewater* is wastewater generated in a commercial or industrial process.

*Land application* is the spraying or spreading of sewage sludge onto the land surface; the injection of sewage sludge below the land surface; or the incorporation of sewage sludge into the soil so that the sewage sludge can either condition the soil or fertilize crops or vegetation grown in the soil.

*Land with a high potential for public exposure* is land that the public uses frequently. This includes, but is not limited to, a public contact site and reclamation site located in a populated area (e.g., a construction site located in a city).

*Land with low potential for public exposure* is land that the public uses infrequently. This includes, but is not limited to, agricultural land, forest and a reclamation site located in an unpopulated area (e.g., a strip mine located in a rural area).

*Leachate collection system* is a system or device installed immediately above a liner that is designed, constructed, maintained, and operated to collect and remove leachate from a sewage sludge unit.

*Liner* is soil or synthetic material that has a hydraulic conductivity of  $1 \times 10^{-7}$  centimeters per second or less.

*Lower explosive limit for methane gas* is the lowest percentage of methane gas in air, by volume, that propagates a flame at 25 degrees Celsius and atmospheric pressure.

*Monthly average (Incineration)* is the arithmetic mean of the hourly averages for the hours a sewage sludge incinerator operates during the month.

*Monthly average (Land Application)* is the arithmetic mean of all measurements taken during the month.

*Municipality* means a city, town, borough, county, parish, district, association, or other public body (including an intermunicipal agency of two or more of the foregoing entities) created by or under State law; an Indian tribe or an authorized Indian tribal organization having jurisdiction over sewage sludge management; or a designated and approved management agency under section 208 of the CWA, as amended. The definition includes a special district created under state law, such as a water district, sewer district, sanitary district, utility district, drainage district, or similar entity, or an integrated waste management facility as defined in section 201 (e) of the CWA, as amended, that has as one of its principal responsibilities the treatment, transport, use or disposal of sewage sludge.

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*Other container* is either an open or closed receptacle. This includes, but is not limited to, a bucket, a box, a carton, and a vehicle or trailer with a load capacity of one metric ton or less.

*Pasture* is land on which animals feed directly on feed crops such as legumes, grasses, grain stubble, or stover.

*Pathogenic organisms* are disease-causing organisms. These include, but are not limited to, certain bacteria, protozoa, viruses, and viable helminth ova.

*Permitting authority* is either EPA or a State with an EPA-approved sludge management program.

*Person* is an individual, association, partnership, corporation, municipality, State or Federal Agency, or an agent or employee thereof.

*Person who prepares sewage sludge* is either the person who generates sewage sludge during the treatment of domestic sewage in a treatment works or the person who derives a material from sewage sludge.

*pH* means the logarithm of the reciprocal of the hydrogen ion concentration; a measure of the acidity or alkalinity of a liquid or solid material.

*Place sewage sludge or sewage sludge placed* means disposal of sewage sludge on a surface disposal site.

*Pollutant (as defined in sludge disposal requirements)* is an organic substance, an inorganic substance, a combination of organic and inorganic substances, or pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could on the basis on information available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction) or physical deformations in either organisms or offspring of the organisms.

*Pollutant limit (for sludge disposal requirements)* is a numerical value that describes the amount of a pollutant allowed per unit amount of sewage sludge (e.g., milligrams per kilogram of total solids); the amount of pollutant that can be applied to a unit of land (e.g., kilograms per hectare); or the volume of the material that can be applied to the land (e.g., gallons per acre).

*Public contact site* is a land with a high potential for contact by the public. This includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses.

*Qualified ground water scientist* is an individual with a baccalaureate or post-graduate degree in the natural sciences or engineering who has sufficient training and experience in ground water hydrology and related fields, as may be demonstrated by State registration, professional certification, or completion of accredited university programs, to make sound professional judgments regarding ground water monitoring, pollutant fate and transport, and corrective action.

*Range land* is open land with indigenous vegetation.

*Reclamation site* is drastically disturbed land that is reclaimed using sewage sludge. This includes, but is not limited to, strip mines and construction sites.

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*Risk specific concentration* is the allowable increase in the average daily ground level ambient air concentration for a pollutant from the incineration of sewage sludge at or beyond the property line of a site where the sewage sludge incinerator is located.

*Runoff* is rainwater, leachate, or other liquid that drains overland on any part of a land surface and runs off the land surface.

*Seismic impact zone* is an area that has 10 percent or greater probability that the horizontal ground level acceleration to the rock in the area exceeds 0.10 gravity once in 250 years.

*Sewage sludge* is a solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to: domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in treatment works.

*Sewage sludge feed rate* is either the average daily amount of sewage sludge fired in all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located for the number of days in a 365 day period that each sewage sludge incinerator operates, or the average daily design capacity for all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located.

*Sewage sludge incinerator* is an enclosed device in which only sewage sludge and auxiliary fuel are fired.

*Sewage sludge unit* is land on which only sewage sludge is placed for final disposal. This does not include land on which sewage sludge is either stored or treated. Land does not include waters of the United States, as defined in 40 CFR §122.2.

*Sewage sludge unit boundary* is the outermost perimeter of an active sewage sludge unit.

*Specific oxygen uptake rate (SOUR)* is the mass of oxygen consumed per unit time per unit mass of total solids (dry weight basis) in sewage sludge.

*Stack height* is the difference between the elevation of the top of a sewage sludge incinerator stack and the elevation of the ground at the base of the stack when the difference is equal to or less than 65 meters. When the difference is greater than 65 meters, stack height is the creditable stack height determined in accordance with 40 CFR §51.100 (ii).

*State* is one of the United States of America, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Trust Territory of the Pacific Islands, the Commonwealth of the Northern Mariana Islands, and an Indian tribe eligible for treatment as a State pursuant to regulations promulgated under the authority of section 518(e) of the CWA.

*Store or storage of sewage sludge* is the placement of sewage sludge on land on which the sewage sludge remains for two years or less. This does not include the placement of sewage sludge on land for treatment.

*Surface disposal site* is an area of land that contains one or more active sewage sludge units.

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*Total hydrocarbons* means the organic compounds in the exit gas from a sewage sludge incinerator stack measured using a flame ionization detection instrument referenced to propane.

*Total solids* are the materials in sewage sludge that remain as residue when the sewage sludge is dried at 103 to 105 degrees Celsius.

*Treat or treatment of sewage sludge* is the preparation of sewage sludge for final use or disposal. This includes, but is not limited to, thickening, stabilization, and dewatering of sewage sludge. This does not include storage of sewage sludge.

*Treatment works* is either a federally owned, publicly owned, or privately owned device or system used to treat (including recycle and reclaim) either domestic sewage or a combination of domestic sewage and industrial waste of a liquid nature.

*Unstable area* is land subject to natural or human-induced forces that may damage the structural components of an active sewage sludge unit. This includes, but is not limited to, land on which the soils are subject to mass movement.

*Unstabilized solids* are organic materials in sewage sludge that have not been treated in either an aerobic or anaerobic treatment process.

*Vector attraction* is the characteristic of sewage sludge that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents.

*Volatile solids* is the amount of the total solids in sewage sludge lost when the sewage sludge is combusted at 550 degrees Celsius in the presence of excess air.

*Wet electrostatic precipitator* is an air pollution control device that uses both electrical forces and water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

*Wet scrubber* is an air pollution control device that uses water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

3. Commonly Used Abbreviations

BOD	Five-day biochemical oxygen demand unless otherwise specified
CBOD	Carbonaceous BOD
CFS	Cubic feet per second
COD	Chemical oxygen demand
Chlorine	
Cl <sub>2</sub>	Total residual chlorine
TRC	Total residual chlorine which is a combination of free available chlorine (FAC, see below) and combined chlorine (chloramines, etc.)

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TRO	Total residual chlorine in marine waters where halogen compounds are present
FAC	Free available chlorine (aqueous molecular chlorine, hypochlorous acid, and hypochlorite ion)
Coliform	
Coliform, Fecal	Total fecal coliform bacteria
Coliform, Total	Total coliform bacteria
Cont. (Continuous)	Continuous recording of the parameter being monitored, i.e. flow, temperature, pH, etc.
Cu. M/day or M <sup>3</sup> /day	Cubic meters per day
DO	Dissolved oxygen
kg/day	Kilograms per day
lbs/day	Pounds per day
mg/l	Milligram(s) per liter
ml/l	Milliliters per liter
MGD	Million gallons per day
Nitrogen	
Total N	Total nitrogen
NH <sub>3</sub> -N	Ammonia nitrogen as nitrogen
NO <sub>3</sub> -N	Nitrate as nitrogen
NO <sub>2</sub> -N	Nitrite as nitrogen
NO <sub>3</sub> -NO <sub>2</sub>	Combined nitrate and nitrite nitrogen as nitrogen
TKN	Total Kjeldahl nitrogen as nitrogen
Oil & Grease	Freon extractable material
PCB	Polychlorinated biphenyl
pH	A measure of the hydrogen ion concentration. A measure of the acidity or alkalinity of a liquid or material
Surfactant	Surface-active agent

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Temp. °C	Temperature in degrees Centigrade
Temp. °F	Temperature in degrees Fahrenheit
TOC	Total organic carbon
Total P	Total phosphorus
TSS or NFR	Total suspended solids or total nonfilterable residue
Turb. or Turbidity	Turbidity measured by the Nephelometric Method (NTU)
ug/l	Microgram(s) per liter
WET	“Whole effluent toxicity” is the total effect of an effluent measured directly with a toxicity test.
C-NOEC	“Chronic (Long-term Exposure Test) – No Observed Effect Concentration”. The highest tested concentration of an effluent or a toxicant at which no adverse effects are observed on the aquatic test organisms at a specified time of observation.
A-NOEC	“Acute (Short-term Exposure Test) – No Observed Effect Concentration” (see C-NOEC definition).
LC <sub>50</sub>	LC <sub>50</sub> is the concentration of a sample that causes mortality of 50% of the test population at a specific time of observation. The LC <sub>50</sub> = 100% is defined as a sample of undiluted effluent.
ZID	Zone of Initial Dilution means the region of initial mixing surrounding or adjacent to the end of the outfall pipe or diffuser ports.

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
NEW ENGLAND - REGION I  
5 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 PURSUANT TO THE  
CLEAN WATER ACT (CWA)

NPDES PERMIT NUMBER: **MA0101591**

PUBLIC NOTICE START AND END DATES: September 18, 2013 – November 16, 2013

NAME AND MAILING ADDRESS OF APPLICANT:

**Town of Middleborough  
Town Hall  
10 Nickerson Avenue  
Middleborough, MA 02346**

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

**Middleborough Water Pollution Control Facility (WPCF)  
Joe Ciaglo Way  
Middleborough, MA 02346**

RECEIVING WATER(S): **Nemasket River (Taunton River Basin, State Code - MA62-26)**

RECEIVING WATER CLASSIFICATION(S): **Class B – Warm water fishery**

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### **1. Proposed Action, Type of Facility, and Discharge Location**

The above named applicant has requested that the U.S. Environmental Protection Agency (EPA) reissue its NPDES permit to discharge from Outfall 001 into the Nemasket River. The facility is an advanced wastewater treatment plant engaged in the collection and treatment of sanitary wastewater.

The existing NPDES permit was issued on September 26, 2003 with an effective date of November 25, 2003 and expired on November 3, 2008. As of November 4, 2008, the expired permit (hereinafter referred to as the “current permit”) was administratively extended because the applicant filed a complete application for permit reissuance as required by 40 Code of Federal Regulations (CFR) §122.6. The facility location is shown on Figure 1 of this fact sheet.

### **2. Description of Discharge**

A quantitative description of the discharge in terms of significant effluent parameters based on recent effluent monitoring data may be found in Table 1 of this fact sheet. Figure 2 of the fact

sheet is a flow process diagram of the facility.

### **3. Receiving Water Description**

The Middleborough WPCF discharges to the Nemasket River Segment MA62-26. Segment MA62-26 runs from the WPCF to the confluence with the Taunton River, a length of 5.2 miles.

The Nemasket River has been designated as a Class B water, warm water fishery. The Massachusetts Surface Water Quality Standards (MA SQWS), 314 Code of Massachusetts Regulations (“CMR”) 4.05(3) (b) states that Class B waters are designated as habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. The waters should have consistently good aesthetic value. A warm water fishery is defined in the Massachusetts Surface Water Quality Standards (314 CMR 4.02) as waters in which the maximum mean temperature over a seven day period generally exceeds 20° Celsius during the summer months and are not capable of supporting a year-round population of cold water stenothermal aquatic life.

The Massachusetts 2012 Integrated List of Waters lists this segment of the Nemasket River, as category 2, attaining some uses; other uses not assessed. The attained use for this segment is aesthetics.<sup>1</sup> The Massachusetts Department of Environmental Protection (MassDEP) 2001 Water Quality Assessment Report for the Taunton River Watershed, which is the basis for the 303(d) list, stated that the aquatic life uses, fish consumption, primary and secondary contact recreation have not been assessed. Aesthetics are listed as support with a qualification for areas where trash and debris are found.

### **4. Limitations and Conditions**

The effluent limitations and all other requirements described in Part VI of this Fact Sheet may be found in the draft permit.

### **5. Permit Basis: Statutory and Regulatory Authority**

Congress enacted the Clean Water Act (CWA) “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” CWA § 101(a). To achieve this objective, the CWA makes it unlawful for any person to discharge any pollutant into the waters of the United States from any point source, except as authorized by specified permitting sections of the CWA, one of which is Section 402. *See* CWA §§ 301(a), 402(a).

Section 402(a) established one of the CWA’s principal permitting programs, the National Pollutant Elimination System (NPDES). Under this section of the CWA, EPA may “issue a permit for the discharge of any pollutant, or combination of pollutants” in accordance with

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<sup>1</sup>Massachusetts Year 2010 Integrated List of Waters, Final Listing of the Condition of Massachusetts’ Waters Pursuant to Sections 303(d) and 305(b) of the Clean Water Act, MassDEP, Division of Watershed Management

certain conditions. *See* CWA § 402(a). NPDES permits generally contain discharge limitations and establish related monitoring and reporting requirements. *See* CWA § 402(a)(1)-(2).

Section 301 of the CWA provides for two types of effluent limitations to be included in NPDES permits: “technology-based” limitations and “water quality-based” limitations. *See* §§ 301, 304(b); 40 CFR §§ 122, 125, 131. Technology-based treatment requirements represent the minimum level of control that must be imposed under Sections 402 and 301(b) of the Clean Water Act. For publicly owned treatment works (POTWs), technology-based requirements are effluent limits based on secondary treatment as defined in 40 CFR 133.102.

EPA regulations require NPDES permits to contain effluent limits more stringent than technology-based limits where necessary to maintain or achieve federal or state water quality standards. Under Section 301(b)(1)(C) of the CWA, discharges are subject to effluent limitations based on water quality standards. The MA SWQS, 314 CMR 4.00, establish requirements for the regulation and control of toxic constituents and also require that EPA criteria, established pursuant to Section 304 (a) of the CWA, shall be used unless a site specific criteria is established. Massachusetts regulations similarly require that its permits contain limitations which are adequate to assure the attainment and maintenance of the water quality standards of the receiving waters as assigned in the MA SWQS. *See* 314 CMR 3.11(3). EPA is required to obtain certification from the state in which the discharge is located that all water quality standards or other applicable requirements of state law, in accordance with Section 301(b)(1)(C) of the CWA, are satisfied, unless the state waives certification.

Section 401(a)(2) of the CWA and 40 CFR § 122.44(d)(4) require EPA to condition NPDES permits in a manner that will ensure compliance with the applicable water quality standards of a “downstream affected state,” in this case Rhode Island. The Rhode Island Water Quality Regulations (RI WQR) also establish designated uses of the State’s waters, criteria to protect those uses, and an antidegradation provision to ensure that existing uses and high quality waters are protected and maintained.

In addition, a permit may not be renewed, reissued or modified with less stringent limitations or conditions than those contained in the previous permit unless in compliance with the anti-backsliding requirements of CWA Section 402(o) and 40 CFR §122.44(l). States are also required to develop antidegradation policies pursuant to 40 CFR § 131.12. No lowering of water quality is allowed, except in accordance with the antidegradation policy.

## **6. Explanation of the Permit’s Effluent Limitation(s)**

### **6.1 Facility Information**

Approximately 29 miles of mostly gravity, separate sanitary sewers transport sewage to the WPCF. The facility has one Significant Industrial User (SIU), Ocean Spray, which currently contributes approximately 230,000 gpd. The facility also treats septage and grease (from Middleborough and Lakeville only) and landfill leachate which is trucked to the facility. There are 803 sewer connections with a service population of approximately 7,180.

The facility was constructed in 1977 and has not undergone a major upgrade since that time. The Town of Middleborough is in the process of engaging a designer for an upgraded facility, and is considering a five stage Bardenpho process that will provide capability to meet stringent nutrient limits. As discussed in section 6.2, the draft permit includes a compliance schedule that corresponds to the Town's planned design and construction schedule.

The existing facility is as follows: Flow through the facility is entirely by gravity. Preliminary treatment consists of two manual bar racks and an aerated grit chamber, followed by a cyclone degritter and muffin monster. After preliminary treatment the wastewater flows through a splitter to two primary clarifiers. Lime is added as needed to maintain the pH and alkalinity necessary for nitrification.

Flow then enters one of four activated sludge aeration basins, each with a capacity of 1 mgd; in general the facility runs one aeration basin at a time, with the other basins providing storage during periods of high flow. Surface mixers provide the aeration. Ferric chloride is added at two locations in the aeration basin for phosphorous removal. Flow then enters the secondary splitter to two secondary clarifiers.

Secondary effluent then flows through one of two traveling bridge sand filters for enhanced solids removal and polishing. Next, it flows thru a Parshall flume to the chlorine contact chamber. Flow measurement is via an ultrasonic flow meter which provides an output for flow paced chlorination. This same signal is repeated to the dechlorination system which introduces chemical feed into the pipe joining the contact chamber to the post aeration tank. Sodium hypochlorite is used for chlorination (chlorine gas was used until approximately 1992), sodium bisulfite is used for dechlorination. Prior to discharge into the Nemasket River the effluent is aerated in the post aeration tank. Composite samples are taken from within the post aeration tanks, and grab samples at the end of post aeration. From the post aeration tank the effluent flows through a 24" pipe and an exposed channel to the Nemasket River.

Primary and waste activated sludge are pumped to a solids holding tank where they are co-mingled prior to dewatering. The sludge holding tank has provisions to decant supernatant via both valves and pumping to increase solids feed to the 1.5 meter belt filter press. Solids dewatering typically occurs four days per week. A liquid cationic polymer is used to flocculate the sludge.

Disposal of sludge cake is at the Middleborough Sanitary Landfill where it is co-mingled with municipal solid waste and buried in a lined landfill. The Middleborough Landfill is operated by Waste Management. The WPCF treats the leachate from this landfill.

## 6.2 Derivation of Effluent Limits under the Federal CWA and the Commonwealth of Massachusetts Water Quality Standards

### A. FLOW

The 12 month rolling average flow limitation of 2.16 MGD in the existing permit has been maintained in the draft permit. This is the design flow of the facility found in Form 2A, Part A,

Section a.6. of the permit application. The draft permit requires continuous flow measurement, and also requires reporting of the average monthly and maximum daily flows.

#### 7Q10 Data and Dilution Factor:

Water quality-based limitations are established with the use of a calculated available dilution. Title 314 CMR 4.03(3)(a) requires that effluent dilution be calculated based on the receiving water 7Q10. The 7Q10 is the lowest observed mean river flow for 7 consecutive days, recorded over a 10 year recurrence interval. Additionally, the plant design flow is used to calculate available effluent dilution.

The United States Geological Survey (USGS) Gazetteer of Hydrologic Characteristics for the Taunton River Basin (WRI Report 84-4283) lists a 7 day low flow with a recurrence interval of 10-years (7Q10) for the Nemasket River at Murdock Street (Gage Station No. 01107800) of 4.2 cfs with a drainage area of 69.4 square miles (mi<sup>2</sup>). After subtracting plant flow of 1.06 cfs, based on the average WWTF flow during the two year operating period of the gage (the Nemasket USGS stream flow gage is no longer operational), the remaining flow at the Nemasket gage would be 3.14 cfs. The Town's consulting engineer, Whitman and Howard, estimated a drainage area of 67.1 mi<sup>2</sup> at the WWTF (see Whitman and Howard letter dated October 29, 1993 in the permit file). Therefore, the 7Q10 just upstream of the WWTF will be equal to  $4.06 \times 67.1 / 69.4$  or 3 cfs, the same as was used to calculate the dilution factor in the existing permit. Since the treatment plant design flow has also not changed, the calculated dilution factor is also the same as used for the existing permit

$Q_e$  = Middleborough WWTP Design Flow: 2.16 mgd = 3.34 cfs

Receiving stream - Nemasket River

$Q_s$  = 7 day 10 year low flow (7Q10): 3.0 cfs

Dilution Factor =  $(Q_s + Q_e) / Q_e = (3.0 + 3.34) / 3.34 = 1.9$

## B. CONVENTIONAL POLLUTANTS

### Carbonaceous Biochemical Oxygen Demand (CBOD) and Total Suspended Solids (TSS)

The CBOD and TSS concentration limits in the draft permit are the same as the limits in the existing permit and are based on a waste load allocation (WLA). These limits are more stringent than those required by the secondary treatment requirements of 40 CFR Part 133. The draft permit also contains percent removal requirements of 85% based on secondary treatment requirements.

There have been no violations of the monthly average BOD and TSS limits during the period of June 2010 through June 2012, with a long term average of 1.6 and 1.4 mg/l, respectively. See Table 1. The BOD and TSS removal percentages have both averaged 99% with no violations during this time period.

## pH

The draft permit includes pH limitations based in part on MA SWQS, 314 CMR 4.00, and are at least as stringent as pH limitations set forth at 40 C.F.R. §133.102(c). The MA SWQS require that Class B waters shall be in a range of 6.5 through 8.3 standard units. MassDEP generally requires a permit range of 6.5 to 8.3 s.u. as a condition of state certification. The monitoring frequency remains the same at once (1) per day.

## Bacteria

Limitations for bacteria in the existing permit are based upon state water quality standards for Massachusetts. There were no violations of the fecal coliform limit in the period June 2010 through June 2012.

The limits are modified in the Draft Permit to reflect the *E. coli* criteria in the revisions to the MA SWQS, 314 CMR § 4.05(3)(b), approved by EPA in 2007. The monthly average limitation in the draft permit is 126 colony forming units (cfu) per 100 ml, and shall be expressed as a monthly geometric mean. The daily maximum limitation in the draft permit is 409 cfu/100 ml. These limitations are a State certification requirement and are consistent with EPA guidance recommending that no dilution be considered in establishing permit limits for discharges to rivers designated for primary contact recreation. *EPA Memorandum re: Initial Zones of Dilution for Bacteria in Rivers and Streams Designated for Primary Contact Recreation*, November 12, 2008. The monitoring frequency is maintained at three times per week.

## C. NON-CONVENTIONAL POLLUTANTS

EPA is required to limit any pollutant or pollutant parameter that is or may be discharged at a level that caused, has reasonable potential to cause or contributes to an excursion above any water quality criterion.

### Total Phosphorus

The existing total phosphorus permit limit of 0.2 mg/l average monthly, based on “highest and best practical treatment” pursuant to 314 CMR 4.05(5)(c), is reduced in the draft permit to 0.15 mg/l in order to meet the Gold Book target of 0.1 mg/l to prevent eutrophication in the receiving water.

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). 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 nuisance/toxic algal blooms and low dissolved oxygen. (EPA, 2001). In freshwater systems such as the Nemasket, phosphorus is the primary nutrient of concern.

The MA SWQS at 314 CMR 4.00 do not contain numerical criteria for total phosphorus. They include a narrative criterion for nutrients at 314 CMR 4.05(5)(c), which provides that “all surface waters shall be free from nutrients in concentrations that would cause or contribute to

impairment of existing or designated uses.” They also include a requirement that “[a]ny existing point source discharge containing nutrients in concentrations that would cause or contribute to cultural eutrophication, including the excessive growth of aquatic plants or algae, in any surface water shall be provided with the most appropriate treatment as determined by the Department, including, where necessary, highest and best practical treatment (HBPT) for POTWs” Id. MassDEP has interpreted the “highest and best practicable treatment” (HBPT) requirement in its standards as requiring an effluent limit of 0.2 mg/l (200 ug/l) for phosphorus, and that requirement was incorporated in the existing permit as the monthly average total phosphorus limit for April to October.

EPA is not aware of any assessments of eutrophication indicators or conditions downstream of the Middleborough WPCF since implementation of the permit. As the Town of Middleborough intends to construct an upgrade, and the existing permit limit was based on HBPT (a technology standard) rather than a water quality based calculation, EPA has calculated a new limit for this draft permit designed to meet water quality standards in the Nemasket River.

In the absence of a numeric criterion for phosphorus, EPA looks to nationally recommended criteria and other technical guidance documents. *See* 40 CFR 122.44(d)(1)(vi)(B). EPA has produced several guidance documents which contain recommended total phosphorus criteria for receiving waters. The 1986 *Quality Criteria for Water* (“Gold Book”) recommends in-stream phosphorus concentrations of no greater than 50 ug/l in any stream entering a lake or reservoir, 100 ug/l for any stream not discharging directly to lakes or impoundments, and 25 ug/l within a lake or reservoir. EPA has also released “Ecoregional Nutrient Criteria,” established as part of an effort to reduce problems associated with excess nutrients in water bodies in specific areas of the country. *Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams*, December 2000 (EPA-822-B-00-022). The published criteria represent conditions in waters in that ecoregion that are minimally impacted by human activities, and thus representative of water without cultural eutrophication. The Middleborough WPCF is within Ecoregion XIV, Eastern Coastal Plains. The recommended total phosphorus criterion for this ecoregion is 24 ug/l.

EPA has decided to rely on the Gold Book criterion of 0.1 mg/l rather than the more stringent eco-region criteria of 0.024 mg/l, given that it was developed from an effects-based approach, versus the eco-region criteria that were developed on the basis of reference conditions. The effects-based approach is taken because it is often more directly associated with an impairment to a designated use (i.e. fishing, swimming). The effects-based approach provides a threshold value above which adverse effects (i.e., water quality impairments) are likely to occur. It applies empirical observations of a causal variable (i.e., phosphorus) and a response variable (i.e., chlorophyll *a*) associated with designated use impairments. Reference-based values are statistically derived from a comparison within a population of rivers in the same eco-region class. They are a quantitative set of river characteristics (physical, chemical and biological) that represent minimally impacted conditions.

Therefore EPA has calculated a revised total phosphorus limit based on meeting the Gold Book target for preventing eutrophication under 7Q10 conditions. In performing this calculation EPA assumes a receiving water concentration of 0.045 mg/l, based on the median receiving water

concentration upstream of the treatment plant as reported in MassDEP, *Taunton River Watershed 2001 Water Quality Assessment Report – Appendix B, OWM/DWM Water Quality Monitoring Data, Taunton River Watershed 1996* at B4. These data are quite old and EPA encourages the facility to provide more updated sampling data if available. The calculation is as follows:

$$\text{Permit limit } (C_d) = \frac{(C_r * Q_r - C_s * Q_s)}{(Q_d)} \quad ; \text{ where}$$

$C_d$  = Permit limit

$Q_d$  = Design flow of facility = 3.34 cfs

$C_s$  = Median concentration in Nemasket River upstream of discharge

$Q_s$  = 7Q10 streamflow in Nemasket River upstream of discharge = 3.0 cfs

$C_r$  = Target receiving water concentration downstream = 0.1 mg/l

$Q_r$  = Flow in receiving water downstream =  $Q_s + Q_d$

$$\text{Limit} = \frac{[(3.34 + 3.0 \text{ cfs}) * 0.1 \text{ mg/l} - 3.0 \text{ cfs} * 0.045 \text{ mg/l}]}{3.34 \text{ cfs}} = 0.15 \text{ mg/l}$$

The draft permit also includes a load limit of 2.7 lb/day, calculated using the effluent concentration limit and the facility design flow.

The draft permit provides a compliance schedule for meeting the new total phosphorus limit at the earliest practicable time, pursuant to 314 CMR 4.03(1)(b) and 40 CFR 122.47(a)(1). This schedule is consistent with the Town of Middleborough's design and construction schedule for the facility upgrade.

#### Ammonia-Nitrogen

The draft permit continues the existing permit's warm weather (April 1 through October 31) average monthly concentration limit for ammonia-nitrogen of 1.0 mg/l, based on a MassDEP Wasteload Allocation.

There were no violations of the warm weather limit between June 2010 and June 2012 (see Table 1). The average value for the warm weather monthly average concentration was 0.48 mg/l (n = 15). Monthly average ammonia-nitrogen values for the warm weather (April through October) ranged between 0.21 and 1 mg/l.

#### Total Nitrogen

The draft permit includes a monthly average total nitrogen limit of 5.0 mg/l total nitrogen, and a mass limit of 90 lbs/day based on the concentration limit and the design flow of the treatment facility, in effect for the months of May through October, in order to address cultural eutrophication in the Taunton River Estuary and Mount Hope Bay. In addition to this seasonally-applied numeric limit, the permit requires the permittee to optimize the treatment facility operations for the removal of total nitrogen during the months of November through April using all available treatment equipment at the facility. The basis for this determination is set forth

below.

*a. Ecological Setting: the Taunton River Estuary, Mount Hope Bay and Estuarine Systems Generally*

The saltwater portions of the Taunton River (the “Taunton River Estuary”) and Mount Hope Bay are part of the greater Narragansett Bay Estuary system, which covers approximately 147 square miles within Massachusetts and Rhode Island. The Narragansett Bay Estuary is one of only 28 “estuaries of national significance” under the National Estuary Program (NEP), which was established in 1987 by amendments to the CWA to identify, restore and protect estuaries along the coasts of the United States.

Mt. Hope Bay (the Bay) is situated in the northeast corner of Narragansett Bay, lying within both Rhode Island to the south and west and Massachusetts to the north and east. The Bay connects to the East Passage of Narragansett Bay to the southwest, via a deep, narrow channel where the Mt. Hope Bridge crosses over from Aquidneck Island to Bristol Point, and to Rhode Island Sound to the South via the Sakonnet River (actually an embayment) between Tiverton, RI and Aquidneck Island. The Bay covers an area of 13.6 square miles, and has a volume of 53.3 billion gallons at mean low water (MLW). <http://www.smast.umassd.edu/MHBNL/report2003.php>

The Bay has a tidal range averaging approximately 4.5 feet.

The Taunton River is the largest freshwater source to Mount Hope Bay. It discharges into the Bay from the north at Fall River. The Taunton River Estuary consists of the saltwater portions of the Taunton River, extending from the Braga Bridge at the confluence with Mount Hope Bay upstream to the Route 24 bridge (Taunton/Raynham), approximately four miles upstream of the Taunton WWTP discharge. (MassDEP, 2001). It is the longest river unobstructed by dams in New England, with tidal influence extending upriver approximately 20 miles. (Horsley Witten, 2007).

Estuaries are extremely significant aquatic resources. An estuary is a partially enclosed coastal body of water located between freshwater ecosystems (lakes, rivers, and streams; freshwater and coastal wetlands; and groundwater systems) and coastal shelf systems where freshwater from the land measurably dilutes saltwater from the ocean. This mixture of water types creates a unique transitional environment that is critical for the survival of many species of fish, birds, and other wildlife. Estuarine environments are among the most productive on earth, creating more organic matter each year than comparably sized areas of forest, grassland, or agricultural land (EPA, 2001).

Maintaining water quality within an estuary is important for many reasons. Estuaries provide a variety of habitats such as shallow open waters, freshwater and saltwater marshes, sandy beaches, mud and sand flats, rocky shores, oyster reefs, tidal pools, and seagrass beds. Tens of thousands of birds, mammals, fish, and other wildlife depend on estuarine habitats as places to live, feed, and reproduce. Many species of fish and shellfish rely on the sheltered waters of estuaries as protected places to spawn.

Moreover, estuaries also provide a number of recreational values such as swimming, boating,

fishing, and bird watching. In addition, estuaries have an important commercial value since they serve as nursery grounds for two-thirds of the nation's commercial fish and shellfish, and support tourism drawing on the natural resources that estuaries supply. (EPA, 1998). Consequently, EPA believes sound environmental policy reasons favor a pollution control approach that is both protective and undertaken expeditiously to prevent degradation of these critical natural resources. Because estuaries are the intermediary between oceans and land, both of these geographic features influence their physical, chemical, and biological properties. In the course of flowing downstream through a watershed to an estuary, tributaries pick up materials that wash off the land or are discharged directly into the water by land-based activities.

Eventually, the materials that accumulate in the tributaries are delivered to estuaries. The types of materials that eventually enter an estuary largely depend on how the land is used. Undisturbed land, for example, will discharge considerably fewer pollutants than an urban center or areas with large amounts of impervious cover. Accordingly, an estuary's overall health can be heavily impacted by surrounding land uses.

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.

#### *b. Effects of Nutrients on Estuarine Water Quality*

The basic cause of nutrient problems in estuaries and nearshore coastal waters is the enrichment of freshwater with nitrogen (N) and phosphorus (P) (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). 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 3 shows the progression of nutrient impacts on a waterbody.

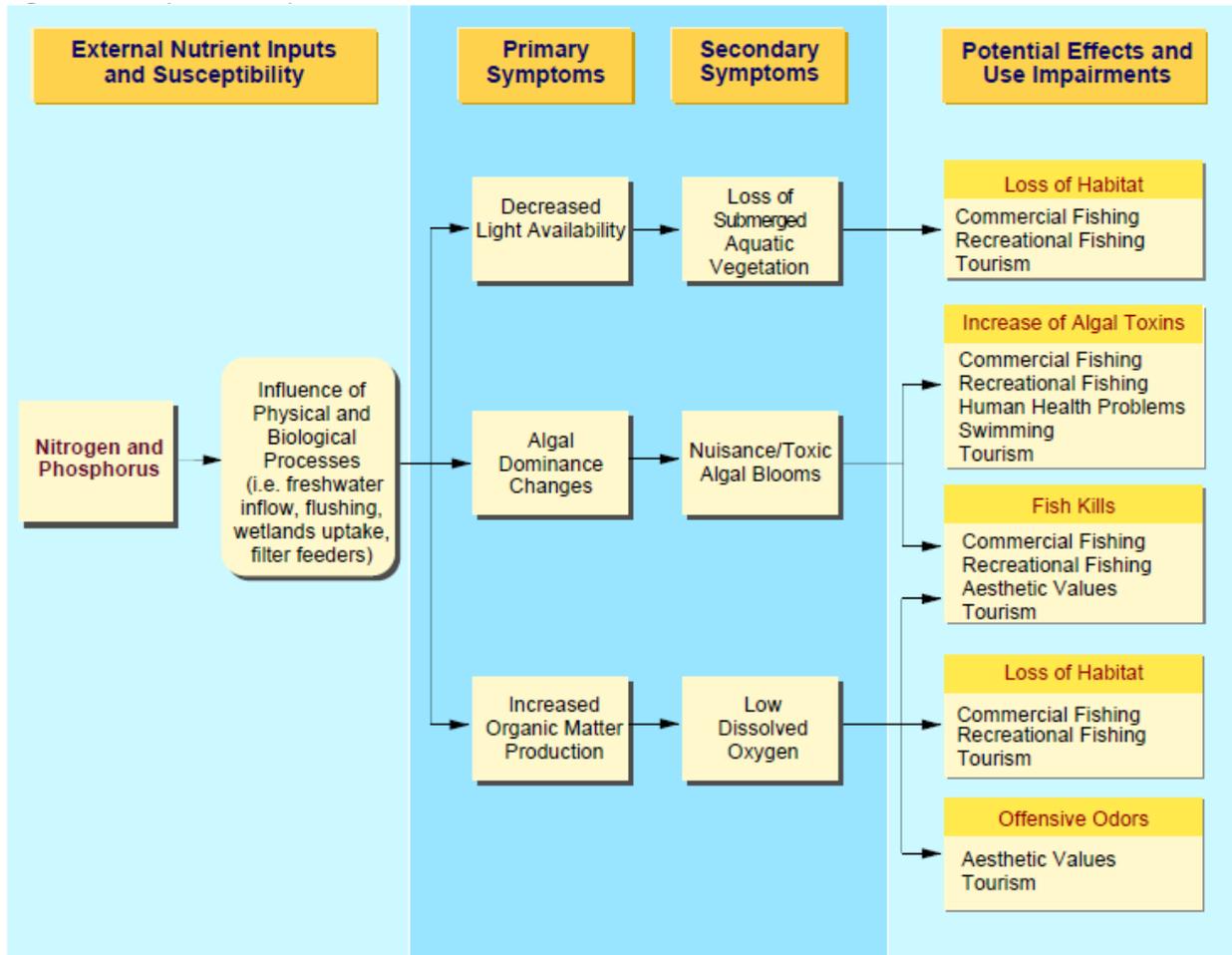


Figure 3  
Source: Bricker, 1999 as cited in EPA, 2001

Estuarine nutrient dynamics are complex and are influenced by flushing time, freshwater inflow and stratification, among other factors. The deleterious physical, chemical, and biological responses in surface water resulting from excessive plant growth impair designated uses in both receiving and downstream waterbodies. Excessive plant growth can result in a loss of diversity and other changes in the aquatic plant, invertebrate, and fish community structure and habitat.

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 (DO) levels. Through respiration, and the decomposition of dead plant matter, excessive algae and plant growth can reduce instream DO 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, DO 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 DO. Many aquatic insects, fish, and other organisms become stressed and may even die when DO levels drop below a particular threshold level.

Nutrient overenrichment of estuaries and nearshore coastal waters from human-based causes is now recognized as a national problem on the basis of Clean Water Act Section 305(b) reports from coastal States (EPA, 2001). Most of the nation's estuarine and coastal waters are moderately to severely polluted by excessive nutrients, especially nitrogen and phosphorus (NOAA, 2007; NOAA, 1999, EPA, 2006; EPA, 2004, EPA; and EPA, 2001).

*c. Water Quality Standards Applicable to the Taunton River Estuary and Mount Hope Bay*

Under the MA SWQS, 314 CMR 4.00, surface waters are divided into water "use" classifications, including Class SA and SB for marine and coastal waters. The Taunton River Estuary and the eastern portion of Mount Hope Bay are classified as SB waters, with designations for Shellfishing (Restricted and Conditionally Restricted Shellfish Areas) and CSO. Class SB waters are designated as a "habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. In certain waters, habitat for fish, other aquatic life and wildlife may include, but is not limited to, seagrass. Where designated in the tables to 314 CMR 4.00 for shellfishing, these waters shall be suitable for shellfish harvesting with depuration (Restricted and Conditionally Restricted Shellfish Areas)." 314 CMR 4.05(4)(b). Waters in this classification "shall have consistently good aesthetic value." *Id.*

Class SB waters are subject to class-specific narrative and/or numeric water quality criteria. 314 CMR 4.05(4)(b)1 to 8. DO concentrations in Class SB waters "[s]hall not be less than 5.0 mg/l. Seasonal and daily variations that are necessary to protect existing and designated uses shall be maintained. Where natural background conditions are lower, DO shall not be less than natural background."

The western portion of Mount Hope Bay is designated as a Class SA – Shellfishing water. These waters are designated as an excellent habitat for fish, other aquatic life and wildlife and for

primary and secondary contact recreation. In approved areas, they shall be suitable for shellfish harvesting without depuration (Open Shellfish Areas). These waters shall have excellent aesthetic value. With respect to DO, the criteria for class SA waters is “not less than 6.0 mg/. Where natural background conditions are lower, DO shall not be less than the natural background. Natural seasonal and daily variations that are necessary to protect existing and designated uses shall be maintained.”

Both Class SA and Class SB waters are also subject to additional minimum standards applicable to all surface waters, as set forth at 314 CMR 4.05(5). With respect to nutrients, the MA SWQS provide:

Unless naturally occurring, all surface waters shall be free from nutrients in concentrations that would cause or contribute to impairment of existing or designated uses and shall not exceed the site specific criteria developed in a TMDL or as otherwise established by the Department pursuant to 314 CMR 4.00. Any existing point source discharge containing nutrients in concentrations that would cause or contribute to cultural eutrophication, including the excessive growth of aquatic plants or algae, in any surface water shall be provided with the most appropriate treatment as determined by the Department, including, where necessary, highest and best practical treatment (HBPT) for POTWs and BAT for non POTWs, to remove such nutrients to ensure protection of existing and designated uses.

314 CMR 4.05(5)(c). In addition, the MA SWQS require:

Aesthetics – All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum, or other matter to form nuisances; produce objectionable odor, color, taste, or turbidity; or produce undesirable or nuisance species of aquatic life. 314 CMR 4.05(5)(a)

Massachusetts has not adopted numeric criteria for total nitrogen or other nutrients. MassDEP has, however, used a number of indicators in interpreting its narrative nutrient standard. The DEP/SMASST Massachusetts Estuaries Project report, *Site-Specific Nitrogen Thresholds for Southeastern Massachusetts Embayments: Critical Indicators - Interim Report* (Howes et al., 2003) (Critical Indicators Report), was developed to provide “a translator between the current narrative standard and nitrogen thresholds (as they relate to the ecological health of each embayment) which can be further refined based on the specific physical, chemical and biological characteristics of each embayment. This report is intended to provide a detailed discussion of the issue and types of indicators that can be used, as well as propose an acceptable range of nitrogen thresholds that will be used to interpret the current narrative standard.”

<http://www.oceanscience.net/estuaries/pdf/nitroest.pdf>. This interpretive guidance has been used in a number of TMDLs for estuarine waters in southeastern Massachusetts.

The Critical Indicators Report finds that the indicators of primary concern to be:

- plant presence and diversity (eelgrass, macroalgae, etc.)
- animal species presence and diversity (finfish, shellfish, infauna)

- nutrient concentrations (nitrogen species)
- chlorophyll-a concentration
- dissolved oxygen levels in the embayment water column

(Howes et al., 2003 at 11). With respect to total nitrogen, it concluded:

It is not possible at this time to put quantitative nitrogen levels on each Water Quality Class. In fact, initial results of the Massachusetts Estuaries Project (Chatham Embayment Report 2003) indicate that the total nitrogen level associated with a particular ecological response can vary by over 1.4 fold (e.g. Stage Harbor versus Bassing Harbor in Chatham MA). Although between embayments nitrogen criteria may be different, it does appear that within a single embayment a consistent quantitative nitrogen criterion can be developed.

However, the Critical Indicators Report provides guidance for indicators, including total nitrogen, for various water quality classes. The nitrogen indicator ranges are based on long-term (>3 yr) average mid-ebb tide concentrations of total nitrogen (mg/L) in the water column. For “Excellent to Good” nitrogen related water quality conditions, equivalent to SA classification, the Report guidance is as follows: “Eelgrass beds are present, macroalgae is generally non-existent but in some cases may be present, benthic animal diversity and shellfish productivity are high, oxygen levels are generally not less than 6.0 mg/l with occasional depletions being rare (if at all), chlorophyll-a levels are in the 3 to 5 µg/L range. . . . For the case study, total nitrogen levels of 0.30-0.39 mg N/L were used to designate “excellent to good” quality areas.” Id at 21-22.

For SB waters, the Critical Indicators Report provides the following guidance for indicators of unimpaired conditions, to be refined based on data from the specific embayments: “benthic animal diversity and shellfish productivity are high, oxygen levels are generally not less than 5.0 mg/l with depletions to <4 mg/L being infrequent, chlorophyll-a levels are in the 3 to 5 µg/L range and nitrogen levels are in the 0.39 - 0.50 range. . . . eelgrass is not present . . . and macroalgae is not present or present in limited amounts even though a good healthy aquatic community still exists.” Id. at 22.

“Moderate Impairment” is indicated by “Shellfisheries may shift to more resistant species. Oxygen levels generally do not fall below 4 mg/L, although phytoplankton blooms raise chlorophyll a levels to around 10 µg/L. Eelgrass is not sustainable and macro-algae accumulations occur in some regions of the embayment. In the Case Study, embayment regions supporting total nitrogen levels >0.5 mg N/L were clearly impaired.” Significant Impairment is indicated by total nitrogen concentrations of 0.6/0.7 mg/l and above. In “severely degraded” conditions, “algal blooms are typical with chlorophyll-a levels generally >20 µg/L, oxygen depletions to hypoxic levels are common, there are periodic fish kills, and macro-algal accumulations occur with both ecological and aesthetic impacts.”

In addition to the Massachusetts water quality standards, water quality standards applicable to the Rhode Island portion of Mount Hope Bay must also be satisfied. As in Massachusetts, the Rhode Island portions of Mount Hope Bay are designated SB waters in the eastern portion and

SA waters in the western portion of the Bay. Rhode Island, like Massachusetts, has specific numeric criteria for DO in SA and SB waters<sup>2</sup>, and narrative criteria for nutrients<sup>3</sup> and aesthetics.<sup>4</sup> The Rhode Island portions of Mount Hope Bay, like the Massachusetts portions are listed for impairments due to total nitrogen, dissolved oxygen (as well as fishes bioassessments and temperature impairments linked to the Brayton Point power plant). As discussed below, permit limits designed to meet water quality standards in the Taunton River Estuary and the Massachusetts portions of Mount Hope Bay are expected to achieve water quality standards in Rhode Island.

#### *d. Receiving Water Quality Violations*

The Taunton River Estuary and Mount Hope Bay 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 water quality standards described above. The impacts of excessive nutrients are evident throughout the Taunton River Estuary and Mount Hope Bay.

Section 303(d) of the CWA requires states to identify those waterbodies that are not expected to meet surface water quality standards after implementation of technology-based controls. The State of Massachusetts has identified Mount Hope Bay and the lower reaches of the Taunton River Estuary for impairments due to organic enrichment/low DO, with Total Nitrogen specifically identified as a cause of impairments in Mount Hope Bay.

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<sup>2</sup> Rule 8.D.3. Table 3. For waters with a seasonal pycnocline, no less than 4.8 mg/l above the seasonal pycnocline; below the seasonal pycnocline DO concentrations above 4.8 mg/l shall be considered protective of Aquatic Life Uses. When instantaneous DO values fall below 4.8 mg/l, the waters shall not be (1) Less than 2.9 mg/l for more than 24 consecutive hours during the recruitment season; nor (2) Less than 1.4 mg/l for more than 1 hour more than twice during the recruitment season; nor (3) Shall they exceed the allowable cumulative DO exposure (Table 3.A).

For waters without a seasonal pycnocline, DO concentrations above 4.8 mg/l shall be considered protective of Aquatic Life Uses. When instantaneous DO values fall below 4.8 mg/l, the waters shall not be: (1) Less than 3.0 mg/l for more than 24 consecutive hours during the recruitment season; nor (2) Less than 1.4 mg/l for more than 1 hour more than twice during the recruitment season; nor (3) Shall they exceed the allowable cumulative DO exposure presented (Table 3.A. and Table 3.B).

<sup>3</sup> Rule 8.D.1(d). Nutrients - Nutrients shall not exceed the limitations specified in rule 8.D.(2) (freshwaters) and 8.D.(3) (seawaters) and/or more stringent site-specific limits necessary to prevent or minimize accelerated or cultural eutrophication.

Rule 8.D.3. None in such concentration that would impair any usages specifically assigned to said Class, or cause undesirable or nuisance aquatic species associated with cultural eutrophication. Shall not exceed site-specific limits if deemed necessary by the Director to prevent or minimize accelerated or cultural eutrophication. Total phosphorus, nitrates and ammonia may be assigned site-specific permit limits based on reasonable Best Available Technologies. Where waters have low tidal flushing rates, applicable treatment to prevent or minimize accelerated or cultural eutrophication may be required for regulated nonpoint source activities.

<sup>4</sup> Rule 8.D.1(b)(iv). Aesthetics - all waters shall be free from pollutants in concentrations or combinations that: iv. Result in the dominance of species of fish and wildlife to such a degree as to create a nuisance or interfere with the existing or designated uses.

A three-year water quality monitoring study was conducted by the School for Marine Science and Technology at UMass-Dartmouth (SMAST) and involved monthly sampling at 22 sites across Mount Hope Bay and the Taunton River Estuary from 2004 to 2006 (see Figure 4). This study showed that average chlorophyll-a over the three year period was above 10 ug/l at all monitoring stations across the Taunton River Estuary and Mount Hope Bay. The 20<sup>th</sup> percentile DO concentrations for the three year period were below the 5.0 mg/l water quality standard at four of the six sites in the Taunton River Estuary (MHB 1, 2 and 18-21). Table 2, reproduced from SMAST, *Summary of Water Quality Monitoring Program for the Mount Hope Bay Embayment System (2004 – 2006)* at 24 (August 16, 2007).

Table 2. Mount Hope Bay Monitoring Program results as reported in SMAST, 2007.

Table 5. Summary of average levels of primary nutrient related water quality parameters measured in the summers of 2004, 2005 and 2006 in Mount Hope Bay by SMAST Coastal Systems staff.												
Station	Total Depth (m)	20% Low <sup>e</sup> D.O. (mg/L)	Sal (ppt)	PO4 (mg/L)	NH4 (mg/L)	NOX (mg/L)	DIN (mg/L)	DON (mg/L)	PON (mg/L)	TN (mg/L)	DIN/DIP Molar Ratio	Total Chl a (ug/L)
MHB1	10.0	5.02	23.3	0.054	0.052	0.095	0.147	0.299	0.155	0.601	6	11.75
MHB2	8.9	4.94	26.1	0.052	0.047	0.043	0.090	0.312	0.170	0.572	4	13.50
MHB3	5.2	5.49	26.0	0.051	0.037	0.035	0.072	0.282	0.163	0.517	3	14.32
MHB4	3.5	5.61	25.7	0.052	0.026	0.017	0.043	0.308	0.173	0.525	3	14.71
MHB5	5.6	5.20	26.2	0.050	0.029	0.020	0.050	0.294	0.169	0.512	2	14.53
MHB6	3.9	5.09	24.1	0.061	0.049	0.030	0.079	0.359	0.168	0.606	3	12.87
MHB7	4.5	5.94	25.5	0.049	0.023	0.016	0.039	0.308	0.189	0.536	2	17.46
MHB8	5.1	4.93	25.8	0.046	0.022	0.019	0.041	0.280	0.165	0.486	2	15.84
MHB9	ND	ND	19.7	0.062	0.049	0.040	0.089	0.453	0.263	0.805	3	14.02
MHB10	3.2	5.86	25.7	0.048	0.017	0.012	0.027	0.314	0.167	0.508	1	14.11
MHB11	4.9	5.02	26.2	0.043	0.017	0.012	0.029	0.268	0.175	0.472	1	16.23
MHB12	5.0	5.36	26.4	0.049	0.020	0.021	0.040	0.284	0.168	0.493	2	16.12
MHB13	5.9	6.00	26.8	0.045	0.020	0.013	0.033	0.282	0.158	0.473	2	15.40
MHB14	6.5	5.34	27.0	0.044	0.024	0.009	0.033	0.289	0.197	0.519	2	16.78
MHB15	12.9	6.46	27.9	0.035	0.021	0.009	0.029	0.273	0.143	0.445	2	12.68
MHB16	11.2	6.33	27.7	0.043	0.028	0.012	0.039	0.265	0.157	0.461	2	13.02
MHB17	ND	ND	24.6	0.064	0.057	0.026	0.083	0.404	0.181	0.669	3	11.81
MHB18	6.7	4.96	22.3	0.062	0.061	0.136	0.197	0.300	0.156	0.652	7	11.44
MHB19	4.0	4.93	18.7	0.058	0.074	0.201	0.275	0.342	0.178	0.799	10	12.27
MHB20	1.8	5.09	17.5	0.054	0.063	0.144	0.207	0.372	0.192	0.771	8	13.59
MHB21	2.6	4.60	14.2	0.061	0.066	0.350	0.415	0.420	0.219	1.058	15	13.34
MHBMOOR	6.3	5.85	26.8	0.045	0.025	0.013	0.038	0.284	0.181	0.503	2	15.57

\* Average of the lowest 20% of recorded values

Figure 4. Mount Hope Bay Monitoring Program estuarine stations.

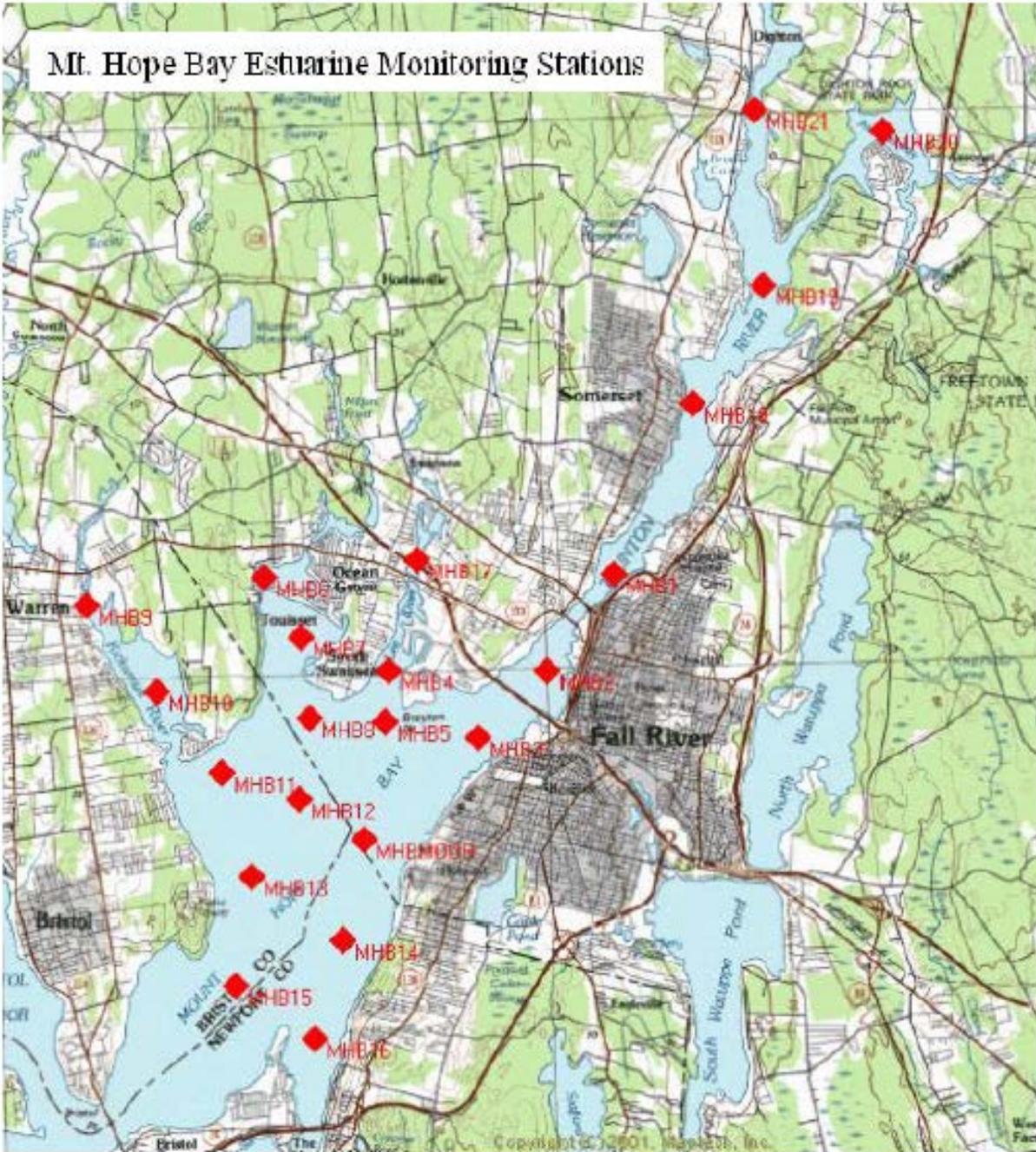


Table 3 below shows the results of the SMAST monitoring for each of the three years of the monitoring program, with the Taunton River stations highlighted. Minimum measured DO concentrations in each year were below 5.0 mg/l at all the Taunton River stations in 2004 and 2006, and a majority of those stations in 2005. In Mount Hope Bay proper, minimum DO concentrations below 5.0 mg/l were encountered at all but one of the Mount Hope Bay stations at least once during the three year period, and at five of the ten stations in both 2004 and 2005. This is compelling evidence of pervasive low DO conditions throughout the Taunton River

Estuary and Mount Hope Bay, given that the sampling was intermittent (and therefore unlikely to capture isolated low DO events) and was not timed to reflect the lowest DO conditions in the waterbody (just before dawn, when oxygen depletion due to respiration is greatest).

Elevated chlorophyll-a concentrations are similarly pervasive based on the SMAST monitoring data. Mean chlorophyll-a concentrations are above the Critical Indicators Report guidelines for unimpaired waters (3-5 ug/l) at every station monitored, in all three of the monitoring seasons. See Table 3. Maximum chlorophyll-a concentrations are routinely above 20 ug/l, far exceeding the chlorophyll concentrations found in unimpaired waters. Again, given the likelihood of intermittent sampling missing the worst conditions in terms of algal blooms, this is compelling evidence of pervasive eutrophic conditions throughout the Taunton River Estuary and Mount Hope Bay.

Total nitrogen concentrations are elevated throughout the system, with a three year average TN concentration above 0.5 mg/l at sixteen of the 22 sites and above 0.45 mg/l at 21 of 22 sites. SMAST, 2007. Total Nitrogen concentrations are generally highest in the tidal rivers, including the Taunton River (e.g. Station 19, TN range 0.66 to 0.99 mg/l). Molar N/P ratios are consistent with nitrogen limitation ( $\leq 10$  at all stations other than MHB21, the uppermost Taunton River station).

Table 3. SMAST Monitoring Data Summarized by Year. Taunton River stations highlighted.

Station	Location	State	2004				2005				2006			
			DO min (mg/l)	Chl-a max (ug/l)	Chl-a mean (ug/l)	TN mean (mg/l)	DO min (mg/l)	Chl-a max (ug/l)	Chl-a mean (ug/l)	TN mean (mg/l)	DO min (mg/l)	Chl-a max (ug/l)	Chl-a mean (ug/l)	TN mean (mg/l)
1	Taunton River	MA	4.8	24.2	7.8	0.53	5.1	49.2	10.9	0.56	4.1	26.6	10.3	0.74
2	Taunton River	MA	4.7	33.2	9.6	0.53	5.0	16.6	8.2	0.51	3.0	48.6	14.2	0.68
3	MHB proper (61-06)	MA	5.1	65.1	11.9	0.51	5.2	20.0	10.2	0.45	4.8	41.5	16.8	0.60
4	Lee River	MA	4.7	19.5	10.5	0.51	5.1	16.0	10.8	0.48	6.1	28.6	16.3	0.59
5	MHB proper (61-07)	MA	4.7	22.4	10.5	0.48	4.6	22.6	11.7	0.49	5.1	29.7	14.3	0.57
6	Cole River	MA	4.9	26.4	11.1	0.52	4.7	16.0	11.0	0.56	5.3	18.6	8.5	0.74
7	MHB proper (61-07)	MA	3.4	37.2	14.2	0.47	5.3	22.3	13.3	0.54	7.1	24.9	16.2	0.60
8	MHB proper (61-07)	MA	3.8	38.8	12.7	0.46	2.6	27.5	11.8	0.45	5.6	32.7	14.1	0.55
9	Kickamut River	RI	No data	19.1	11.9	0.70	No Data	17.7	9.7	0.73	No data	33.1	13.1	1.03
10	Kickamut River	RI	6.0	12.5	8.5	0.48	5.4	29.9	13.6	0.49	5.4	28.9	14.6	0.57
11	MHB-proper	RI	3.2	26.3	10.4	0.44	4.5	33.2	14.3	0.45	5.5	35.6	17.1	0.53
12	MHB-proper	RI	4.0	29.2	10.8	0.45	4.0	29.6	14.4	0.50	5.4	36.4	14.1	0.52
13	MHB-proper	RI	6.5	25.8	11.2	0.42	4.1	27.9	13.4	0.46	6.2	26.5	13.7	0.53
14	MHB-proper	RI	6.0	36.8	14.2	0.58	6.1	32.4	12.1	0.41	2.1	80.6	19.4	0.57
15	MHB-proper	RI	6.9	23.1	9.8	0.45	6.3	23.6	8.8	0.42	4.3	42.4	14.5	0.46
16	MHB-proper	RI	6.2	25.5	10.5	0.45	6.0	33.3	10.3	0.44	5.3	30.4	14.1	0.50
17	Lee River	MA	No data	9.2	4.7	0.65	No Data	17.3	7.9	0.61	No data	27.2	13.8	0.76
18	Taunton River	MA	4.7	16.1	7.5	0.61	4.4	38.0	9.0	0.60	4.3	12.9	7.2	0.80
19	Taunton River	MA	4.4	27.0	10.8	0.72	4.7	33.2	10.5	0.73	4.6	15.0	5.5	0.99
20	Assonet River	MA	5.1	15.7	9.1	0.72	5.6	27.1	12.2	0.63	4.8	16.9	7.6	0.94
21	Taunton River	MA	3.8	23.1	10.5	0.98	4.1	19.8	10.5	1.04	4.8	14.3	5.9	1.24
MOOR	MHB proper (61-06)	MA	6.3	21.4	11.4	0.51	5.4	19.9	11.5	0.45	2.7	35.4	16.5	0.55

Based on these data, the SMAST report concluded that a Massachusetts Estuaries Project (“MEP”) analysis of nitrogen loading was warranted for the Mount Hope Bay/Taunton River complex, stating:

Given the high population within the watershed and resultant N loading to this down gradient estuary and the observed high chlorophyll levels and oxygen depletions, it is not surprising that nitrogen levels are moderately to highly enriched over offshore waters. The Taunton River estuarine reach, as the focus of upper watershed N loading, showed very high total nitrogen levels (TN) in its upper reach (1.058 mg N L<sup>-1</sup>) and maintained high levels throughout most of its reach (>0.6 mg N L<sup>-1</sup>). The main basin of Mt. Hope Bay supported lower TN levels primarily as a result of mixing with incoming waters (generally 0.5-0.6 mg N L<sup>-1</sup>). This is consistent with the observed oxygen depletions and infauna animal communities. The highest (Moderate) water quality was found at the stations in the main basin and lower reaches of Mt Hope Bay out to the channels to lower Narragansett Bay and the Sakonet River (Figure 6).

...

In general, the Taunton River Estuary, with its large watershed N load and high TN levels, is showing poor water quality due to its high chlorophyll and oxygen depletions. The main basin of Mt. Hope Bay, with its greater flushing and access to higher quality waters of the lower Bay, is showing less impairment with moderate water quality. Finally, the lower basin of Mt. Hope Bay, nearest the tidal "inlet", is generally showing moderate water quality. . . . [T]hese data indicate that the MEP analysis of this system should focus on restoration of the main basin of Mt. Hope Bay and the Taunton River estuarine reach, and that it is likely that restoration of the Taunton River Estuary will have a significant positive effect on the habitat quality of the main basin of Mt. Hope Bay.

To date, the MEP analysis, along with the TMDL that would result from the analysis, has not been completed.<sup>5</sup>

Additional evidence of conditions in Mount Hope Bay is provided from the Narragansett Bay Water Quality Network, fixed monitoring station in the Bay, equipped with two datasondes that measured temperature, salinity, dissolved oxygen and depth at approximately 1 meter from the bottom and 0.5 meters below the surface, and chlorophyll fluorescence at the near surface sonde. ([http://www.narrbay.org/d\\_projects/buoy/buoydata.htm](http://www.narrbay.org/d_projects/buoy/buoydata.htm)). The datasondes have been deployed in the Rhode Island portion of Mount Hope Bay near SMAST site MHB13, from May or June through October, since 2005. Analysis of the DO data from the deep sonde at this site in 2005 and 2006 showed multiple events (three in 2005; seven in 2006) of DO depletion below the 4.8

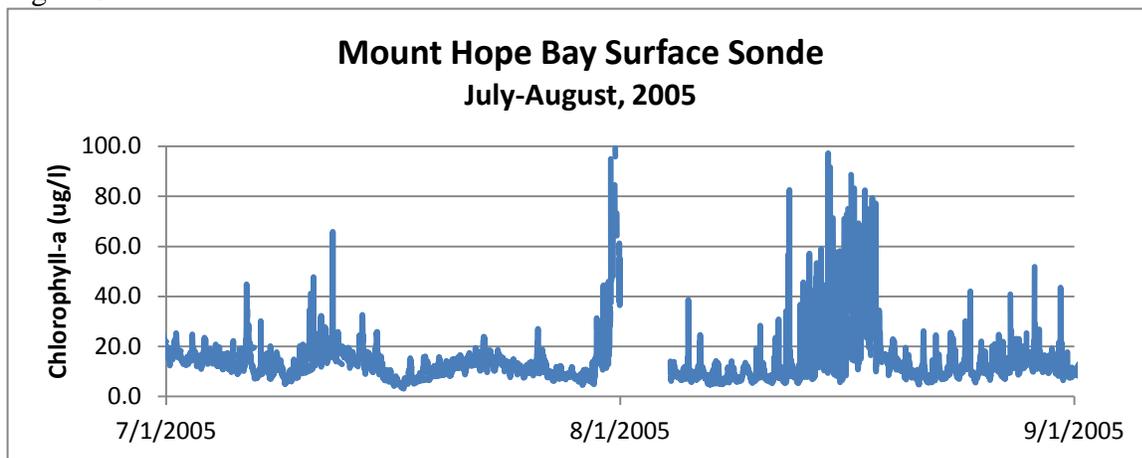
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<sup>5</sup> EPA is required to issue the permit with limits and conditions necessary to ensure compliance with State water quality standards at the time of permit reissuance. Neither the CWA nor EPA regulations require that a TMDL be completed before a water quality-based limit may be included in a permit. Rather, water quality-based effluent limitations in NPDES permits must be “consistent with the assumptions and requirements of any *available* [emphasis added] wasteload allocation.” 40 C.F.R. § 122.44(d)(1)(vii)(B). Thus, an approved TMDL is not a precondition to the issuance of an NPDES permit for discharges to an impaired waterway; nor does EPA have discretion to wait for the issuance of a TMDL to include effluent limitation on discharges of pollutants that contribute to impairments.

mg/l RI water quality threshold, with individual events lasting between two and twelve days. Codiga et al, “Narragansett Bay Hypoxic Even Characteristics Based on Fixed-Site Monitoring Network Time Series: Intermittency, Geographic Distribution, Spatial Synchronicity, and Interannual Variability,” *Estuaries and Coasts* 32:621-641 (2009). Two of the 2006 events were characterized as “hypoxic”, with DO concentrations less than 2.9 mg/l persisting for over two days. Id.

The sonde data also confirms the occurrence of algal blooms and generally elevated chlorophyll-a concentrations in Mount Hope Bay. The 2005 sonde data, Figure 5, shows multiple events with chlorophyll-a concentrations well above 20 ug/l, and above the maximum concentrations captured with the intermittent SMAST sampling.

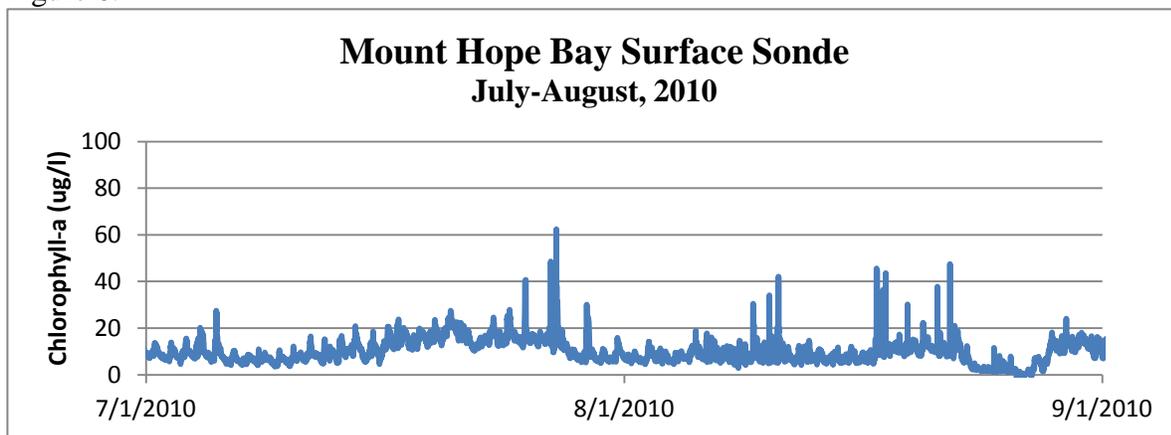
Figure 5



Charts by EPA. Source data: Narragansett Bay Fixed-Site Monitoring Network (NBFSMN), 2005. 2005 Datasets. Rhode Island Department of Environmental Management, Office of Water Resources. Data available at [www.dem.ri.gov/bart](http://www.dem.ri.gov/bart)

The Sonde monitoring also confirms that these water quality violations continue to the present. The most recent published data (for 2010) show elevated chlorophyll-a concentrations and persistent DO concentrations below 5 mg/l. See Figure 6.

Figure 6.



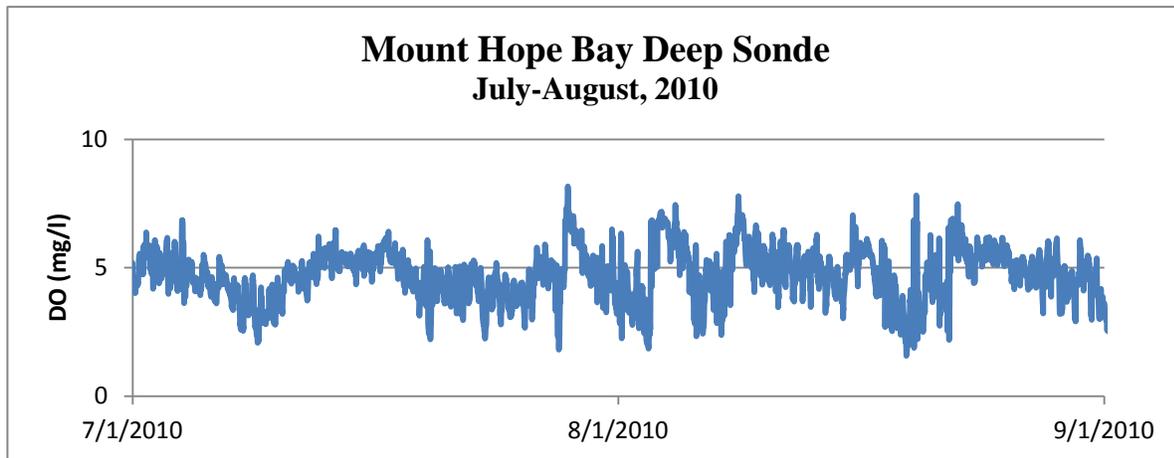


Chart by EPA. Source data: Narragansett Bay Fixed-Site Monitoring Network (NBFSMN), 2010. 2010 Datasets. Rhode Island Department of Environmental Management, Office of Water Resources. Data available at [www.dem.ri.gov/bart](http://www.dem.ri.gov/bart)

Based on these data, EPA has concluded that cultural eutrophication due to nitrogen overenrichment in the Taunton River Estuary and Mount Hope Bay has reached the level of a violation of both Massachusetts and Rhode Island water quality standards for nutrients and aesthetics, and has also resulted in violations of the numeric DO standards in these waters.

*e. Reasonable Potential Analysis*

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.

To determine the extent of the facility’s contribution to the violation of the MA SWQS, EPA performed an analysis of nitrogen loading to the Taunton River Estuary using data from the SMAST monitoring program, which included monitoring on the Taunton River and major tributaries to the Taunton River Estuary, in addition to the estuarine stations. The analysis focuses on the Taunton River Estuary because that area shows the greatest eutrophication impacts and greatest nitrogen concentrations. Using the 2004-2005 to representative a “typical year” based on precipitation data,<sup>6</sup> EPA used the USGS LOADEST program to calculate a

<sup>6</sup> Rainfall during the summers of 2004 and 2005 totalled 17.82 and 11.03 inches respectively ([http://weather-warehouse.com/WeatherHistory/PastWeatherData\\_TauntonMuniArpt\\_EastTaunton\\_MA\\_September.html](http://weather-warehouse.com/WeatherHistory/PastWeatherData_TauntonMuniArpt_EastTaunton_MA_September.html)), compared to a long term average of 15.24 inches (<http://www.weather.com/weather/wxclimatology/>)

calculate a seasonal average (June to September) nitrogen load for the Taunton River and each tributary using measured nitrogen concentrations and flow for several discrete events. A description of the LOADEST analysis is provided in Attachment A.

EPA also calculated the point source loads to the Taunton River Estuary derived from wastewater treatment plants based on DMR data from each facility from June through September 2004-05. These include direct discharges to the Taunton River Estuary (Taunton and Somerset WWTPs), and discharges to the tributaries from other POTWs, which are a component of the tributary loads calculated above. For POTWs discharging to tributaries to the Taunton River, an attenuation factor was applied to account for instream uptake of nitrogen. A description of the attenuation calculation is provided in Attachment B. Attenuation was determined to range from four to eighteen percent for the major (> 1 mgd) facilities located on tributaries (eleven percent for Brockton, the largest discharger), with higher attenuation for some of the smaller facilities on smaller tributaries. Table 6 shows the point sources, the receiving stream, their nitrogen discharges and the delivered load to the estuary.

Table 4.

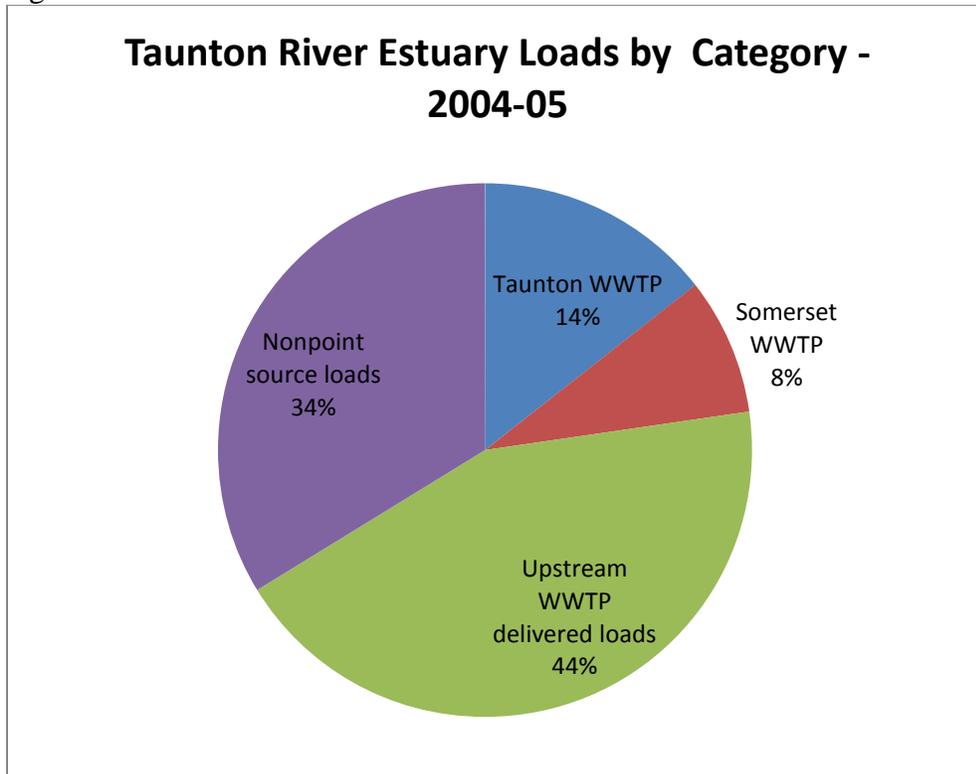
WWTF	Design Flow (MGD)	Receiving stream	Average 2004-05 Summer TN discharged (lb/d)	Average 2004-05 Summer TN delivered to Estuary (lb/d)
<i>Direct discharges to Estuary</i>				
Taunton	8.4	Taunton River Estuary	610	610
Somerset	4.2	Taunton River Estuary	349.5	349.5
<i>Total direct point source load:</i>				959
<i>Upstream discharges</i>				
MCI Bridgewater	0.55	Taunton River	37	33
Brockton	18	Salisbury Plain River	1303	1160
Bridgewater	1.44	Town River	137.5	132
Dighton-Rehoboth Schools	0.01	Segregansett River	1	1
Mansfield	3.14	Three Mile River	375.5	312
Middleboro	2.16	Nemasket River	207.5	191
Wheaton College	0.12	Three Mile River	6	3
Oak Point	0.18	Bartlett Brook	9	8
East Bridgewater High School	0.01	Matfield River	1.5	1
<i>Total upstream point source load:</i>				1841

monthly/graph/02780). The third monitoring year, 2006, was excluded because extremely high rainfall in May and June (over 9 inches per month, or more than twice the long term average) has potential to disturb the “steady-state” assumption that underlies EPA’s load analysis.

Finally, EPA calculated total loads to the estuary and allocated those loads between point sources and nonpoint sources. For upstream loads, nonpoint sources were calculated by subtracting the delivered point source loads from the LOADEST total load. Nonpoint source loads from the watershed area downstream of the SMAST monitoring sites, not accounted for in the LOADEST analysis, were calculated using an areal loading factor derived from the LOADEST loading figures. Direct atmospheric deposition to the Taunton River Estuary was not included in the model as it is a relatively small contribution given the relatively small area of the estuary.<sup>7</sup> The average summer load to the estuary in 2004 to 2005 is 4,228 lbs/day.

Table 5 and Figure 7 show the total watershed nitrogen loads to the Taunton River Estuary. Wastewater treatment plant loads make up 66% of the total nitrogen load. Nonpoint sources make up the remaining 34%. The Middleborough WPCF load, at 191 lbs/day, is approximately 4.5% of the total nitrogen load.

Figure 7



<sup>7</sup> Atmospheric deposition to the watershed is included in the nonpoint source loading figures.

Table 5.

Total loads	Avg 2004-05 Summer Load (lb/d)
Taunton WWTP	610
Somerset WWTP	350
Upstream WWTP delivered loads	1841
Nonpoint source loads	1428
Total	4228

On this basis, EPA concludes that the Middleborough WPCF’s nitrogen discharges “cause, have a reasonable potential to cause, or contribute” to nitrogen-related water quality violations in the Taunton River Estuary. Therefore, an effluent limit must be included in the permit.

*f. Effluent limitation calculation*

EPA’s calculation of an effluent limitation for nitrogen consists of two parts. First, EPA determines a threshold nitrogen concentration in the water body that is consistent with unimpaired conditions. Second, EPA determines the allowable load from watershed sources generally, and this facility specifically, that will result in receiving water concentrations at or below the allowable threshold.

*i. Threshold nitrogen concentration*

To determine an appropriate threshold concentration, EPA applies the procedure developed by the Massachusetts Estuaries Project of identifying a target nitrogen concentration threshold based on a location within the estuary where water quality standards are not violated, in order to identify a nitrogen concentration consistent with unimpaired conditions. This approach is consistent with EPA guidance regarding the use of reference conditions for the purposes of developing nutrient water quality criteria. The Taunton River Estuary is classified as an SB water and is not a location where eelgrass has historically been found.<sup>8</sup> Therefore the primary water quality parameter considered in determining a sentinel location is DO. EPA notes that concentrations previously found to be protective of DO in other southeastern Massachusetts estuaries have ranged between 0.35 and 0.55 mg/l.<sup>9</sup>

<sup>8</sup> Known historic eelgrass locations within Mount Hope Bay are located on the western portion of the Bay, including the mouths of the Kickamuit, Cole and Lee Rivers, and in the Sakkonet River. See Restoration Sites and Historical Eelgrass Distribution in Narragansett Bay, Rhode Island (2001), <http://www.edc.uri.edu/restoration/images/maps/historiceelgrass.pdf>. Water quality based TN thresholds would be lower in those areas to protect eelgrass habitat. The DO-based thresholds used for development of permit limits will also protect eelgrass in those locations due to much greater dilution of the Taunton River discharges in those areas of the Bay.

<sup>9</sup> See, e.g. MassDEP, *FINAL West Falmouth Harbor Embayment System Total Maximum Daily Loads For Total Nitrogen* (2007) (Harbor Head threshold 0.35 – SA water); MassDEP, *Oyster Pond Embayment System Total Maximum Daily Loads For Total Nitrogen* (2008) (threshold 0.55).

Data from the SMAST monitoring program indicates widespread DO violations at a range of TN concentrations. Table 5 of the SMAST report (Table 4 above) provides the three year period 20% low DO concentration, which was below the 5 mg/l water quality standard at four stations, with long term average TN concentrations ranging from 0.486 to 1.058 mg/l. However, EPA does not consider a three year, 20% low DO to be a sufficiently sensitive indicator of water quality violations because the water quality criteria are based on a minimum DO concentration of 5 mg/l.

Closer examination of the SMAST monitoring data indicates multiple stations with minimum DO violations during the year with corresponding TN mean concentrations below 0.48 mg/l. Indeed minimum DO concentrations of less than 5.0 mg/l were encountered at all but one site (MHB16) during the three year monitoring program. See Table 3.

In addition, DO concentrations from the fixed site monitoring station indicate extensive periods with DO below 5.0 mg/l in 2005 and 2006 (the datasonde was not operating in 2004). EPA considers fixed site monitoring to be superior to intermittent sampling data with respect to DO concentrations because the continuous monitoring includes critical conditions and time periods (e.g. early morning DO minimums) that are generally missed in intermittent sampling. The SMAST monitoring station that is closest to the fixed site station is MHB13. The average TN concentration at MHB13 between 2004 and 2006 was 0.473 mg/l, indicating that the threshold concentration must be lower than that value.

On the basis of these data, EPA determined that station MHB16 was appropriate as a sentinel site where dissolved oxygen standards were met, and that a total nitrogen concentration of **0.45** mg/l (the average of 2004-05 concentrations) represents the threshold protective of the dissolved oxygen water quality standard of 5.0 mg/l. Higher TN concentrations are associated with multiple DO violations, based on the available monitoring data. EPA notes that this value is within the range of target nitrogen thresholds previously determined in southeastern Massachusetts embayments, and is also consistent with TN concentration thresholds to protect dissolved oxygen standards identified in other estuaries. See NHDES, 2009.

*ii. Allowable TN load*

EPA next determined an allowable total nitrogen load from the watershed that would result in TN concentrations at or below the 0.45 mg/l TN threshold. To do so, EPA applied a steady state ocean water dilution model based on salinity, from Fischer et al. (1979). A similar approach was used by the New Hampshire Department of Environmental Services to develop loading scenarios for the Great Bay Estuary (NHDES, 2009). The basic premise is that steady state concentrations of nitrogen in an estuary will be equal to the nitrogen load divided by the total water flushing rate from freshwater and ocean water. Estuaries are complicated systems with variability due to tides, weather, and stream flows. However, by making the steady state assumption, it is not necessary to model all of these factors. The steady state assumption can be valid for calculations based on long term average conditions, which approximate steady state conditions.

Salinity data is used to determine the proportion of fresh and ocean water in the estuary. Freshwater input is calculated from streamflow measurements at USGS gages in the watershed. Then, ocean water inputs are estimated using salinity measurements and the freshwater inputs. The total flushing rate is then used with the target nitrogen threshold to determine the total allowable load to the estuary. For this calculation, salinity at Station MHB19 during 2004-05<sup>10</sup> was used to represent the sentinel location for meeting the target threshold, because it is the uppermost station that appears clearly nitrogen limited based on the Mount Hope Bay Monitoring Program data.

Freshwater Flow: Average freshwater flow input to the estuary in the summers of 2004 and 2005 is shown in Table 6. Freshwater flows at the mouths of the river is determined based on the USGS streamgage data using a drainage area ratio calculation as follows:

$$\text{Flow at mouth} = \text{Flow at USGS gage} * \text{Drainage area at mouth} / \text{Drainage area at gage}$$

Table 6

	1 Taunton River (Bridge-water) USGS Gage	2 Taunton River (area to mouth of estuary minus tributaries) Drainage Area calculation	3 Three Mile River (North Dighton) USGS Gage	4 Three Mile River (mouth) Drainage Area calculation	5 Segreganset River (Dighton) USGS Gage	6 Segreganset River (mouth) Drainage Area calculation	7 Assonet River (dam) based on Segregansett	8 Quequechan River (mouth) based on Segregansett	Total Freshwater Flow (Sum of Columns 2+4+6+ 7+8)
Drainage Area	261 sq. miles	410 sq. miles	84 sq. miles	85 sq. miles	10.6 sq. miles	14.9 sq. miles	21.9 sq. miles	30.5 sq. miles	
2004	195 cfs	306 cfs	54 cfs	55 cfs	4.4 cfs	6.1 cfs	9.0 cfs	12.6 cfs	<b>389 cfs</b>
2005	217 cfs	341 cfs	55 cfs	56 cfs	4.6 cfs	6.4 cfs	9.4 cfs	13.1 cfs	<b>427 cfs</b>
							Average:		<b>408 cfs</b>

Salinity: A mass balance equation is applied as follows:

Average salinity at ocean boundary (Rhode Island Sound) = 30 ppt (Kincaid and Pockalny, 2003)

Average salinity at MHB19 in Taunton River Estuary for 2004-05 = 22.35 ppt

Average freshwater flow 2004-05 (Table 8) = 408 cfs

$$(30 \text{ ppt} * X \text{ cfs} + 0 \text{ ppt} * 408 \text{ cfs}) / (408 \text{ cfs} + X) = 22.35 \text{ ppt}$$

$$X = 1,192 \text{ cfs ocean water}$$

<sup>10</sup> As discussed above, 2004-05 represent a typical year.

Nitrogen Target: The nitrogen target load in lbs per day is calculated by combining all water inputs and multiplying by the threshold concentration and the appropriate conversion factors.

$$(408 \text{ cfs} + 1,192 \text{ cfs}) * (0.646) * (8.34) * (0.45 \text{ mg/l}) = 3,879 \text{ lbs/day}$$

The nitrogen concentration at the seaward boundary is 0.28 mg/l (from Oviatt, et al., *Annual Primary Production in Narragansett Bay with no Bay-Wide Winter-Spring Phytoplankton Bloom* (2001). The ocean load can then be calculated:

$$\text{Ocean load} = 1,192 \text{ cfs} * (0.646) * (8.34) * (0.28 \text{ mg/l}) = 1,798 \text{ lbs/day}$$

Based on the overall flow of the estuary (average of summers 2004 and 2005), the allowable TN load to the Taunton River Estuary, including both ocean and watershed loads, is 3,879 lbs/day.<sup>11</sup> The load from the ocean is 1,798 lbs/day, leaving an allowable load of **2,081** lbs/day from watershed sources. As noted above, actual loads in 2004-05 averaged 4,228 lbs/day. This means a reduction in watershed loads of 2,147, or approximately 51%, is required in order to meet water quality standards in the Taunton River Estuary.<sup>12</sup>

The required load reduction is greater than the load discharged from any single facility and can be achieved only through permit limits on multiple facilities. Furthermore, the reduction should be fairly allocated among all discharges to the estuary. EPA notes that all the wastewater treatment plants contributing to the Taunton River are due for permit reissuance, and it is EPA's intent to include nitrogen limits in those permits as appropriate, consistent with this analysis. In doing so, EPA considers not only the facility's current discharges, but their potential discharges under their approved design flows. As this analysis considers summer flows only, an estimated summer flow is calculated at 90% of design flow, consistent with the analysis done by the Rhode Island Department of Environmental Management (RIDEM) for Narragansett Bay facilities. (RIDEM, 2004) See Table 7. This accounts for the fact that a facility discharging at an annual average flow equal to its design flow will average less than design flow during the drier summer months.

For purposes of allocating the required load reduction, EPA first notes that nonpoint sources are unlikely to be reduced by 51% (the overall reduction required in the estuary), and that therefore a higher proportion of the reduction will be allocated to wastewater point sources in the estuary. This is consistent with approaches in approved TMDLs in Massachusetts and elsewhere. EPA considers a 20% nonpoint source reduction to be a reasonably aggressive target for nonpoint source reduction in this watershed based on the prevalence of regulated MS4 stormwater discharges, trends in agricultural uses and population, and potential reductions in atmospheric deposition through air quality programs. EPA notes that should nonpoint source reductions fail

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<sup>11</sup> To provide a check on this calculation, EPA calculated the predicted TN concentration in the estuary using calculated loads from 2004-05 using the same mass balance equation. Using the calculated watershed load of 4,228 lbs/day and an ocean load of 1,803 lbs/day as calculated above, the predicted concentration in the estuary is 0.70 mg/l. The monitoring data indicates that the average TN concentration was 0.73 mg/l, within 5% of the predicted value.

<sup>12</sup> Ocean loads are not considered controllable.

to be achieved, permit limits for WWTPs in the watershed shall be revisited to ensure that water quality standards are met.

Using the baseline NPS load of 1,428 lbs/day from 2004-05, a 20% reduction would result in a NPS load of 1,142 lbs/day. This leaves an available load for wastewater discharges of 939 lbs/day. Of the eleven facilities discharging to the watershed, five are minor discharges (< 1 MGD) with a combined load of less than 50 lbs/day. These facilities are considered de minimis contributors for the purposes of this analysis and are not analyzed further here.

To determine an equitable load allocation, EPA first determined the permit limit that would be required to meet the allowable load if a uniform limit were applied to all facilities. While permit limits are generally set to be more stringent on larger dischargers/direct discharges to impaired waters, calculating a uniform limit allows EPA to determine the range of options for permit limits. As shown in Table 7 below, a uniform permit limit on all discharges > 1 MGD in the Taunton would have to be between 3.4 and 3.5 mg/l for the allowable loading threshold to be met. For the largest discharges such as Taunton and Brockton, therefore, a 3.4 mg/l limit represents the upper bound of possible permit limits to meet the water quality requirement. For a lower bound on potential permit limits, EPA notes that the currently accepted limit of technology (LOT) for nitrogen removal is a seasonal average of 3.0 mg/l.

Table 7.

<b>WWTF</b>	<b>Design Flow (MGD)</b>	<b>Percent delivered to estuary</b>	<b>Limit assumption: 3.3</b>	<b>Limit assumption: 3.4</b>	<b>Limit assumption: 3.5</b>
Taunton	8.4	100%	208	214	221
Somerset	4.2	100%	104	107	110
Brockton	18	89%	397	409	421
Bridgewater	1.44	96%	34	35	36
Mansfield	3.14	83%	65	67	69
Middleboro	2.16	92%	49	51	52
Smaller facilities (at 04-05 loads)			46	46	46
Total			903	929	955

Given the determination that the maximum possible limit for larger facilities is less than 4 mg/l, and that upgrades to meet the most stringent permit limits are more cost-effective at facilities with the highest flows and highest proportion of the load delivered to the estuary, EPA has concluded that a LOT permit limit of 3.0 mg/l (seasonal average) is required for the larger dischargers of nitrogen to the estuary. Effluent limits for the smaller dischargers, including the Middleborough WPCF, are therefore calculated based on an assumption of a 3.0 mg/l on the Taunton and Brockton facilities. This results in a permit limit of 5.0 mg/l for the Middleborough WPCF.

To put this limit in context, Table 8 shows an example permitting scenario that would meet the allowable loading threshold. In this particular example permit limits for the Brockton AWRP

(the largest discharger), and Taunton WWTP (the second largest discharge and a direct discharger to the estuary) are set at 3.0 mg/l. Somerset WWTP (the third largest discharge and a direct discharger to the estuary) is set at 3.7 mg/l; and the remaining three facilities (Bridgewater, Mansfield and Middleborough) are set at 5.0 mg/l. Final determinations as to the permit limits on facilities other than the Middleborough WPCF will be made in each individual permit issuance.

Table 8.

<b>WWTF</b>	<b>Design Flow (MGD)</b>	<b>Percent delivered to estuary</b>	<b>Potential permit limit</b>	<b>Load discharged (lbs/day) at 90%</b>	<b>Load delivered to Estuary</b>
Brockton	18	89%	3.0	405	361
Taunton	8.4	100%	3.0	189	189
Somerset	4.2	100%	3.7	117	117
Mansfield	3.14	83%	5.0	118	98
Middleboro	2.16	92%	5.0	81	74
Bridgewater	1.44	96%	5.0	54	52
Smaller facilities (at current loads)					46
Total					937

For these reasons, EPA has included a monthly average total nitrogen limit of 5.0 mg/l (May to October) in the draft permit.<sup>13</sup> Also, in accordance with 40 CFR 122.45(f), EPA is imposing a monthly average mass limit of 90 lbs/day, also applicable during the months of May through October. This mass limit is based on the monthly average concentration limit and the design flow of the facility, and represents the highest load that the facility can discharge consistent with achieving water quality standards. The sampling frequency is two times per week. The permit contains a compliance schedule for meeting the nitrogen limit (See Permit Section 1.F).

Consistent with the seasonal analysis, EPA has not included nitrogen limits for the timeframe of November through March because these months are not the most critical period for phytoplankton growth. As noted earlier, EPA is imposing a condition requiring the permittee to optimize nitrogen removal during the wintertime. The summer limits and the winter optimization requirements will serve to keep the annual discharge load low. In combination, the numeric limitations and the optimization requirements are designed to ensure that the discharge does not

<sup>13</sup> The May to October seasonal period is consistent with other Narragansett Bay-related nitrogen limits. See Upper Blackstone Water Pollution Abatement District, MA01002369. The Mount Hope Bay Monitoring Program did not include May and October sampling, so those months were not explicitly included in the loading analysis. However, the Narragansett Bay Fixed Site Monitoring Program extends through October and includes limited data at the end of May and supports the need for permit limits in those months. For example, in 2006 chlorophyll-a concentrations in the last week of May averaged 13 ug/l with a maximum of 25 ug/l, with an average DO at the surface sonde of less than 5.0 mg/l. In 2005, chlorophyll-a concentrations from October 1 through 5 averaged 15 ug/l, with a maximum of 45 ug/l; DO concentrations measured at the near-bottom datasonde were less than 5.0 mg/l for approximately 5% of that time.

cause or contribute to violations of applicable water quality standards, including narrative water quality criterion for nutrients, in accordance with Section 301(b)(1)(C) of the CWA.

EPA also notes that while the permit limit was set based on standards in the Taunton River Estuary, the limit is also protective of water quality standards in Mount Hope Bay under Massachusetts and Rhode Island water quality standards. Mount Hope Bay receives much greater dilution by ocean water, so that the nitrogen concentrations resulting from Taunton River loadings will be lower in the Bay than the 0.45 mg/l being met in the Taunton River Estuary. While other loads to Mount Hope Bay (particularly the Fall River WWTP) will need to be addressed as well, the reduction in nitrogen loadings from the Taunton River will ensure that those discharges do not cause or contribute to nitrogen-related impairments in Mount Hope Bay.

#### Total Residual Chlorine (TRC)

Chlorine and chlorine compounds produced by the chlorination of wastewater can be extremely toxic to aquatic life. Effluent limits are based on water quality criteria for total residual chlorine (TRC) which are specified in EPA water quality criteria established pursuant to Section 304(a) of the Clean Water Act. The most recent EPA recommended criteria are found in National Recommended Water Quality Criteria: 2002 (EPA-822-R-02-047). The fresh water aquatic life criteria for TRC are 11 ug/l for protection from chronic toxicity and 19 ug/l for protection from acute toxicity.

In its issuance of the existing permit EPA determined that there is reasonable potential for TRC concentrations discharged in the effluent to cause or contribute to an exceedance of the water quality criteria given and calculated an average monthly limitation of 21 ug/l and maximum daily limitation of 36 ug/l for TRC based on the dilution under 7Q10 conditions. The limits are calculated below.

Given:

acute freshwater criterion 19 ug/l chlorine  
chronic freshwater criterion 11 ug/l chlorine  
dilution factor 1.9

Then:

acute criterion x dilution factor = Daily Maximum Limit  
 $19 \text{ ug/l} \times 1.9 = 36 \text{ ug/l}$   
chronic criterion x dilution factor = Monthly Average Limit  
 $11 \text{ ug/l} \times 1.9 = 21 \text{ ug/l}$

The draft permit continues the existing permit's requirement that chlorination and dechlorination systems provide an alarm for indicating system interruptions or malfunctions. Any interruption or malfunction of the chlorine dosing system may result in levels of chlorine that are inadequate for achieving effective disinfection, or interruptions and/or malfunctions of the dechlorination system may result in excessive levels of chlorine in the final effluent. The draft permit requires that all interruptions or malfunctions be reported with the monthly DMRs. The draft permit requires that the report include the date and time of the interruption or malfunction, the nature of

the problem, and the estimated amount of time that the reduced levels of chlorine or dechlorination chemicals occurred.

### Copper

The limits for copper in the existing permit were calculated based on the chronic and acute criteria set forth in the 1998 *National Recommended Water Quality Criteria*, pursuant to the MA SWQS in effect when the existing permit was issued in 2003. The facility has been unable to meet the limits in the existing permit and has been operating under an interim monthly average limit of 34 ug/l set forth in a September 2002 compliance order. Since the issuance of the existing permit the Commonwealth of Massachusetts has issued, and EPA has approved, site-specific water quality criteria for copper for the Nemasket River that are less stringent than the prior criteria. The new site specific criteria for copper establish a chronic criterion of 18.1 ug/l(dissolved, “d”),<sup>14</sup> and an acute criterion of 25.7 ug/l(d). The draft permit contains effluent limits of 34 ug/l(total recoverable “tr”)(monthly average) and 49 ug/l(tr)(maximum daily). The derivation of these limits is set forth below.

In determining the appropriate effluent limitation in response to this revised standard, EPA must apply the requirements of the revised state standard, as set forth in the Mass DEP *Protocol for and Determination of Site-Specific Copper Criteria for Ambient Waters in Massachusetts*, January 2007 (the “site-specific protocol”), and the requirements of the anti-backsliding provisions of the Clean Water Act §§ 402(o) and 303(d)(4).

*Site-Specific Protocol:* In determining effluent limitations under the revised standard, the site-specific protocol allows for relaxation of permit limits to reflect the higher criteria only to the extent required to reflect the actual performance that the facility has been able to achieve. It states:

[A]s part of the site-specific criteria, all reasonable efforts to minimize the loads of metals, and copper in this case, are part of the criteria revision protocol. So, the Department on a case-by-case basis will develop permit copper limits. Each determination will be based not only on the adjusted concentration resulting from the appropriate multiplier but will reflect the demonstrated level of copper reduction routinely achievable at the facility in order to minimize copper loads and thereby reduce its accumulation in the sediment.

Thus, determination of the appropriate effluent limits under the site-specific protocol requires calculating both (i) the required effluent limits that would meet the numeric criteria (criteria-

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<sup>14</sup> Water quality criteria for copper are expressed in terms of dissolved metals. However, permit limitations for copper are expressed in terms of total recoverable metals in accordance with the requirements of 40 CFR § 122.45(c). As such, conversion factors are used to develop total recoverable limits from dissolved criteria. The conversion factor reflects how the discharge of a particular metal partitions between the particulate and dissolved form after mixing with the receiving water. In the absence of site-specific data describing how a particular discharge partitions in the receiving water, a default assumption equivalent to the criteria conversion factor is used in accordance with the *Metal Translator Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion* (USEPA 1996 [EPA-823-B96-007]). Therefore, a conversion factor of 0.960 was used to convert between total recoverable and dissolved copper concentrations. Dissolved concentrations are denoted ug/l(d), while total recoverable concentrations are denoted ug/l(tr)

based limits) and (ii) the actual effluent concentrations achieved by the facility (performance-based limits), and selecting the more stringent of the two.

*Anti-backsliding:* The reissuance of a permit with less stringent effluent limits must meet the requirements of the Clean Water Act's anti-backsliding provision, § 402(o), which allows relaxation of water quality based standards only if they comply with CWA § 303(d)(4), and only if the revised limit meets current effluent guidelines and will not cause a violation of water quality standards.<sup>15</sup> The Massachusetts antidegradation policy is set forth in 314 CMR § 4.04, providing, *inter alia*, “[i]n all cases existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.”

The analysis under the site-specific protocol addresses the anti-backsliding and antidegradation requirements by relaxing the copper limits to the more stringent of the limits necessary to achieve the revised criteria, or to the limits that have historically been achieved by the facility (unless the facility has historically discharged an effluent concentration lower than the current permit limits, in which those limits are retained). Because any relaxed limits will result in attainment of the site-specific criteria and not be less stringent than the facility's current performance, the facility will not be able to scale back its efforts to reduce copper concentrations in the effluent. Therefore, the less stringent limits will not have the result of exceeding the revised criteria or worsening water quality in the receiving water, and the antidegradation requirement will be met.

As set forth above, the effluent limitations are determined by calculating both (i) the required effluent limits that would meet the numeric criteria (criteria-based limits) and (ii) the actual effluent concentrations achieved by the facility (performance-based limits), and selecting the more stringent of the two. The only exception to this procedure is if the actual effluent concentration is lower than the current (non site-specific) limits, then the current limits are retained in the permit

*Criteria-based calculation.* The criteria-based limits are calculated based on dilution under 7Q10 conditions, assuming a receiving water concentration of 2 ug/l based on the median receiving water result reported in the WET test reports.:

Calculation of acute limit for copper:

Acute criteria (dissolved) = 25.7 ug/l(d)

7Q10 flow = 3.0 cfs

Design flow = 3.34 cfs

Criteria for total recoverable copper = 25.7 ug/l(d)/0.960 = 26.8 ug/l (tr)

Effluent limit = [(3.34 + 3.0 cfs)\*26.8 ug/l – 3.0 cfs \* 2 ug/l]/3.34 = 49.1 ug/l

Calculation of chronic limit for copper:

Chronic criteria (dissolved) = 18.1 ug/l(d)

7Q10 flow = 3.0 cfs

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<sup>15</sup> The anti-backsliding rule also contains a number of exceptions that are not applicable here. See CWA § 402(o)(2); 40 CFR § 122.44(l).

Design flow = 3.34 cfs

Criteria for total recoverable copper =  $18.1 \text{ ug/l(d)}/0.960 = 18.85 \text{ ug/l (tr)}$

Effluent limit =  $[(3.34 + 3.0 \text{ cfs}) * 18.85 \text{ ug/l} - 3.0 \text{ cfs} * 2 \text{ ug/l}]/3.34 = 34.0 \text{ ug/l}$

*Performance-based calculation.* The level of copper removal routinely achieved by the facility (i.e., the past demonstrated performance of the facility) is determined by a statistical analysis of discharge data submitted by the facility over the two year period from December 2009 through November 2011, using the methodology set forth in the *Technical Support Document for Water Quality-based Toxics Control*, EPA/505/2-90-001 (March 1991) (Appendix E). The average monthly and maximum daily limits are based on the 95th and 99th percentile of a lognormal distribution, based on the facility's monthly average effluent data as shown in Table 9. These calculations indicate that limits based solely on past performance would result in a monthly average limit of  $40 \text{ }\mu\text{g/l(tr)}$  and a maximum daily limit of  $68 \text{ }\mu\text{g/l(tr)}$ .

*Resulting Effluent Limitation.* As noted above, pursuant to the site-specific protocol, effluent limits will be relaxed only to the more stringent of the criteria-based or performance-based limits. In this case the criteria-based limits are more stringent. The draft permit therefore includes criteria-based monthly average and maximum daily permit limits, as follows:

Monthly average:  $34 \text{ }\mu\text{g/l(tr)}$

Maximum daily:  $49 \text{ }\mu\text{g/l(tr)}$

#### Other metals

The draft permit includes new monthly average effluent limits for aluminum and cadmium, in addition to continuing the existing permit limit for lead.

Examination of effluent analysis conducted in connection with WET testing in the past five years indicates that the Middleborough WPCF discharges have included detectable levels of the metals aluminum, cadmium, nickel and zinc. EPA therefore analyzed the available data on effluent and receiving water concentrations to determine whether these pollutants "are or may be discharged at a level that causes, has reasonable potential to cause, or contributes to an excursion above" the water quality standard. 40 CFR 122.44(d)(1)(i).

Table 9 shows the concentrations of metals in the Middleborough effluent and receiving water samples from February 2010 through August 2012. EPA bases its determination of "reasonable potential" on a characterization of the upper bound of expected effluent concentrations based on a statistical analysis of the available monitoring data. As noted in the *Technical Support Document for Water Quality Based Toxics Control* (EPA 1991) ("TSD"), "[a]ll monitoring data, including results for concentrations of individual chemicals, have some degree of uncertainty associated with them. The more limited the amount of test data available, the larger the uncertainty." Thus with a limited data set, the maximum concentration that has been found in the samples may not reflect the full range of effluent concentration. On the other hand, individual high data points may be outliers or otherwise not indicative of the normal range of effluent concentrations.

Table 9. Effluent Analytical Data

	Effluent Analytical Data (ug/l <sub>tr</sub> )						
	Hardness (mg/l)	Al	Cd <sup>1</sup>	Cu	Ni	Pb <sup>1</sup>	Zn
2/9/2010	209	ND-5	0.2	5.1	5.9	1.2	52.6
5/11/2010	314	297	0.3	41.3	9.9	8	103
8/17/2010	207	ND-5	ND-0.2	10.7	13.5	0.5	21.3
11/15/2010	275	ND-5	ND-0.2	6.7	6.8	ND-0.5	21.3
2/14/2011	514	216	ND-0.2	4	7.2	0.8	53.2
5/9/2011	190	12	ND-0.2	2.8	7.5	ND-0.5	22.1
8/8/2011	758	ND-5	ND-0.2	11.9	7.6	ND-0.5	123
11/14/2011	278	14	ND-0.2	5.7	7.6	ND-0.5	23.4
2/6/2012	624	34	ND-0.2	10.4	9	ND-0.5	63.2
2/22/2012	270	17	1.2	24.1	8.1	0.9	90
5/7/2012	290	ND-5	ND-0.2	10.4	9.6	ND-0.5	34
8/20/2012	260	7	ND-0.2	21.7	13.5	ND-0.5	20.9
Median	277	17	ND-0.5	10	8	0.9	43
95th percentile <sup>2</sup>		247	0.9	40	13	4.95	129

<sup>1</sup> Non-detects noted as " ND- [minimum detection level]"

<sup>2</sup> Percentiles calculated from a lognormal distribution with mean and standard deviation derived from monitoring data

To account for this, EPA has developed a statistical approach to characterizing effluent variability. As “experience has shown that daily pollutant discharges are generally lognormally distributed,” *TSD* at App. E, EPA uses a lognormal distribution to model the shape of the observed data, unless analysis indicates a different distributional model provides a better fit to the data. The model parameters (mean and variance) are derived from the monitoring data.

The lognormal distribution generally provides a good fit to environmental data because it is bounded on the lower end (i.e. you cannot have pollutant concentrations less than zero) and is positively skewed. It also has the practical benefit that if an original lognormal data set X is logarithmically transformed (i.e.  $Y = \ln[X]$ ) the resulting variable Y will be normally distributed. Then the upper percentile expected values of X can be calculated using the z-score of the standardized normal distribution (i.e. the normal distribution with mean = 0 and variance = 1), a common and relatively simple statistical calculation. The  $p^{\text{th}}$  percentile of X is estimated by

$$X_p = \exp(\mu_y + z_p \sigma_y), \quad \text{where } \mu_y = \text{mean of } Y$$

$$\sigma_y = \text{standard deviation of } Y$$

$$Y = \ln[X]$$

For the 95<sup>th</sup> percentile,  $z_{95} = 1.645$ , so that

$$X_{95} = \mu_y + 1.645 \sigma_y$$

The 95th percentile value is used to determine whether a discharge has a reasonable potential to

cause or contribute to an exceedance of a water quality standard. The combination of the upper bound effluent concentration with dilution in the receiving water is calculated to determine whether the water quality criteria will be exceeded. The *TSD* also includes a procedure for determine such percentiles when the dataset includes non-detect results, as is the case for Middleborough, based on a delta-lognormal distribution. The statistical analyses for the metals with non-detect results (aluminum, cadmium and lead) in Middleborough’s discharges are set forth in Attachment C.

The receiving water concentration is calculated taking into account dilution at 7Q10 conditions, through a mass balance equation that accounts for concentrations in the Nemasket River upstream of the discharge as reported in the facility’s WET test reports:

$$\text{Receiving water concentration } (C_r) = \frac{(C_d * Q_d + C_s * Q_s)}{(Q_d + Q_s)} \quad ; \text{ where}$$

- $C_d$  = upper bound effluent concentration data (95<sup>th</sup> percentile)
- $Q_d$  = Design flow of facility
- $C_s$  = Median concentration in Nemasket River upstream of discharge
- $Q_s$  = 7Q10 streamflow in Nemasket River upstream of discharge

The projected receiving water concentrations are compared to the water quality criteria from EPA, *National Recommended Water Quality Criteria 2002*, which have been incorporated into the Massachusetts SWQS, 314 CMR 4.05 (5)(e). For cadmium, nickel, lead and zinc the water quality criteria are hardness dependent. Because the reasonable potential analysis is performed using dilution under 7Q10 conditions, a projected hardness under 7Q10 conditions is calculated using the same mass balance equations and the median hardness of the effluent (277 mg/l) and upstream receiving water (20 mg/l), for a calculated hardness of 155 mg/l. Table 10.

**Table 10. Freshwater Metals Criteria**

7Q10	1.939237	MGD
Design flow	2.16	MGD
Hardness	155.2988	mg/L

Metal	$m_A$	$b_A$	$m_C$	$b_C$	CF acute	CF chronic	Dissolved Criteria		Total Recoverable Criteria	
							Acute Criteria (CMC) (ug/l <sub>d</sub> )	Chronic Criteria (CCC) (ug/l <sub>d</sub> )	Acute Criteria (CMC) (ug/l <sub>tr</sub> )	Chronic Criteria (CCC) (ug/l <sub>tr</sub> )
Hardness Dependent Metals										
Cadmium	1.0166	-	0.7409	-	0.926	0.891	3.09	0.33	3.34	0.37
Lead	1.2730	-	1.2730	-	0.727	0.727	103.93	4.05	142.98	5.57
Nickel	0.8460	2.2550	0.8460	0.0584	0.998	0.997	679.51	75.47	680.87	75.70
Zinc	0.8473	0.8840	0.8473	0.8840	0.978	0.986	170.15	171.54	173.98	173.98

National Recommended Water Quality Criteria 2002  
<http://www.epa.gov/waterscience/criteria/wqctable/>

Table 11 shows the result of the mass balance equations.

**Table 11. Mass Balance and comparison to water quality criteria**

Pollutant	Qd (mgd)	Cd (ug/l <sub>tr</sub> )	Qs (mgd)	Cs (ug/l <sub>tr</sub> )	$(C_r) = \frac{(C_d * Q_d + C_s * Q_s)}{(Q_d + Q_s)}$	Criterion (expressed as total recoverable metal)	
						Acute (ug/l <sub>tr</sub> )	Chronic (ug/l <sub>tr</sub> )
Al	2.16	247	1.939	59	158.1	750	87
Cd		0.92		ND-0.2*	0.5	3.3	0.37
Ni chronic		13		0.9	7.3	681	76
Pb chronic		4.95		0.6	2.9	143	5.6
Zn chronic		129		6.15	70.8	174	174

The results indicate that the aluminum and cadmium discharges have a reasonable potential to cause exceedances of the chronic water quality criteria for these pollutants. Therefore an effluent limit is included in the draft permit that will achieve the water quality criteria, calculated as follows:

$$\text{Permit limit} = \frac{(Q_d + Q_s) * \text{Criterion} - Q_s * C_s}{Q_d}$$

$$\text{Aluminum limit} = [(1.94+2.16)*87 - (1.94*59)]/2.16 = 112 \text{ ug/l}$$

$$\text{Cadmium limit} = [(1.94+2.16)*0.37 - (1.94*0)]/2.16 = 0.7 \text{ ug/l}$$

It should be noted that the previous permit's metals analysis incorporated a hardness of 30 mg/l based on downstream sampling conducted by MassDEP in 1996. 2003 Fact Sheet at 7. As the water quality criteria become more stringent at lower hardness, this resulted in lower water quality criteria being used in the analysis, and was the basis for the existing permit limit for lead. That approach does not accurately reflect hardness conditions under 7Q10 dilution, when the high hardness of the effluent would significantly increase the instream hardness downstream of the discharge. While the water quality criteria for lead is higher under the current analysis under 7Q10 conditions, and might seem to support a less stringent limit, the permit limit has not been changed from that in the existing permit because antibacksliding rules (40 CFR 122.44(l)) do not allow relaxation of the permit limit where water quality standards are not currently being met in the receiving water. While water quality standards would be met under 7Q10 conditions at a higher effluent concentration when hardness is dominated by WWTP flows, under higher flow conditions, when the natural baseflow is dominant, the downstream hardness and the resulting criteria are significantly lower, and background receiving water concentrations exceed the chronic criterion.<sup>16</sup> This situation, where 7Q10 conditions do not represent the "most severe hydrologic condition" as contemplated by 314 CMR 4.03, is unusual and is the result of relatively high lead background concentrations, low receiving water hardness, high effluent hardness, and low dilution under 7Q10 conditions.

<sup>16</sup> For example, under flow conditions of 100 cfs in the Nemasket River the hardness of the combined effluent and receiving water would be 25 mg/l, resulting in a chronic criterion of 0.54 ug/l<sub>tr</sub>. The median receiving water concentration is 0.6 ug/l<sub>tr</sub>, exceeding the criterion.

Therefore, the existing permit limit for lead is maintained in the draft permit.

### Toxicity Testing

National studies conducted by EPA have demonstrated that domestic sources contribute toxic constituents to POTWs. These constituents include metals, chlorinated solvents and aromatic hydrocarbons among others. The Region's current policy is to include toxicity testing requirements in all municipal permits, while Section 101(a)(3) of the CWA specifically prohibits the discharge of toxic pollutants in toxic amounts.

Based on the potential for toxicity resulting from domestic and industrial contributions, the low level of dilution at the discharge location, water quality standards, and in accordance with EPA regulation and policy, the draft permit includes chronic and acute toxicity limitations and monitoring requirements. (See, e.g., "Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants", 50 Fed. Reg. 30,784 (July 24, 1985); see also, EPA's *Technical Support Document for Water Quality-Based Toxics Control*). EPA Region I has developed a toxicity control policy. The policy requires wastewater treatment facilities to perform toxicity bioassays on their effluents. The MassDEP requires bioassay toxicity testing for state certification.

The MassDEP's Division of Watershed Management has a current toxics policy that requires toxicity testing for all major dischargers such as the Middleborough WPCF (*Implementation Policy for the Control of Toxic Pollutants in Surface Waters*, MassDEP 1990). In addition, EPA feels that toxicity testing is required to assure that the synergistic effect of the pollutants in the discharge does not cause toxicity, even though the pollutants may be at low concentrations in the effluent. The inclusion of whole effluent toxicity limitations in the draft permit will assure that the Middleborough WWTF does not discharge combinations of toxic compounds into the Nemasket River in amounts that would affect aquatic or human life.

Pursuant to EPA Region I Policy, and MassDEP's *Implementation Policy for the Control of Toxic Pollutants in Surface Waters* (February 1990), dischargers having a dilution factor less than 10 are required to conduct acute and chronic toxicity testing four times per year unless there are passing results over an extended period of time. A dilution factor of 1.9 was calculated for this facility. In accordance with the above guidance, the draft permit includes an acute toxicity limit (LC50 of > 100%) and a chronic toxicity limit (C-NOEC of > 53 %). The C-NOEC calculations are as follows:  $(1/\text{dilution factor} * 100) = (1/1.9 * 100) = 53$  percent.

Toxicity testing shall be performed on the daphnid, *Ceriodaphnia dubia* in accordance with the EPA Region I Toxicity protocol found in the draft permit **Attachment A** for the chronic test and **Attachment B** for the acute test, and the tests will be conducted four times a year. The prior permit's use of the single "chronic (and modified acute)" test has been revised to two separate tests, consistent with the requirement to use approved test methods. EPA has reduced the number of species to be tested based on the greater sensitivity of the daphnid as demonstrated by the facility's WET test results; there have been no violations of any of the WET effluent limits in the past three years.

EPA and the MassDEP may use the results of the toxicity tests and chemical analyses conducted by the permittee, required by the permit, as well as national water quality criteria, state water quality criteria, and any other appropriate information or data, to develop numerical effluent limitations for any pollutants.

## **7. Industrial Pretreatment Program**

The permittee is required to administer a pretreatment program based on the authority granted under 40 CFR 122.44(j), 40 CFR Part 403 and Section 307 of the Act. The permittee's pretreatment program received EPA approval on July 31, 1982 and, as a result, appropriate pretreatment program requirements were incorporated into the previous permit, which were consistent with that approval and federal pretreatment regulations in effect when the permit was issued.

The Federal Pretreatment Regulations in 40 CFR Part 403 were amended in October 1988, in July 1990, and again in October 2005. Those amendments established new requirements for implementation of pretreatment programs. Upon reissuance of this NPDES permit, the permittee is obligated to modify its pretreatment program to be consistent with current Federal Regulations. Those activities that the permittee must address include, but are not limited to, the following: (1) develop and enforce EPA approved specific effluent limits (technically-based local limits); (2) revise the local sewer-use ordinance or regulation, as appropriate, to be consistent with Federal Regulations; (3) develop an enforcement response plan; (4) implement a slug control evaluation program; (5) track significant noncompliance for industrial users; and (6) establish a definition of and track significant industrial users.

These requirements are necessary to ensure continued compliance with the POTW's NPDES permit and its sludge use or disposal practices.

In addition to the requirements described above, the draft permit requires the permittee to submit to EPA in writing, within 180 days of the permit's effective date, a description of proposed changes to permittee's pretreatment program deemed necessary to assure conformity with current federal pretreatment regulations. These requirements are included in the draft permit to ensure that the pretreatment program is consistent and up-to-date with all pretreatment requirements in effect. Lastly, the permittee must continue to submit, annually by October 1, a pretreatment report detailing the activities of the program for the twelve month period ending 60 days prior to the due date.

## **8. Operation and Maintenance of the Sewer System**

EPA regulations set forth a standard condition for "Proper Operation and Maintenance" that is included in all NPDES permits. *See* 40 CFR § 122.41(e). This condition is specified in Part II.B.1 (General Conditions) of the draft permit and it requires the proper operation and maintenance of all wastewater treatment systems and related facilities installed or used to achieve permit conditions.

EPA regulations also specify a standard condition to be included in all NPDES permits that

specifically imposes on permittees a “duty to mitigate.” *See* 40 CFR § 122.41(d). This condition is specified in Part II.B.3 of the draft permit and it requires permittees to take all reasonable steps – which in some cases may include operations and maintenance work - to minimize or prevent any discharge in violation of the permit which has the reasonable likelihood of adversely affecting human health or the environment.

Proper operation of collection systems is critical to prevent blockages and equipment failures that would cause overflows of the collection system (sanitary sewer overflows, or SSOs), and to limit the amount of non-wastewater flow entering the collection system (inflow and infiltration or I/I<sup>17</sup>). I/I in a collection system can pose a significant environmental problem because it may displace wastewater flow and thereby cause, or contribute to causing, SSOs. Moreover, I/I could reduce the capacity and efficiency of the treatment plant and cause bypasses of secondary treatment. Therefore, reducing I/I will help to minimize any SSOs and maximize the flow receiving proper treatment at the treatment plant. MassDEP has stated that the inclusion in NPDES permits of I/I control conditions is a standard State Certification requirement under Section 401 of the CWA and 40 CFR § 124.55(b).

Therefore, specific permit conditions have been included in Part I.B. and I.C. of the draft permit. These requirements include mapping of the wastewater collection system, preparing and implementing a collection system operation and maintenance plan, reporting unauthorized discharges including SSOs, maintaining an adequate maintenance staff, performing preventative maintenance, controlling infiltration and inflow to the extent necessary to prevent SSOs and I/I related-effluent violations at the wastewater treatment plant, and maintaining alternate power where necessary. These requirements are intended to minimize the occurrence of permit violations that have a reasonable likelihood of adversely affecting human health or the environment.

Several of the requirements in the new draft permit were not included in the existing permit or the previous draft permit, including collection system mapping, and preparation of a collection system operation and maintenance plan. EPA has determined that these additional requirements are necessary to ensure the proper operation and maintenance of the collection system and has included schedules for completing these requirements in the draft permit.

## **9. Essential Fish Habitat**

Under the 1996 Amendments (PL 104-267) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq. (1998)), EPA is required to consult with the National Marine Fisheries Services (NMFS) if EPA’s action or proposed actions that it funds, permits, or undertakes, may adversely impact any essential fish habitat as: waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. § 1802 (10)). Adversely impact means any impact which reduces the quality and/or quantity of EFH (50 C.F.R. § 600.910 (a)). Adverse effects may include direct (e.g., contamination or physical disruption), indirect

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<sup>17</sup> “Infiltration” is groundwater that enters the collection system through physical defects such as cracked pipes, or deteriorated joints. “Inflow” is extraneous flow entering the collection system through point sources such as roof leaders, yard and area drains, sump pumps, manhole covers, tide gates, and cross connections from storm water systems.

(e.g., loss of prey, reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. Essential fish habitat is only designated for species for which federal fisheries management plans exist (16 U.S.C. § 1855(b) (1) (A)). EFH designations for New England were approved by the U.S. Department of Commerce on March 3, 1999. The Nemasket River is not covered by the EFH designation for riverine systems and thus EPA has determined that a formal EFH consultation with NMFS is not required.

## **10. Endangered Species Act**

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, whereas NMFS administers Section 7 consultations for marine species and anadromous fish.

EPA has determined that no federally-listed or proposed, threatened or endangered species or critical habitat are known to occur in the Nemasket River. Furthermore, the effluent limitations and other permit requirements identified in this Fact Sheet are designed to be protective of all aquatic species.

## **11. Monitoring and Reporting**

The effluent monitoring requirements have been established to yield data representative of the discharge under authority of Section 308 (a) of the CWA in accordance with 40 CFR §§122.41 (j), 122.44 (l), and 122.48.

As noted on page 4 of the permit, a routine sampling program shall be developed in which samples are taken at the same location, same time and same day(s) of every month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable Discharge Monitoring Report (DMR) that is submitted to EPA.

The Draft Permit includes new provisions related to 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 CWA permittees to submit 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 Massachusetts.

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 and will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees must continue to send hard copies of reports other than DMRs to MassDEP until further notice from MassDEP.

The Draft Permit also includes an “opt-out” request process. Permittees who believe they cannot use NetDMR due to technical or administrative infeasibilities, or other logical reasons, must demonstrate the reasonable basis that precludes the use of NetDMR. These permittees must submit the justification, in writing, 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 such a 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.

## **12. State Certification Requirements**

EPA may not issue a permit unless MassDEP certifies that the effluent limitations included in the permit are stringent enough to assure that the discharge will not cause the receiving water to violate State Water Quality Standards. EPA has requested permit certification by the State pursuant to 40 CFR §124.53 and expects the draft permit will be certified.

### **13. Comment Period, Hearing Requests, and Procedures for Final Decisions**

All persons, including applicants, who believe any condition of the 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 Susan Murphy, U.S. Environmental Protection Agency, 5 Post Office Square, Suite 100 (OEP06-1), Boston, MA 02109. Any person prior to such date may submit a request in writing for a public hearing to consider the draft permit to EPA and the State Agency. Such requests shall state the nature of the issues 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. In reaching a final decision on the draft permit the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

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

### **14. EPA Contact**

Requests for additional information or questions concerning the draft permit may be addressed Monday through Friday, between the hours of 9:00 a.m. and 5:00 p.m., to :

Susan Murphy  
U.S. Environmental Protection Agency  
5 Post Office Square, Suite 100 (OEP06-1)  
Boston, MA 02109  
Telephone: (617) 918-1534 Fax: (617) 918-0534  
Email: [murphy.susan@epa.gov](mailto:murphy.susan@epa.gov)

Claire Golden  
Massachusetts Department of Environmental Protection  
205B Lowell Street  
Wilmington, MA 01887  
Telephone: (978) 694-3244 Fax (978) 694-3498  
Email: [claire.golden@state.ma.us](mailto:claire.golden@state.ma.us)

**Ken Moraff, Acting Director  
Office of Ecosystem Protection  
U.S. Environmental Protection Agency**

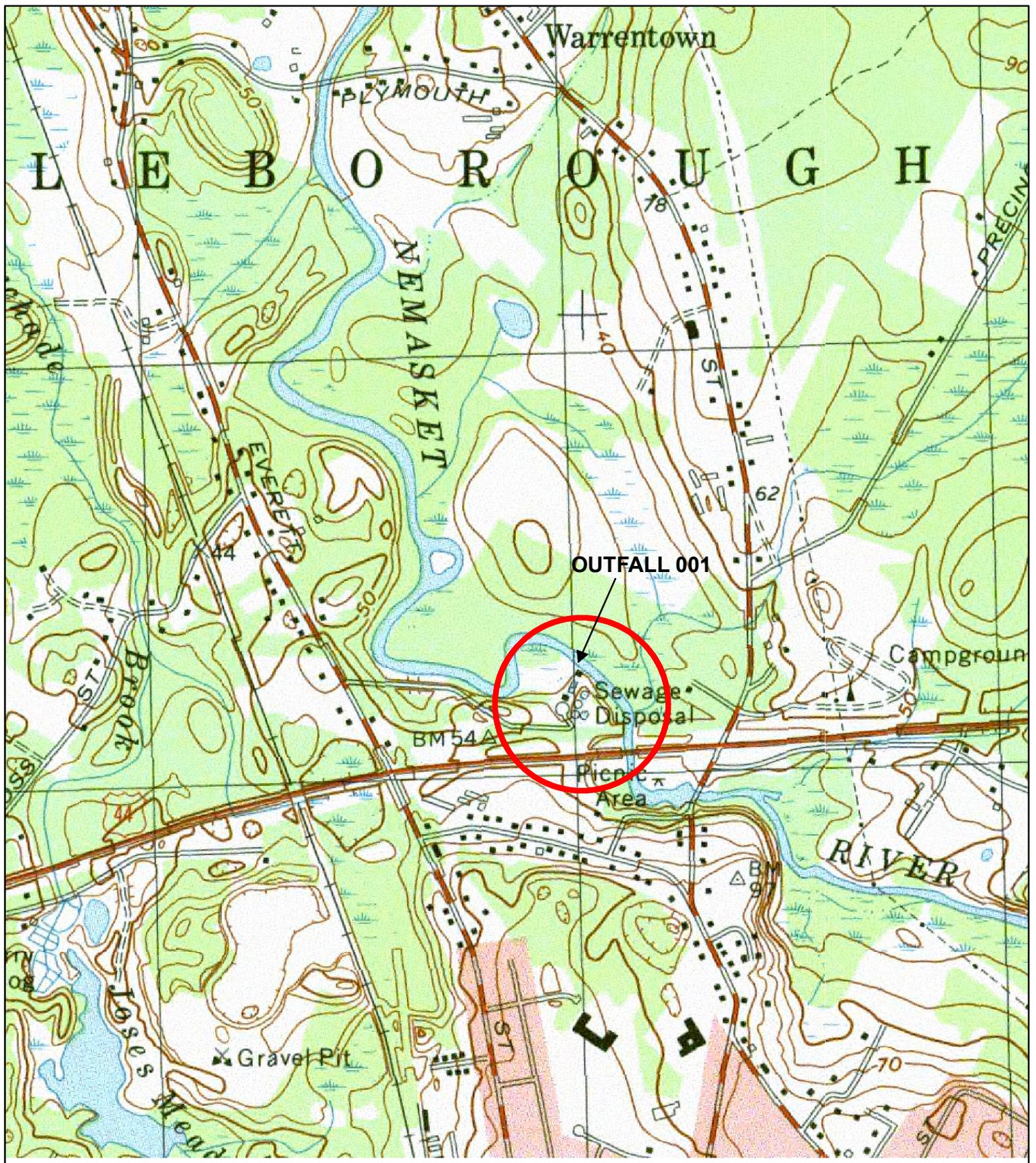
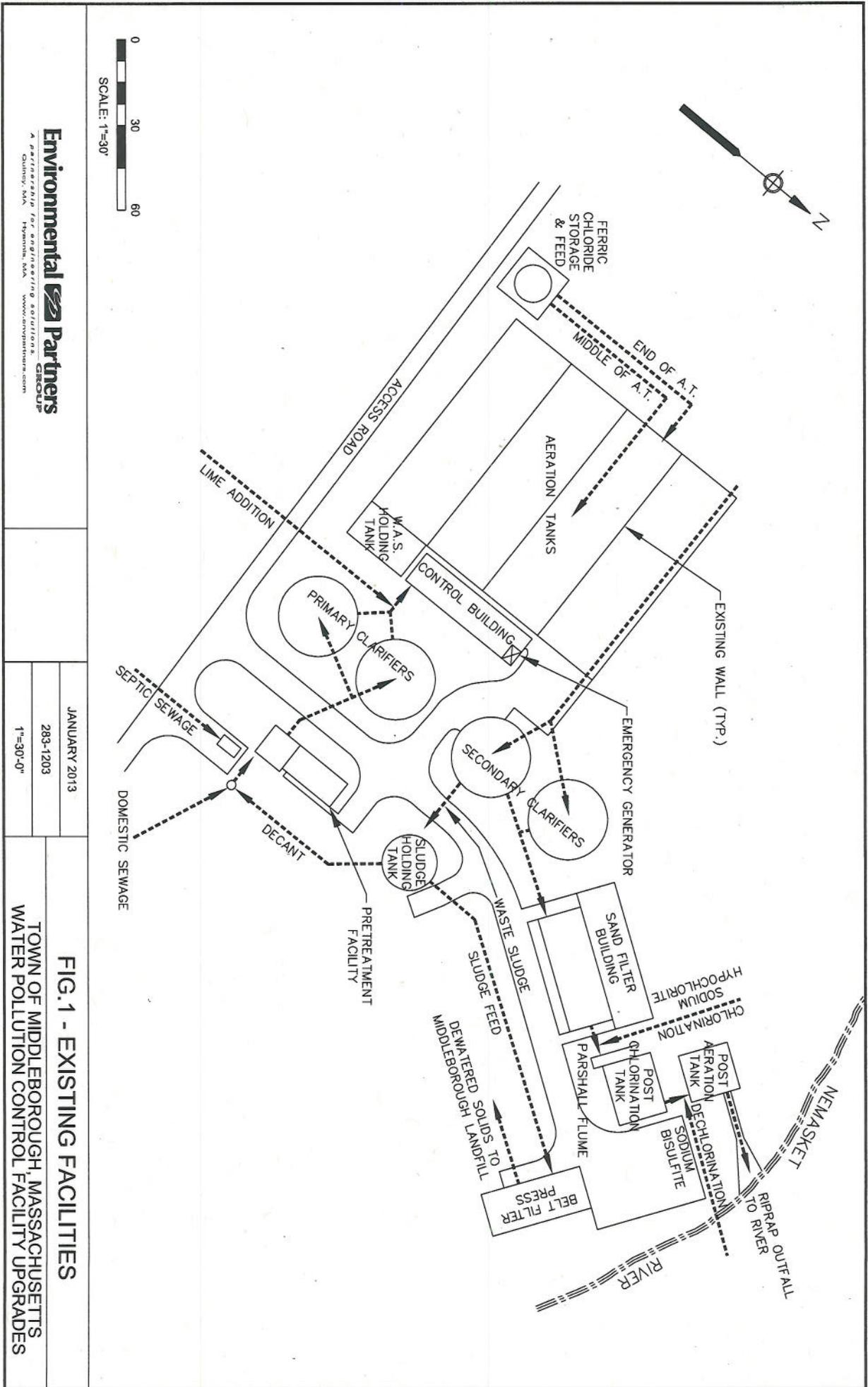


Figure 1. Location Map  
 Middleborough  
 NPDES No. MA0101591



 Middleborough WPCF



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JANUARY 2013  
 283-1203  
 1"=30'-0"

**FIG. 1 - EXISTING FACILITIES**  
 TOWN OF MIDDLEBOROUGH, MASSACHUSETTS  
 WATER POLLUTION CONTROL FACILITY UPGRADES

Monitoring Period End Date	CBOD					TRC		Fecal Coliform		Copper	Flow		Lead	Total Ammonia Nitrogen (June 1 - October 31)			Total Ammonia N (November 1 - April 30)
	Average Monthly	Maximum Daily	Average Monthly	Average Weekly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily		Monthly Average	Maximum Daily	Monthly Average	Monthly Average	Weekly Average	Maximum Daily	Monthly Average
	lb/day		mg/L			ug/L		cfu/100mL		ug/L	MGD		ug/L	mg/L			mg/L
06/30/2010	7.4	9.9	0.9	1.1	1.2	0	20	2	5	2	1.32	3.4	0	0.16	0.21	0.23	Test Not Required
07/31/2010	9.4	16.5	1.1	1.4	2	10	20	21	276	10	1.28	2.6	0	0.54	1	11.91	Test Not Required
08/31/2010	8.5	14.2	1	1.5	1.8	10	20	4	26	7	1.26	3.4	0	0.47	0.84	1.37	Test Not Required
09/30/2010	8.2	16.3	1	1.6	2.2	10	20	10	29	9	1.23	1.09	0	0.15	0.21	0.26	Test Not Required
10/31/2010	6.8	9.1	0.8	0.9	1	10	20	10	76	10	1.22	1.33	0	0.39	0.48	0.85	Test Not Required
11/30/2010	8.3	11.8	1	1.1	1.2	Test Not Required				5	1.3	3.4	0	Test Not Required			0.2
12/31/2010	20.9	49.5	2.3	4.5	5.1	Test Not Required				9	1.17	3.1	0	Test Not Required			0.36
01/31/2011	17.1	28.7	1.8	2.6	3.1	Test Not Required				9	1.15	2.5	0	Test Not Required			0.36
02/28/2011	40.1	94.2	4.2	8.9	10	Test Not Required				6	1.16	3.6	0	Test Not Required			1.1
03/31/2011	35.1	118	2.8	5	8.1	Test Not Required				10	1.14	3.1	0	Test Not Required			0.43
04/30/2011	19	26	1.6	1.7	1.9	0	20	2	2	2	1.09	1.79	0	Test Not Required			0.59
05/31/2011	10.9	12.3	1.1	1.3	1.6	0	20	2	2	2	1.09	3	0	Test Not Required			0.19
06/30/2011	7	11.7	0.8	1	1.4	10	20	9	300	7	1.09	2.8	0	0.26	0.54	0.88	Test Not Required
07/31/2011	18	53.9	2.3	6.8	6.9	10	20	7	23	20	1.1	3.25	0	0.4	0.66	0.69	Test Not Required
08/31/2011	8.9	19.9	1.2	1.5	2.6	20	30	18	144	7	1.1	2.8	0	0.27	0.32	0.38	Test Not Required
09/30/2011	11	13.6	1.1	1.4	1.5	20	30	34	208	6	1.11	1.27	0	0.27	0.36	0.4	Test Not Required
10/31/2011	14.7	25.4	1.4	2	2.5	10	20	6	29	5	1.14	1.71	0	0.27	0.39	0.57	Test Not Required
11/30/2011	14.7	19.6	1.2	1.3	1.5	Test Not Required				4	1.17	1.74	0	Test Not Required			0.45
12/31/2011	13.9	17.7	1.2	1.3	1.4	Test Not Required				10	1.2	2.04	0	Test Not Required			0.27
01/31/2012	19	30	2	2.4	2.9	Test Not Required				9	1.2	1.29	0	Test Not Required			0.57
02/29/2012	23.3	32	2.6	3	3.4	Test Not Required				11	1.18	1.3	0	Test Not Required			2.15
03/31/2012	13.9	21.3	1.8	2.9	3.6	Test Not Required				9	1.16	1.23	0	Test Not Required			0.37
04/30/2012	15.8	26.1	1.8	2.2	2.9	10	20	9	265	12	1.12	1.17	0	Test Not Required			0.58
05/31/2012	11.3	17.4	1.2	1.4	1.6	0	20	1	2	11	1.11	1.43	0	Test Not Required			0.34
06/30/2012	9.2	13.8	1.1	1.3	1.5	0	20	1	9	17	1.1	1.82	0	0.22	0.3	0.39	Test Not Required
Existing Permit Limit	126	270	7	10	15	20	36	200	400	34 (order)	2.16	Report	1.3	1	1	2	Report
Minimum	6.8	9.1	0.8	0.9	1	0	20	1	2	2	1.09	1.09	0	0.15	0.21	0.23	0.19
Maximum	40.1	118	4.2	8.9	10	20	30	34	300	20	1.32	3.6	0	0.54	1	11.91	2.15
Average	14.9	28.4	1.6	2.4	2.9	8	21	9	93	8	1.17	2.25	0	0.31	0.48	1.63	0.57
Standard Deviation	8.3	26.1	0.8	2	2.3	7	4	9	113	4	0.07	0.88	0	0.13	0.26	3.43	0.51
Number of Measurements	25	25	25	25	25	15	15	15	15	25	25	25	25	11	11	11	14
Number of Exceedences	0	0	0	0	0	0	0	0	0	0	0	N/A	0	0	0	1	N/A



To estimate the TN load to the Taunton River Estuary, the USGS LOADEST computer modeling program was used. This program develops a number of regression equations correlating constituent concentration and streamflow based on an input calibration file listing corresponding data points of these two variables. For each regression equation, three different models are used to estimate the average summer load based on the summer flow record. The first, Adjusted Maximum Likelihood Estimation (AMLE), and the second, Maximum Likelihood Estimation (MLE) are applicable when the calibration model errors, or “residuals,” are normally distributed. Normality is determined by the Turnbull-Weiss test. These two estimations will be the same unless there are any censored data points, in which case the AMLE estimate is more accurate. The third model, Least Absolute Deviation (LAD), is used for non-normally distributed data.

The average summer TN load to the Taunton River at Weir Village, as well as to the four tributaries downstream from this point, were modeled by LOADEST using nitrogen concentration data from the Mount Hope Bay Monitoring Program and 2004 and 2005 daily streamflow data either measured by USGS gages, or adjusted proportionally based on drainage area. For days on which more than one concentration was measured, the average concentration was used in the LOADEST calibration file. Days on which the streamflow was 0 cfs were excluded from the dataset.

For all load estimations the best regression equation was automatically selected by the program based on the Akaike Information Criteria (AIC) value. In calculating the summer loads, the regression equation was selected based on the full year of monitoring data (i.e., the equation used to calculate the summer 2004 loads was selected based on a calibration dataset of the entire year 2004 monitoring data).

As described earlier, LOADEST gives load estimations based on three different models. If the calibration residuals were distributed normally, the Maximum Likelihood Estimation (MLE) was chosen. Otherwise, the Least Absolute Deviation (LAD) estimation was chosen. The calibration residuals were considered normal if the p-value of the Turnbull Weiss test was greater than 0.05.

<b>Taunton River at Weir Village</b>	
Year	Load Est. (lb/d)
2004	2659
2005	2289

<b>Three Mile River</b>	
Year	Load Est. (lb/d)
2004	547
2005	403

<b>Segreganset River</b>	
Year	Load Est. (lb/d)
2004	35
2005	34

<b>Assonet River</b>	
Year	Load Est. (lb/d)
2004	49
2005	51

<b>Quequechan River</b>	
Year	Load Est. (lb/d)
2004	85
2005	112

<b>Sum of Loads (lb/d)</b>	
2004	3375
2005	2889

### Nitrogen Attenuation

As a result of chemical and biological processes, not all of the nitrogen discharged from each point source reaches the estuary. To determine the delivered nitrogen load, attenuation from each point source was calculated. The governing equation is:

$$L_f = L_i * e^{-kt} ; \text{ where}$$

$L_f$  = the delivered load;  
 $L_i$  = discharged load;  
 $k$  = attenuation coefficient; and  
 $t$  = travel time in days.

Attenuation calculations have been estimated in a number of studies for smaller order streams but generally do not reflect the effluent-dominated stream conditions encountered downstream of the Brockton AWRF (DF (dilution factor) = 1.02) and, to a lesser extent, the Bridgewater (DF 2.2), Mansfield (DF 2.2) and Middleborough (DF 1.9) WWTPs. For example, attenuation coefficients for small streams are given by the NE SPARROW models. Moore et al., *Estimation of Total Nitrogen and Phosphorus in New England Streams Using Statistically Referenced Regression Models*, USGS SIR-2004-5012. The NE SPARROW model indicates that no attenuation would be expected in the Taunton River mainstem, but that the tributaries (with flows  $\leq 100$ cfs) are given an attenuation coefficient of  $0.77 \text{ day}^{-1}$ .

For the Brockton AWRF, attenuation calculations based on regional regression equations were determined to be insufficient. Using the above analysis with SPARROW regression coefficients, the calculated attenuation of the Brockton AWRF discharge under summer flow conditions is predicted to be approximately 30%. EPA determined that this figure was unreliable for the following reasons:

(1) Use of a 30% attenuation factor for Brockton's load to allocate the total loads at Weir Village from the LOADEST analysis resulted in an implausibly large nonpoint source load per square mile compared to the other tributaries. This would indicate that the point source component of the load is being understated; the likeliest explanation for that is that attenuation of Brockton's load is overstated.<sup>1</sup>

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<sup>1</sup> To explain further, monitoring of the Taunton River at Weir Village indicates an average summer load for 2004-05 of 2,474 lbs/day. If the Brockton discharge of 1,303 lbs/day is assumed to be reduced by 30% through attenuation, then 912 lbs/day of the load at Weir Village is due to Brockton. Other WWTPs contribute 330 lbs/day, leaving 1,232 lbs/day attributable to nonpoint sources. Given the drainage area above Weir Village of 358 square miles, this gives an estimated summer nonpoint source loading of 3.4 lbs/day/sq.mi. This is significantly greater than the areal nonpoint source loading found at any other monitoring site in the Mount Hope Bay Monitoring Program, including the Quequechan River (which drains the City of Fall River) as well as the Ten Mile, Assonet and Segreganset Rivers.

(2) Nitrogen data collected by CDM for the Brockton AWRF receiving water study, although not collected for the purposes of attenuation calculations, do not appear to be consistent with significant in-stream attenuation.<sup>2</sup>

(3) The extremely effluent-dominated conditions downstream of the Brockton AWRF discharge are likely outside of the range of conditions used in developing the SPARROW regional regression equations.<sup>3,4</sup>

Because of the large impact of Brockton's discharge on the loading analysis, EPA determined that an improved attenuation estimate was necessary for this analysis, and therefore conducted a monitoring study including sampling and streamflow measurements in the summer of 2012, in order to estimate an attenuation rate for Brockton's discharge.

The Matfield River Monitoring Study utilized a Lagrangian sampling program modelled on USGS, *Lagrangian Sampling of Wastewater Treatment Plant Effluent in Boulder Creek, Colorado, and Fourmile Creek, Iowa*, Open File Report 2011-1054 (2011), based on following the same "packet" of water downstream from the AWRF and sampling downstream based on calculated time of travel from the AWRF. Samples were taken at one upstream and four downstream locations on the Salisbury Plain and Matfield Rivers, as well as the two major tributaries (Beaver Brook and Meadow Brook) and the AWRF discharge, and streamflow was measured at three downstream locations. Sampling locations are shown on Figure B-1.

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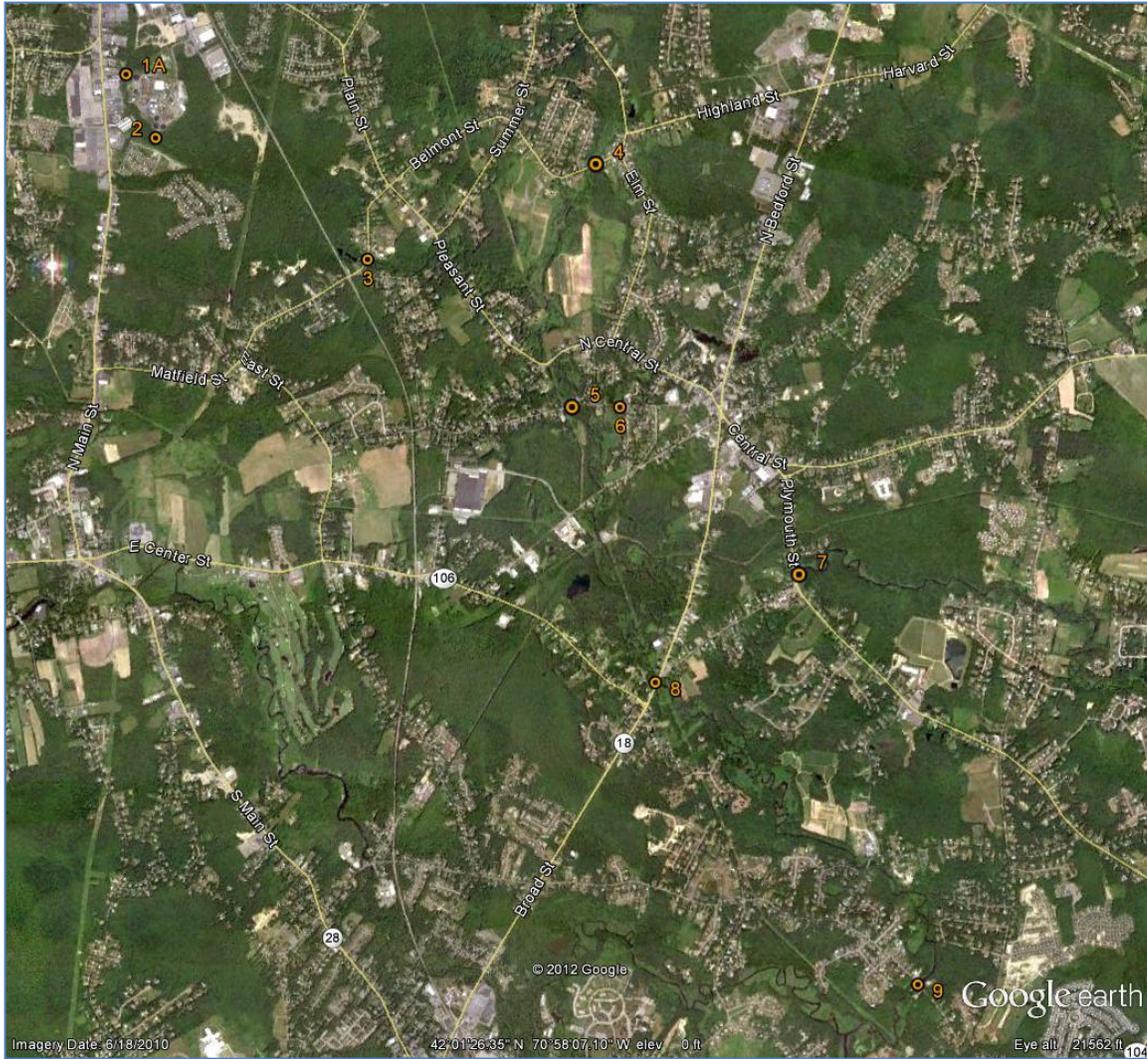
<sup>2</sup> For example, total nitrogen concentrations at the site of the discontinued USGS gage on the Matfield (CDM's station BR1-08) were within 5% of the concentrations found over 4 miles upstream on the Salisbury Plain River (CDM Station BR1-03), indicating on a qualitative level that little attenuation is occurring once the additional dilution resulting from the confluence of Beaver Brook, Meadow Brook and other minor tributaries and baseflow is accounted for.

<sup>3</sup> EPA also notes the SPARROW regression equations include a regression coefficient for POTW loads of 1.11. This means that direct application of the SPARROW model would require that Brockton's load be inflated by 11% before applying the attenuation factor in order to calculate Brockton's contribution to the delivered flow. It is unclear that application of the SPARROW attenuation factor in isolation accurately reflects SPARROW model results.

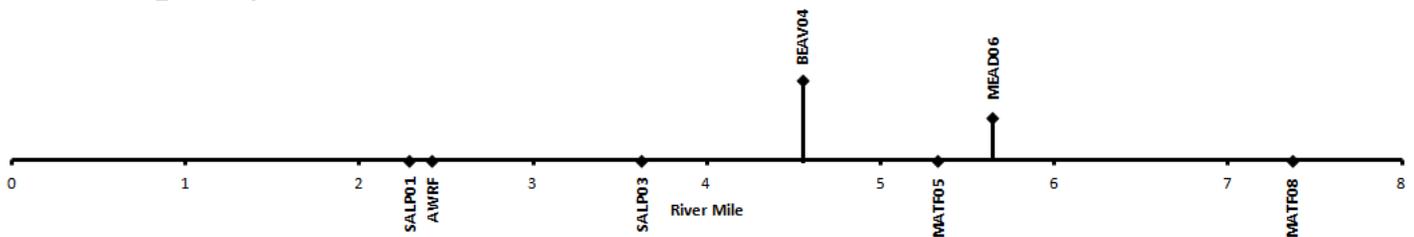
<sup>4</sup> Available literature also indicates the potential for significant reduction in attenuation rates under high nitrogen concentrations. See Alexander et al, Dynamic modeling of nitrogen losses in river networks unravels the coupled effects of hydrological and biogeochemical processes, *Biogeochemistry* 93:91-116 (2009).

Figure B-1. Sampling locations

(a) Map of sampling locations. Site 2 not used in analysis.

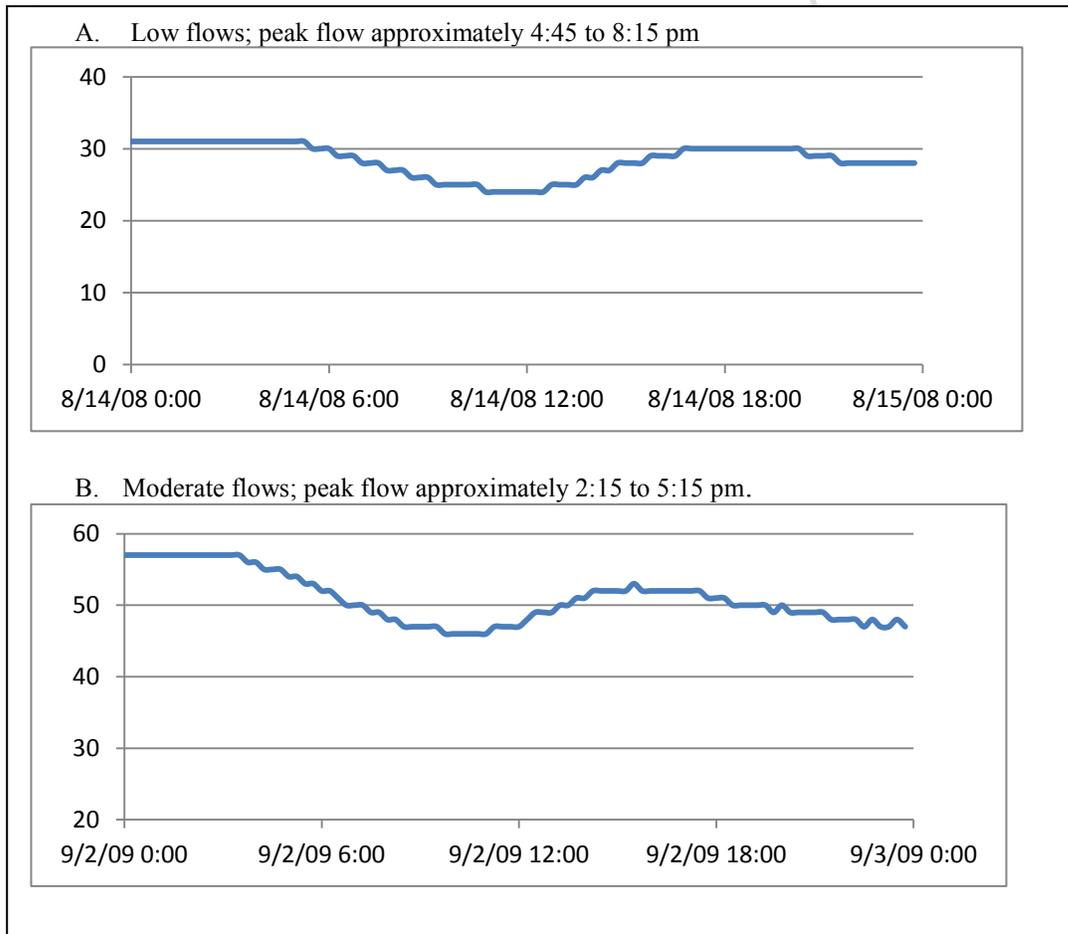


(b) Sampling locations by river mile along Salisbury Plain and Matfield Rivers.



The furthest downstream station (MATF08) was located at the former USGS streamgage site on the Matfield River at Elmwood (USGS 01106500). Time of travel to this site was based on 15-minute streamflow data provided by USGS for summer months prior to discontinuance of data collection at the streamgage in October 2009. These show a clear pattern of influence from the Brockton AWRF's diurnal discharge variation. Figure B-2 shows two 24-hour streamflow records from September 2009 at relatively low (chart A) and moderate (chart B) flows. These show a distinct diurnal flow pattern, consistent with wastewater discharges, and a delayed and more spread out pattern under lower flow conditions, consistent with lower stream velocities under those conditions. The time of travel for individual days was determined by comparison of the daily streamflow pattern with the Brockton AWRF discharge data from the facility's SCADA system (measurements approximately every 3 minutes; an example is shown at Figure B-3). Time of travel to the intermediate sites was assumed to be proportional to time of travel to MATF08, based on the distance in river miles to each site.

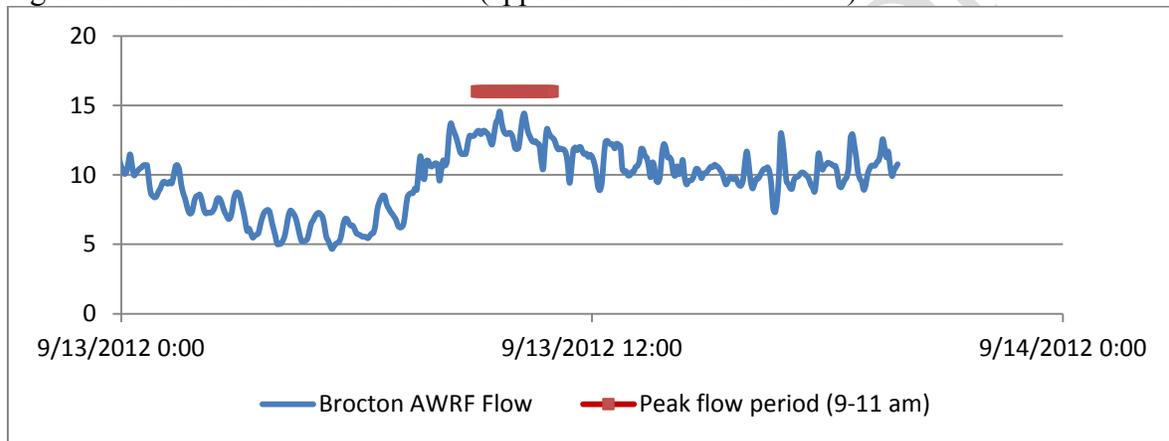
Figure B-2. USGS 01106500, Matfield River at Elmwood, 15-minute flow data



As can be seen from the Brockton AWRF SCADA data, there is considerable short term variability in the AWRF discharge rate. As explained by the facility, this is due to the

interaction of the various pump operations related to facility discharge and is inherent in the operation of the facility. While this variability will tend to dissipate as the plume moves downstream (see smoother pattern in 15-min data from the USGS gage downstream), there is potential for initial load calculations, and thus the attenuation factor, to vary on the order of 5-8% in the short term (on the order of 3 minutes). A time of travel analysis is not expected to be sufficiently precise to capture the exact packet of discharge within the sub-3 minute variability of the discharge. Therefore the analysis focused on following the peak period of Brockton's flows, approximately 9 to 11 a.m. While this provides a lower level of precision than would be ideal, it is sufficient that attenuation on the order of 30% (as predicted using regional regression models) would be apparent.

Figure B-3. Brockton AWRF Flows (approx. 3-min SCADA data)



Monitoring data from sampling stations on the Salisbury Plain and Matfield River are shown in Table B-1. On two of the sampling dates, instream total nitrogen concentrations increase slightly as sampling moves downstream, inconsistent with significant attenuation of nitrogen under those flow conditions (these are the two lowest flow dates). These increases could indicate instream release of nitrogen under low flow conditions. In contrast, in the August sampling a significant reduction in total nitrogen concentration occurred between sites 5 and 8. In general, the reach between sites 5 and 8 saw the most variability, with both load increases and one day of significant load decrease recorded between the two sites. This is likely due to the extensive wetland system the river passes through between these two stations, which appear to provide potential for sizeable release as well as uptake of nitrogen discharges. EPA notes that results showing widely variation attenuation rates under different stream conditions are consistent with the available literature (see, e.g. Smith et al., Nitrogen attenuation in the Connecticut River, northeastern USA; a comparison of mass balance and N<sub>2</sub> production modeling approaches, *Biogeochemistry* 87, 311-323 (2008) (differing attenuation in April (zero in both reaches) from August (zero in southern reach, 18% in northern reach)); Vanderburg et al., Field Evaluation of Mixing Length and Attenuation of Nutrients and Fecal Coliform in a Wastewater Effluent Plume, Environmental Monitoring and

Assessment (2005) 107: 45–57 (2005) (“Nitrate attenuation is markedly different between the two sampling events.”).

Table B-1. Monitoring data

Station	Distance from AWRF (mi)	6/18/2012			7/9/2012			8/13/2012			9/13/2012		
		Flow (cfs)	TN (mg/l)	Travel time (d)	Flow (cfs)	TN (mg/l)	Travel time (d)	Flow (cfs)	TN (mg/l)	Travel time (d)	Flow (cfs)	TN (mg/l)	Travel time (d)
SALP01 (upstream)	-0.1	--	1.7	NA	--	2.1	NA	--	1.7	NA	--	1.5	NA
AWRF	0	25.2	4.2	0	18.3	4.3	0	22.1	4.8	0	19.9	4.0	0
SALP03	1.2	37.4	3.3	0.06	26.0	3.2	0.07	42.2	3.3	0.05	25.2	3.4	0.07
MATF05	2.9	42.1	2.8	0.16	26.8	3.2	0.18	55.3	2.8	0.14	25.8	3.5	0.18
MATF08 <sup>1</sup>	4.9	46.0	3.1	0.27	27.7	3.4	0.24	63.0	1.6	0.24	26.7	3.8	0.30

<sup>1</sup> Flow at MATF08 determined from USGS staff gage and most recent shifted rating curve for June, August and September sampling dates. Direct streamflow measurements on 7/9/12 and early morning on 9/13/12 used to confirm shifted rating curve, which is considered highly provisional by USGS since discontinuance of site as active USGS streamgage.

Load reduction percentages were calculated for each sampling station on the Salisbury Plain/Matfield Rivers for each monitoring data and are shown in Table B-2. The general equation for calculating attenuation is:

$$\text{Attenuation} = \frac{(\text{Load upstream of reach} + \text{Load added to reach} - \text{Load at end of reach})}{(\text{Load upstream of reach} + \text{Load added to reach})}$$

This calculation assumes that all the additional load input into the reach is subject to the same attenuation as the load coming in from the mainstem upstream of the reach. This is an accurate assumption for the reach upstream of SALP03 (where greater than 90% of the drainage area is upstream of the AWRF) and for the reach upstream of MATF08 (77% of additional drainage area is Meadow Brook watershed, and Meadow Brook enters close to the head of this reach). See Figure B-1(b). For the reach upstream of MATF08 the majority of additional load is from Beaver Brook (82% of additional drainage area) which enters the mainstem at approximately the halfway point of the reach; while this load is subject to lesser attenuation than assumed in the calculation the effect is minor and the approximation is reasonable.<sup>5</sup>

In general load reductions are on the order of a few percent and, given the uncertainty in the analysis, are consistent with either zero attenuation or a low level of attenuation in the system on all sampling dates but August 13 (when significant attenuation is shown). These calculations indicate that, averaged over the summer, there is attenuation of nitrogen taking place downstream of the AWRF discharge. Average attenuations over the summer for the three reaches were combined to determine a cumulative attenuation

<sup>5</sup> To assess the impact, the calculation was performed assuming the additional load received zero attenuation:  $[\text{Attenuation}] = [\text{Upstream load} + \text{Load added to reach} - \text{Load at end reach}] / \text{Upstream Load}$ . Calculated attenuation differed by between 0.02 and 0.34%; the actual effect would be less since most of the load enters the stream at the midpoint of the reach, giving some opportunity for attenuation.

percentage from the AWRP to Station MATF08 of 7%. This corresponds to an attenuation coefficient  $k$  of  $0.28 \text{ day}^{-1}$ , based on a travel time of 0.27 days using the loading equation

$$L_f = L_i * e^{-kt}; \text{ or } k = - [\ln(L_f/L_i)]/t$$

$L_f$  = the delivered load;  
 $L_i$  = discharged load;  
 $L_f/L_i$  = delivery percentage = 93%  
 $k$  = attenuation coefficient; and  
 $t$  = travel time in days = 0.27.

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Table B-2

	6/18/2012			7/9/2012			8/13/2012			9/13/2012		
	Flow (cfs)	TN (mg/l)	Load									
<i>Input Loads</i>												
Brockton A/WRF	25.2	4.2	572	18.3	4.3	425	22.1	4.8	572	19.9	4.0	428
Upstream of SALP03 <sup>1</sup>	12.2	1.7	110	7.8	2.1	89	20.1	1.7	181	5.3	1.5	44
			<b>682</b>			<b>514</b>			<b>753</b>			<b>472</b>
<i>Output Load</i>												
Total load at SALP03	37.4	3.26	<b>656</b>	26.0	3.21	<b>450</b>	42.2	3.32	<b>754</b>	25.2	3.43	<b>465</b>
Attenuation percent			<b>4%</b>			<b>12%</b>			<b>0%</b>			<b>1%</b>

<sup>1</sup> Flow upstream calculated from flow at SALP03 minus Brockton A/WRF flow; concentration upstream from Salisbury Plain River at SALP01, representing 82% of watershed at SALP03.

	6/18/2012			7/9/2012			8/13/2012			9/13/2012		
	Flow (cfs)	TN (mg/l)	Load									
<i>Input Loads</i>												
Load at SALP03	37.4	3.3	656.1	26.0	3.2	449.6	42.2	3.3	754.1	25.2	3.4	465.1
Load added between SALP03 and MATF05 <sup>2</sup>	4.7	1.0	25	0.7	1.4	5	13.1	1.5	106	0.7	1.0	3
			<b>681</b>			<b>455</b>			<b>860</b>			<b>468</b>
<i>Output Load</i>												
Total load at MATF05	42.1	2.785	<b>632</b>	26.8	3.22	<b>464</b>	55.3	2.82	<b>839</b>	25.8	3.51	<b>488</b>
Attenuation percent			<b>7%</b>			<b>-2%</b>			<b>2%</b>			<b>-4%</b>

<sup>2</sup> Flow input between SALP03 and MATF05 calculated from flow at MATF05 minus flow at SALP03; concentration of input flow based on concentration of Beaver Brook at BEAB04, representing 91% of additional watershed between SALP03 and SALP05.

	6/18/2012			7/9/2012			8/13/2012			9/13/2012		
	Flow (cfs)	TN (mg/l)	Load	Flow (cfs)	TN (mg/l)	Load	Flow (cfs)	TN (mg/l)	Load	Flow (cfs)	TN (mg/l)	Load
<i>Input Loads</i>												
Load at SALP03	42.1	2.8	632.0	26.8	3.2	464.0	55.3	2.8	839.1	25.8	3.5	488.4
Load added between MATF05 and MATF08 <sup>3</sup>	3.9	1.6	34	1.0	1.7	9	7.7	2.8	117	0.9	1.5	7
			<b>666</b>			<b>473</b>			<b>956</b>			<b>495</b>
<i>Output Load</i>												
Total load at MATF08 <sup>3</sup>	46	3.085	<b>765</b>	27.7	3.40	<b>508</b>	63	1.64	<b>555</b>	26.7	3.82	<b>549</b>
Attenuation percent			<b>-15%</b>			<b>-7%</b>			<b>42%</b>			<b>-11%</b>

<sup>3</sup> Flow input between MATF08 and MATF05 calculated from flow at MATF08 minus flow at MATF05; concentration of input flow based on concentration of Meadow Brook at MEBR06, representing 77% of additional watershed between SALP05 and SALP08

Reach	Average attenuation in reach	Cumulative attenuation	Cumulative delivery factor	k (1/day)
Upstream of SAPB03	4%	4%	96%	
Between SALP03 and MATF05	1%	5%	95%	
Between MATF05 and MATF08	2%	7%	93%	0.28

The calculated value of k (0.28 day<sup>-1</sup>) was used to determine the delivery factor for the Brockton AWWF and for the Bridgewater, Mansfield and Middleborough WWTPs that also discharge to effluent-dominated streams. For the small facilities discharging to tributaries the New England SPARROW attenuation coefficient was applied. Travel time from each point source to the Taunton River, was calculated using river distance and a calculated average summer velocity,<sup>6</sup> Table B-3 shows the river distance, average velocity, travel time and percent load delivered for each facility.

Table B-3

Facility	River distance on tributary (ft)	Average velocity (fps)	Travel Time (days)	Percent of load delivered
Oak Point	9,613	0.67	0.17	88
MCI Bridgewater	7,665	0.67	0.13	90
Brockton	44,135	1.23	0.42	89
Bridgewater	13,015	1.04	0.14	96
Dighton-Rehoboth Schools	53,385	0.79	0.78	55
Mansfield	62,503	1.1	0.66	83
Middleborough	27,608	1.05	0.30	92
Wheaton College	81,449	1.1	0.86	52
East Bridgewater H.S.	22,976	0.99	0.27	81

<sup>6</sup> Annual average velocities by reach were obtained from the National Hydrography Dataset (NHDPlus). As this analysis is for summer only, when flow and velocities are lower, an average summer velocity was calculated based on the following relationship from Jobson, H.E., 1996, *Prediction of traveltime and longitudinal dispersion in rivers and streams*: U.S. Geological Survey Water-Resources Investigations Report 96-4013 (equation 12).

$$V_p = 0.094 + 0.0143 \times (D'_a)^{0.919} \times (Q'_a)^{-0.469} \times S^{0.159} \times \frac{Q}{D_a}$$

Where  $Q'_a = Q/Q_a$   
 Q = summer average flow  
 Q<sub>a</sub> = annual average flow  
 D<sub>a</sub> = Drainage area  
 S = slope  
 g = gravitational acceleration

$$D'_a = \frac{D_a^{1.25} \times \sqrt{g}}{Q_a}$$

The NHDPlus average annual velocities were calculated using the Jobson equation where Q=Q<sub>a</sub>. The Jobson equation can be used to derive a relationship between summer average and annual average velocity:

$$V_{\text{summer}} = 0.094 + (V_{\text{annual}} - 0.094) \times (Q/Q_a)^{0.531}$$

This equation was used to calculate average summer flows for each reach in NHDPlus.

EPA notes that the results of this field work confirm the complex nature of nitrogen cycling in the Salisbury Plain and Matfield River, and that continued work developing a water quality model of the Salisbury Plain and Matfield Rivers as contemplated by MassDEP and USGS would assist in informing this analysis and any future TMDL analysis, particularly with respect to attenuation under differing loads as upgrades are implemented. However, at this time no modeling effort is ongoing, and the attenuation analysis performed by EPA is the best available information upon which to develop this permit limit. EPA also notes that the permit limit for the Middleborough facility would vary within a relatively small range (between 3 and 7 mg/l) under a wide range of assumptions regarding attenuation of the Brockton discharge. For example, the Fact Sheet notes that, using the 7% attenuation figure, if a uniform permit limit were applied to all facilities in the watershed it would have to be less than 3.5 mg/l. For comparison, if it were assumed that there is zero attenuation of Brockton's discharge, the resulting uniform permit limit would be only slightly higher (approximately 3.7). On the other hand, if the attenuation factor was doubled (resulting in approximately 21% attenuation), a permit limit between 3.1 and 3.2 mg/l would need to be applied. (Required permit limits are more stringent if greater attenuation is assumed. This is because the attenuation factor is used in calculating how much of the measured load is from nonpoint sources; a higher attenuation rate means more load is attributed to the (more difficult to control) nonpoint sources, so that greater reduction from point sources is needed to meet the same total load target). The highest possible permit limits would result from assuming that there is no attenuation at all of the nitrogen discharges and would still require an average limit from all POTW discharges of less than 4. Even under this most generous assumption, which EPA does not consider realistic, the resulting permit limit for the Middleborough WPCF would still be less than 7 mg/l.<sup>7</sup>

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<sup>7</sup> An example load allocation meeting this assumption is as follows: If zero attenuation is assumed for Brockton, Mansfield, Middleborough and Bridgewater, the total load from point sources is 2,070 lbs/day; from nonpoint sources 1,175 lbs/day. Assuming a 20% reduction in nonpoint sources allows for a POTW load of 1,141 lbs/day. This can be met with a permit limit of 3 mg/l on the Brockton AWRF and Taunton WWTP, a permit limit of 5 mg/l on the Somerset WWTP, and limits of 6.7 mg/l on the Mansfield, Middleborough and Bridgewater facilities.

**Reasonable Potential Analysis**  
data with ND, >10 samples, lognormal distribution

Dilution Factor: 1

Date	Al* (ug/l)	lnAl (ug/l)	$(y_i - u_y)^2$
2/9/2010	0		
5/11/2010	297	5.6937	4.8134269
8/17/2010	0		
11/15/2010	0		
2/14/2011	216	5.3753	3.5174951
5/9/2011	12	2.4849	1.0299675
8/8/2011	0		
11/14/2011	14	2.6391	0.7408432
2/6/2012	34	3.5264	0.0007065
2/22/2012	17	2.8332	0.4443108
5/7/2012	0		
8/20/2012	7	1.9459	2.4145109

**Al- (Lognormal distribution, ND)**

<b>Daily Maximum Effluent Derivation (some measurements &lt; detection limit)</b>	
Detection Limit** =	5.0
$u_y$ = Avg of Nat. Log of daily Discharge (mg/L) =	3.49978
$S(y_i - u)^2$ =	12.96126
k = number of daily samples =	12
r = number of non-detects =	5
$s_y^2$ = estimated variance = $(S[(y_i - u_y)^2]) / (k-r-1)$ =	2.16021
$s_y$ = standard deviation = square root $s_y^2$ =	1.46977
$\delta$ = number of nondetect values/number of samples =	0.41667
z 99th percentile= $z$ -score $[(0.99-\delta)/(1-\delta)]$ =	2.11670
z 95th percentile= $z$ -score $[(0.95-\delta)/(1-\delta)]$ =	1.367627923
<b>Daily Max = <math>\exp(u_y + z\text{-score} * s_y)</math></b>	
<b>99th Percentile Daily Max Estimate=</b>	<b>743.0960 ug/l</b>
<b>95th Percentile Daily Max Estimate =</b>	<b>247.1195 ug/l</b>

\*\* Detection limit here is the detection limit that resulted in the greatest number of Non Detects in the dataset



**Reasonable Potential Analysis**  
data with ND, >10 samples, lognormal distribution

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Date	Pb* (ug/l)	lnPb (ug/l)	$(y_i - u_y)^2$
2/9/2010	1.2	0.1823	0.0905969
5/11/2010	8	2.0794	2.5476207
8/17/2010	0		
11/15/2010	0		
2/14/2011	0.8	-0.2231	0.4990833
5/9/2011	0		
8/8/2011	0		
11/14/2011	0		
2/6/2012	0		
2/22/2012	0.9	-0.1054	0.3465386
5/7/2012	0		
8/20/2012	0		

**Pb- (Lognormal distribution, ND)**

<b>Daily Maximum Effluent Derivation (some measurements &lt; detection limit)</b>	
Detection Limit** =	0.5
$u_y = \text{Avg of Nat. Log of daily Discharge (mg/L)} =$	0.48331
$S (y_i - u)^2 =$	3.48384
k = number of daily samples =	12
r = number of non-detects =	8
$s_y^2 = \text{estimated variance} = (S[(y_i - u_y)^2]) / (k-r-1) =$	1.16128
$s_y = \text{standard deviation} = \text{square root } s_y^2 =$	1.07763
$\delta = \text{number of nondetect values/number of samples} =$	0.66667
z 99th percentile= $z\text{-score}[(0.99-\delta)/(1-\delta)] =$	1.88079
z 95th percentile= $z\text{-score}[(0.95-\delta)/(1-\delta)] =$	1.036433389
<b>Daily Max = <math>\exp(u_y + z\text{-score} * s_y)</math></b>	
<b>99th Percentile Daily Max Estimate=</b>	<b>12.3063 ug/l</b>
<b>95th Percentile Daily Max Estimate =</b>	<b>4.9540 ug/l</b>

\*\* Detection limit here is the detection limit that resulted in the greatest number of Non Detects in the dataset

**Middleborough Water Pollution Control Facility - Response to Comments**

On September 18, 2013, the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) public noticed a Draft Permit (MA0101591) for the Middleborough Water Pollution Control Facility.

EPA received comments from the Town of Middleborough and the Nature Conservancy. The following are responses to all significant comments received, descriptions of any changes made to the public-noticed permit as a result of those comments, and a description of other changes made to the Final Permit.

**A. The Town of Middleborough submitted comments by letter dated November 7, 2013.**

**Comment A.1.** The previous discussions between the Town and EPA centered on a total nitrogen effluent limit of 5.5 mg/l. The draft permit includes a more stringent 5.0 mg/l, which is more difficult and costly to meet. The difference in load to the estuary is 8 pounds per day (82 lb/day – 74 lb/day). Within the Permit Fact Sheet, EPA states, “Of the eleven facilities discharging to the watershed, five are minor discharges (< 1 MGD) with a combined load of less than 50 lbs/day. These facilities are considered de minimis contributors for the purposes of this analysis and are not analyzed further here.” We request that EPA revert the total nitrogen limit to 5.5 mg/l, recognizing the minimal change in overall watershed loading (0.85%) and the possibilities for load removal at other facilities not currently covered under this analysis.

**Response to Comment A.1.** EPA disagrees with the characterization of communications between EPA and the Town regarding the prospective permit limit. While a 5.5 mg/l number was discussed at one meeting, EPA’s stated intent was to give the permittee a sense of the scale of nitrogen reduction that would be required. EPA specifically stated that the exact number was not final and could be somewhat different when the permit was issued. EPA also informed the Town and its consultants on multiple occasions prior to the Draft Permit issuance that the Draft Permit would be issued with a 5 mg/l permit limit.

EPA acknowledges that a load allocation among multiple facilities as in this watershed has multiple alternative solutions that would meet the targeted load, and understands that Middleborough would prefer to receive a slightly higher permit limit at the expense of requiring greater nitrogen reduction from other facilities. EPA has endeavored to achieve a reasonable, fair and equitable allocation of load among the various facilities. The load allocation strategy was to impose the most stringent limits achievable with current technology (3 mg/l) on the largest facilities (Brockton and Taunton), a somewhat less stringent permit limit on the next largest (Somerset, draft permit yet to be issued but limit projected as approximately 3.7 mg/l), and a 5 mg/l limit on the next largest group of facilities (Mansfield, Middleborough and Bridgewater). Moving Middleborough to 5.5 mg/l would not change the facility design or construction

for Middleborough but would provide more operational flexibility for the Town, while either requiring new construction of upgraded treatment at multiple small facilities (the five minor discharges) or requiring the Somerset WWTP to meet a challenging “limit of technology” permit limit. EPA therefore stands by its determination that a 5 mg/l permit limit for Middleborough represents a reasonable and equitable load allocation.

**Comment A.2.** The additional sampling and subsequent off-site laboratory testing for metals, as well as the twice weekly testing for nitrogen, will significantly impact the Town’s testing budget. The Town wishes to mitigate this effort and cost by reducing the frequency of this sampling to be consistent throughout the permit or by setting a schedule and benchmarks by which the Town can reduce the sampling frequency in the future.

- a. Without specific discharge limits, and listed as “report” only, we request that the sampling and reporting frequency for TKN, nitrate, and nitrite remain as 1/MO instead of the change to 2/WK. Also we request that EPA limit the sampling and reporting for these nitrogen constituents from May 1 to October 31 to coincide with the total nitrogen sampling frequency.

**Response to Comment A.2.** EPA recognizes the concern with cost of testing and has provided an alternative approach in the Final Permit. In doing so, EPA notes that testing for Total Nitrogen requires that TKN and Nitrate and Nitrite be tested, as there is no EPA-approved method for direct testing of Total Nitrogen at this point. Sampling for nitrogen species is also important to further detailed analysis of nitrogen cycling in the estuary. Therefore it is EPA’s intent that the monitoring frequencies for TN, TKN, Nitrate and Nitrite be consistent. However EPA agrees that less frequent monitoring is appropriate during periods when the Total Nitrogen limit is not in effect and therefore has modified the permit as follows:

- (1) Monitoring frequency for TKN, Nitrate and Nitrite is reduced to 1/Month in the period November 1 to April 30. Reporting of TN is also required in the winter months.
- (2) The permit compliance schedule has been revised to reduce the monitoring frequency until the permit limit goes into effect (i.e. while the facility upgrade is being constructed). Monitoring frequency for TKN, Nitrate and Nitrite will be 1/Week in the May 1 to October 31 period, and remain 1/Month in the period November 1 to April 30.

EPA believes that the frequency of sampling is necessary to adequately characterize loads to the system and monitor compliance and therefore is not at this time setting any schedule or benchmarks for reduction in monitoring frequency. However EPA notes that the permit compliance schedule provides that the permit limits will not go into effect until 54 months from the permit effective date (close to the time frame for reissuance of the permit) and monitoring frequency can be reconsidered in the next permit reissuance.

**Comment A.3.** Effluent samples over the short term are not the most effective indicator of the impact on receiving waters. A longer time period where several samples are tested is a better indicator of threats to water quality. We understand that EPA has recently issued new NPDES permit limits at other facilities for total phosphorus and total nitrogen based on seasonal rolling averages. Therefore:

- a. From May 1 to October 31, the seasonal permit limit for total nitrogen is listed as 5.0 mg/l and 90 lb/day on a monthly average basis. We request the monthly average basis be revised to a seasonal average, which will provide the Town greater operational flexibility in complying with the stricter permit limit, and will not adversely impact receiving waters.
- b. From April 1 to October 31, the seasonal permit limit for total phosphorus is listed as 0.15 mg/l and on a monthly average basis. We request the monthly average basis be revised to a 60-day rolling average, which will provide the Town greater operational flexibility in complying with the stricter permit limit, and will not adversely impact receiving waters.

**Response to Comment A.3.** EPA recognizes that seasonal and 60-day rolling average limits would provide greater operational flexibility. However, while the analysis that forms the basis of the permit limits is based on seasonal average loads, EPA's permitting regulations specifically require that permit limits for POTWs be expressed as monthly average and weekly average "unless impracticable." Therefore it is not the case that EPA must provide "justification" for including average monthly limits for smaller dischargers to the Taunton River estuary; rather, EPA must justify any decision to base permit limits on longer averaging periods.

The standard for determining whether longer term averaging period are permissible for nutrient limits is discussed in an EPA memorandum concerning nutrient limits to protect Chesapeake Bay, wherein EPA approved a proposal to include permit limits based on annual averages rather than monthly averages. The approval memorandum recognized that the Chesapeake Bay may not be unique, and that

[t]he establishment of an annual limit with a similar finding of "impracticability" pursuant to 40 CFR 122.45(d) may be appropriate for the implementation of nutrient criteria in other watersheds when: attainment of the criteria is dependent on long-term average loadings rather than short-term maximum loadings; the circumstances match those outlined in this memo for Chesapeake Bay and its tidal tributaries; annual limits are technically supportable with robust data and modeling as they are in the Chesapeake Bay context; and appropriate safeguards to protect all other applicable water quality standards are employed.

Hanlon, J.A., *MEMORANDUM: Annual Permit Limits for Nitrogen and Phosphorus for Permits Designed to Protect Chesapeake Bay and its tidal tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System* (EPA, 2004) ("Hanlon Memo"). The circumstances identified in support of annual limits included: "the exposure period of concern for nutrients loadings to Chesapeake Bay and its tidal tributaries is very long; the area of concern is far-field (as opposed to the

immediate vicinity of the discharge); and the average pollutant load rather than the maximum pollutant load is of concern.” The EPA memorandum also noted the variability of nutrient treatment systems on an annual basis, stating

the efficiency of treatment of nutrients by biological nutrient removal is highly sensitive to ambient temperature and is not effective at lower temperatures. Thus, the effluent loading of nutrients is not constant due to seasonal temperature fluctuations in northern climates. Even a simple steady-state model for permit development such as dividing the annual limit by 12 and establishing that value as the monthly limit is therefore, not appropriate. Such a limit does not account for seasonal fluctuations in effluent loading.

*Hanlon Memo* at 5. With respect to nitrogen there are a number of similarities between the circumstances identified in Chesapeake Bay and those underlying the limits here, in that the area of concern is “far-field (as opposed to the immediate vicinity of the discharge)” and EPA’s load analysis is based on an average pollutant load (here seasonal rather than annual) rather than the maximum pollutant load. On the other hand EPA’s basis for concluding that the exposure period of concern for pollutants is very long is not as robust in this analysis as it was in Chesapeake Bay; as noted in the Memorandum there was very detailed modeling in Chesapeake Bay that demonstrated that there was no benefit to monthly average as opposed to annual average limits:

The complex movement of water within Chesapeake Bay and its tidal tributaries, particularly the density-driven vertical estuarine stratification, is simulated with a Chesapeake Bay hydrodynamic model of more than 13,000 cells. The Water Quality Model is linked to the hydrodynamic model and uses complex nonlinear equations describing 26 variables of relevance to the simulation of dissolved oxygen, water clarity and chlorophyll a. Coupled with the Water Quality Model are simulations of settling organic material into and upon the sediments and its subsequent decay and flux of inorganic nutrients from the sediment, as well as a coupled simulation of underwater Bay grasses in the shallows.

The Water Quality Model was used to examine the differences between a constant monthly load and a variable monthly load, but each at the same annual load levels. For nitrogen, the constant monthly discharge estimate is based on a scenario that assumes the level of point source loads based on a constant 5 mg/l discharge applied against point source flow. The variable load scenario is based on the records of 54 sewage treatment plants (STPs) that discharge to Chesapeake Bay that have complete monthly records. The Total Nitrogen average concentration for each month was calculated and then converted to a concentration that would be at the same annual loads as the constant 5 mg/l case, but still preserve the observed monthly variations. Monthly changes in flow were also taken into account. The variation in monthly concentrations varied from a low of 3.76 mg/l in August to a high of 8.46 mg/l in January. The derived monthly variation equivalent on an annual basis to the constant 5 mg/l monthly

loads was applied to all point source dischargers in the Chesapeake Bay watershed. Water quality results of the two scenarios were indistinguishable, no difference was seen in the achievement of Chesapeake Bay water quality criteria.

*Hanlon Memo* at 3 n.4 and 5. With respect to phosphorus, EPA's permit limit analysis was not based on far field or long term average exposures but on 7Q10 conditions in the immediate vicinity of the exposure.

In addition, the seasonal variability of treatment plant performance cited in the Memorandum is mitigated in this case by the use of a seasonal limit, which is only in effect in warm weather (April to October for phosphorus and May to October for nitrogen). While there is still some variability in treatment performance within that time period, EPA has generally found facilities to be able to achieve similar limits on monthly average basis. The cases referred to facilities have been given 60-day rolling averages for phosphorus or seasonal nitrogen limits have involved permits limits at the limit of technology that are more challenging to meet on a monthly average basis.

Given these factors, EPA cannot conclude at this time that the use of monthly average limits is "impracticable" under 40 CFR 122.45(d). The monthly average limits are maintained in the Final Permit.

**Comment A.4.** We understand that EPA has issued or approved NPDES permits for total phosphorus that have a mass limit but no concentration limit (e.g. Jaffrey, NH; Concord, NH; Stowe, VT; Sanford, ME). The Town requests that the concentration limit for total phosphorus be deleted.

**Response to Comment A.4.** EPA has under some circumstances issued NPDES permits for total phosphorus that have a mass limit but no concentration limit (Jaffrey and Concord, NH), although EPA notes that permits issued under delegated state programs (the VT and ME permits) are not specifically "approved" by EPA. This is allowable under EPA's regulations, which provide that "All pollutants limited in permits shall have limitations, standards or prohibitions expressed in terms of mass . . ." and that "Pollutants limited in terms of mass additionally may be limited in terms of other units of measurement, and the permit shall require the permittee to comply with both limitations." 40 CFR 122.45(f)(1) and (2).

In cases where a mass-only limit is set, a demonstration has been made that the specific mass limit is protective of water quality standards in the receiving water under all flow conditions; this means that the mass limit is lower than would be calculated using the alternative concentration limit at design flow. This tradeoff is clearly discussed in EPA's explanation of the permit limits in Jaffrey and Concord NH; in both cases the mass limit is lower than the mass limit that was calculated at design flow. While in some cases this is advantageous to a community, particularly where the facility is well below design flow on a consistent basis and expects to remain at that level, in most cases a concentration

based limit is necessary in order to allow a facility to meet permit limits at higher flows while still being protective of low flow conditions.

Specifically in the case of the Middleborough WWTP, the suggestion to simply delete the concentration limit would not be protective under low flow conditions. If a move to mass-based limits is considered, a mass limit that would be protective of the receiving water under low flow conditions would be calculated using 7Q10 receiving water flow (3.0 cfs or 1.94 mgd) and the lowest monthly flow from the facility (approximately 0.84 mgd<sup>1</sup>). Under those conditions the total allowable load in the receiving water in pounds per day, including background load, is:

$$Q_{\text{total}} \text{ mgd} * 0.1 \text{ mg/l (target concentration)} * 8.34 \text{ (conversion factor)} \\ = (1.94 + 0.84) * 0.1 * 8.34 = 2.319 \text{ lb/day (background + WWTP)}$$

The receiving water background concentration is 0.045 mg/l (see fact sheet), so the background load under 7Q10 conditions is  $(1.94 * 0.045 * 8.34) = 0.728$  lb/day. This leaves an available mass load of **1.591 lb/day**. This would be the appropriate mass limit if the concentration limit was deleted and a mass-only limit was included in the permit.

EPA does not believe that a mass limit of 1.591 lb/day would be consistent with the intent of the comment. While the facility is operating under its design flow, monthly flows are variable and can significantly exceed the 0.84 mgd value. For example in April 2013 the monthly flow was 1.24 mgd; under this flow a 1.59 lb/day mass limit would require the facility to achieve an average concentration of 0.154 mg/l – essentially the same as the Draft Permit concentration limit. Furthermore, under future conditions were the facility to reach its design flow of 2.16 mgd, that mass limit would be equivalent to a concentration of 0.088 mg/l, requiring a substantial upgrade in treatment capability.

Therefore the Final Permit maintains the concentration-based limit for Total Phosphorus, as well as a mass limit calculated based on the concentration limit and the facility design flow in accordance with 40 CFR 122.45(f)(1).

EPA has also reviewed the basis for concentration limits on total nitrogen in light of this comment. As set forth in the Fact Sheet, the nitrogen analysis is based on analysis of total loads to the estuary and is not dependent on any assumptions regarding flow from this facility. In this context, a mass-only limit equal to that in the Draft Permit is protective of water quality standards in the estuary, without any corresponding concentration-based limit.

Concentration based limits are not mandated under EPA's regulations, and mass-only limits have been implemented in certain state-delegated NPDES programs, involving watershed-wide loading analyses of nitrogen load reductions. For

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<sup>1</sup> This is the average monthly flow recorded in the facility Monthly Operating Report for July 2012.

example, the Long Island Sound TMDL nitrogen load allocations (see NYSDEC and CTDEP, *A Total Maximum Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound* (December 2001)) have been implemented in Connecticut through a mass load-based *General Permit for Nitrogen Discharges* from POTWs. This approach facilitates the trading of nitrogen load credits under Connecticut's Nitrogen Credit Exchange. See <http://www.ct.gov/deep/cwp/view.asp?A=2719&Q=325572>. Similarly in the Chesapeake Bay Watershed, EPA encouraged a permitting approach based on annual mass loads and promoted watershed permits and trading programs. See Chesapeake Bay Program, *NPDES Permitting Approach for Discharges of Nutrients in the Chesapeake Bay Watershed* (December 2004). Load based permit limits facilitate trading programs, although no such programs have been proposed in this watershed.

In this case, mass-only limits are sufficient to meet the water quality requirements described in the Fact Sheet, and will provide some flexibility to the facility to operate in a more cost-efficient manner even in the absence of trading. Therefore EPA has eliminated the concentration limit for Total Nitrogen from the Final Permit.

**Comment A.5.** One small typographic error for clarification: PHOSPHORUS, TOTAL is listed as (November 1 – October 31) but it should be (November 1 – March 31).

**Response to Comment A.5.** EPA apologizes for the typographic error and has corrected the error in the Final Permit.

**Comment A.6.** In addition to the continued compliance and the ongoing upgrade project at the WPCF, the town continues its proactive operations and maintenance of the complete system with projects such as:

- The Nemasket Interceptor was upgraded in 2005 at a cost of \$5 million. This significantly reduced infiltration and sanitary sewer overflows in the collection system.
- Standby generators were installed at the East Main and Lane Street wastewater pump stations, decreasing the chance of backups in the system due to equipment malfunction.
- As reported annually to EPA, collection system maintenance and I/I programs continue to prevent overflows due to extraneous flow or capacity restrictions.

**Response to Comment A.6.** EPA acknowledges the comment, and appreciates the Town's commitment to system improvement and its cooperation with the permitting process.

**B. The Nature Conservancy submitted comments by letter dated November 15, 2013.**

The Nature Conservancy is an international, nonprofit conservation organization. Our mission is to conserve the lands and waters on which all life depends. Our work is carried out in all 50 states and over 30 countries, and is supported by over 36,000 members in Massachusetts and Rhode Island and over one million members worldwide. The Conservancy works globally on freshwater and coastal science and management to help government agencies, water management agencies, industry, scientists, and other non-governmental organizations around the world to improve ecosystem health and implement sustainable solutions.

The Taunton River is the longest free flowing coastal river in New England, with tidal influence reaching nearly 20 miles inland from Narragansett Bay. This extent of tidal influence maintains large, high quality, and globally rare brackish and freshwater tidal marshes. The river supports populations of environmentally-sensitive species such as river otters and freshwater mussels; three globally rare species of plants and two globally rare fish, bridle shiner and Atlantic sturgeon, inhabit the watershed. The Taunton River provides important habitat for one of the largest spawning populations of river herring in New England and populations of other fish that play a critical role in supporting marine food webs. The River was designated Wild and Scenic in 2009, to protect six outstanding resource values: agriculture, ecology and biodiversity, estuary, fisheries, history and archaeology, and recreation.

Nutrient pollution from upstream wastewater is widely recognized as a major source of impairment for Narragansett Bay and other estuaries throughout the region. The Conservancy is committed to efforts to reduce reactive nitrogen levels in this region because of persistent problems related to excessive nitrogen including widespread algal blooms causing shellfish harvest closures, low dissolved oxygen levels, and loss of eelgrass.

From Nantucket Sound to Block Island Sound to Great South Bay, NY, The Nature Conservancy is investing in estuarine restoration focused on salt marsh, seagrass, oysters, bay scallops, hard clams, and diadromous fish habitat. However, monitoring and research have shown that to be truly effective at scale, restoration success requires improved water quality to support a diversity and abundance of native species and habitats. Limiting nitrogen from wastewater treatment facilities is a high priority for the Conservancy in our efforts to improve water quality and thus ecosystem health in the region's estuaries.

The Nature Conservancy supports the draft NPDES permit, and we agree with EPA that these limits are necessary to achieve water quality standards in the Nemasket River and downstream waterways, and that the limits are justified by the best available science. Requiring the Middleborough facility and other dischargers to meet these new limits will help to protect and improve water quality in the Taunton River watershed and associated estuary. We view this permit as a key piece of a comprehensive and watershed-wide approach to restoring the environmental conditions of the Taunton River estuary.

While the Conservancy strongly supports the 5.0 mg/l total nitrogen seasonal limit described in the draft permit as a step towards improving water quality, a stricter seasonal limit of 3.0 mg/l total nitrogen, reached over time, may be necessary to meet water quality standards. As the draft permit describes, recent monitoring by the University of Massachusetts School for Marine Science and Technology (SMAST) has shown elevated total nitrogen concentrations in the Taunton River Estuary and Mount Hope Bay. SMAST and Narragansett Bay Water Quality Network monitoring data have also shown other indicators of eutrophic condition, including low dissolved oxygen and elevated chlorophyll-a concentrations. Based on these data, EPA has concluded that excess nitrogen in the Taunton River Estuary and Mount Hope Bay has reached the level of a violation of state water quality standards for nutrients and aesthetics, and has subsequently determined a nitrogen limit is necessary to meet water quality requirements. The Middleborough facility currently constitutes 4.5% of the total watershed nitrogen load; a 51% reduction in nitrogen from the watershed, allocated among several sources, is needed. We agree that a numerical limit on total nitrogen should be included in the permit, and commend the use of recent local data to determine the limit. However, this limit is based on assumptions regarding future reductions in nonpoint source pollution and other point source reductions, in-stream nitrogen attenuation, and dilution within the estuary. To reach water quality conditions that will support historic eelgrass habitat and the general ecological health of Mount Hope Bay, the Conservancy recommends consideration of a 3.0 mg/l season nitrogen limit. The Nature Conservancy is also supportive of other source reductions and limits needed to reach the overall required load reduction, including reductions in nonpoint source pollution.

The Conservancy is supportive of measures to protect and restore the water balance in the Taunton River watershed, consistent with goals of the 2008/2011 Taunton River Watershed Study and the 2004 Massachusetts Water Policy. We encourage careful consideration of flow limits for wastewater treatment plants in the watershed, to restore water balance and promote groundwater recharge, as well as to maintain consistency with anti-degradation regulations to prevent increased discharge of pollutants to already impaired waters. Therefore, we support maintaining the current flow limit of 2.16 MGD for the Middleborough facility.

In coalition with associations representing municipalities and water suppliers, The Nature Conservancy has supported public policy and funding for municipal infrastructure related to water quality including leading the legislative advocacy efforts to create a \$20 million loan fund for dam removal and repair and advocating for capital funding legislation to implement the recommendations of the Water Infrastructure Financing Commission. The Conservancy will continue to help ensure public funding and incentives are available to help communities protect clean water to benefit people and the environment.

**Response B.** EPA acknowledges the Nature Conservancy's support for the draft NPDES permit and agrees that nitrogen limits on this facility and others in the watershed are essential for restoring this estuarine ecosystem.

## **NPDES No. MA0101591**

With respect to the recommendation that EPA consider a 3.0 mg/l nitrogen limit, EPA notes that it did consider a range of permit limits for this facility and that 3 mg/l is within the range of uncertainty of EPA's analysis (as are higher limits, e.g. 7 mg/l). It is EPA's technical judgment that the best available information supports a 5 mg/l permit limit for this facility and that the unavoidable presence of some uncertainty in the analysis does not necessitate the imposition of a limit of technology permit limit on this facility. The projected future nonpoint source and other point source reductions are achievable through ongoing permit reissuance (WWTPs and MS4 permits), atmospheric nitrogen reductions (see Chesapeake Bay TMDL Appendix L), and trends in agricultural land uses in the watersheds, although EPA agrees that continuing monitoring and analysis will be needed to assess both load reductions and the response of the estuary to the reduction in nitrogen loads. If further monitoring and analysis indicates the need for further reductions in nitrogen loads, including if nonpoint source reductions are not achieved, lower limits may be needed in future permit reissuances.

EPA acknowledges the Conservancy's support for maintaining the current flow limit of 2.16 MGD for the Middleborough facility. EPA notes that the Town of Middleborough has not requested a flow increase.

### **Other Changes to the Final Permit**

EPA has become aware that the requirement to submit reports as electronic attachments to DMRs using NetDMR has created confusion as to report due dates, as report due dates generally differ from the DMR due date (the 15<sup>th</sup> of each month) and NetDMR does not allow submission of a report without a concurrently submitted DMR. Therefore, to assist in electronic reporting, EPA has added language to the Final Permit (Section I.G.1.a) stating that such reports shall be considered timely so long as they are electronically submitted with the next DMR submitted by the permittee no later than the next DMR due date following the permit report deadline.