

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) the,

**Town of Medfield**

is authorized to discharge from the facility located at

**Medfield Wastewater Treatment Facility  
101 West Street  
Medfield MA 02052**

to the receiving water named

**Charles River (Charles River Watershed)**

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

This permit shall 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 February 7, 2005.

This draft permit consists of 14 pages which include effluent limitations and monitoring requirements in Part I, 25 pages in Part II Standard Conditions and Attachment A, Freshwater Chronic Toxicity Test Procedure and Protocol.

Signed this 27th day of December, 2011

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

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

PART I.A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning with the effective date and lasting through the expiration date of the permit, the permittee is authorized to discharge treated effluent from outfall number 001 to the Charles River. Such discharge shall be limited and monitored by the permittee as specified below.

<u>Effluent Characteristic</u>	<u>Units</u>	<u>Discharge Limitation</u>			<u>Monitoring Requirement<sup>3</sup></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>	MGD	1.52	----	Report	Continuous	Recorder
Flow <sup>2</sup>	MGD	Report	----	----	Continuous	Recorder
BOD <sup>4</sup> <sub>5</sub>	mg/l lbs/day	15 190	25 317	Report Report	3/Week 3/Week	24-Hour Composite <sup>5</sup> 24-Hour Composite <sup>5</sup>
TSS <sup>4</sup>	mg/l lbs/day	15 190	25 317	Report Report	3/Week 3/Week	24-Hour Composite <sup>5</sup> 24-Hour Composite <sup>5</sup>
pH <sup>1</sup>	S.U.	6.5-8.3 (See Condition I.A.1.b.on Page 6)			1/Day	Grab
Dissolved Oxygen	mg/l	NOT LESS THAN 6			1/Day	Grab
Fecal Coliform Bacteria <sup>1,6</sup> (April 1 through November 30)	cfu/100 ml	200	----	400	2/Week	Grab
Escherichia Coli Bacteria <sup>1,6</sup> (April 1 through November 30)	cfu/100 ml	126	----	409	2/Week	Grab
Total Ammonia Nitrogen, as N, (November 1 through May 31)	mg/l lbs/day	Report Report	---- ----	Report Report	1/Month 1/Month	24-Hour Composite <sup>5</sup> 24-Hour Composite <sup>5</sup>

PART I. A. 1 (continued)

Effluent Characteristic	Units	Discharge Limitation			Monitoring Requirement <sup>3</sup>	
		Average Monthly	Average Weekly	Maximum Daily	Measurement Frequency	Sample Type
Total Ammonia Nitrogen, as N, (June 1 through October 31)	mg/l	7.6	----	----	2/Week	24-Hour Composite <sup>5</sup>
	lbs/day	96	----	----	2/Week	24-Hour Composite <sup>5</sup>
Copper, Total <sup>7</sup>	ug/l	25	----	36	1/Month	24-Hour Composite <sup>5</sup>
	lbs/day	317	----	456		
Lead, Total <sup>9</sup>	ug/l	Report	----	Report	1/Month	24-Hour Composite <sup>5</sup>
	lbs/day	Report	----	Report		
Cadmium, Total <sup>10</sup>	ug/l	Report	----	Report	1/Month	24-Hour Composite <sup>5</sup>
	lbs/day	Report	----	Report		
Phosphorus, Total <sup>8,11</sup> (April 1 through October 31)	mg/l	0.10	----	----	2/Week	24-Hour Composite <sup>5,8</sup>
Phosphorus, Total <sup>8,11</sup> (November 1 through March 31)	mg/l	0.30	----	----	1/Week	24-Hour Composite <sup>5,8</sup>
Orthophosphate <sup>8,12</sup>	mg/l	Report	----	----	1/Month	24-Hour Composite <sup>5</sup>
Aluminum, Total <sup>12</sup>	ug/l	447	----	----	1/Month	24-Hour Composite <sup>5</sup>
	lbs/day	5.67	----	----		
LC <sub>50</sub> <sup>14,16</sup>	%	----	----	100	4/year <sup>13</sup>	24-Hour Composite <sup>5</sup>
C-NOEC <sup>15,16</sup>	%	----	----	≥ 18	4/year <sup>13</sup>	24-Hour Composite <sup>5</sup>

Footnotes:

1. Required for State Certification
2. Report annual average, monthly average, and maximum daily flow. The 1.52 MGD 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. Effluent sampling shall be of the discharge and shall be collected at outfall 001. 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.

4. Sampling required for influent and effluent.
5. A 24-hour composite sample will consist of a least twenty-four (24) grab samples taken during one consecutive 24-hour period (e.g. 0700 Monday to 0700 Tuesday), either collected at equal intervals and combined proportional to flow or continuously collected proportionally to flow. Once per day (1/Day) is defined as one time each day, during regular business hours.
6. Fecal coliform bacteria discharges shall not exceed a monthly geometric mean of 200 colony forming units (cfu) per 100 ml, nor shall they exceed 400 cfu per 100 ml as a daily maximum. *E. coli* discharges shall not exceed a monthly geometric mean of 126 colony forming units (cfu) per 100 ml, nor shall they exceed 409 cfu per 100 ml as a daily maximum. The average monthly limits for fecal coliform bacteria and *E. coli* are expressed as geometric means.

The fecal coliform bacteria limits and monitoring requirements are in effect only for the duration of the first seasonal monitoring period of April 1-November 30 following the effective date of the permit. For example, if the permit becomes effective on January 1, 2012, the fecal coliform limits and monitoring requirements will be in effect April through November 2012.

The *E. coli* monitoring requirements are in effect upon the effective date of the permit. The *limits* become effective on the April 1 following the end of the period in which the fecal coliform limits are effective. For example, if the permit becomes effective on January 1, 2012, the permittee shall monitor *E.coli* beginning in April 2012, but the *limits* will not become effective until April 1, 2013. The monitoring frequency for *E. coli* before the limits go into effect is 1/month. After the *limits* are in effect, the monitoring frequency is 2/week.

7. The minimum detection level (ML) for copper is defined as 3.0 ug/l. This value is the minimum detection level for copper 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 for effluent limitations less than 3.0 ug/l. Compliance/non-compliance will be determined based on the ML. Sampling results of 3.0 ug/l or less shall be reported as zero on the Discharge Monitoring Report.
8. The sampling frequency identified is the minimum sampling frequency and, in accordance with footnote 3 sampling must be conducted on the same day(s) each week. If any additional phosphorus or orthophosphate sampling is conducted, including process control samples, the individual phosphorus or orthophosphate analytical results, the date each sample was taken, the type of sample, i.e., 24-hour composite or grab, and the analytical method must be reported as an attachment to the DMR. Additionally, the chemical dosing rate for all chemicals added for the purpose of phosphorus or orthophosphate control shall be reported for each day of the month. Unless otherwise specified in the permit, only 24-hour composite samples analyzed with an EPA approved method shall be used in determining compliance with the phosphorus permit limit.
9. The minimum detection limit (ML) for lead is defined as 0.50 ug/l. This value is the minimum detection level for lead using the Inductively Coupled Plasma Mass Spectrometry analytical method (EPA Method). This method or other EPA-approved method with an equivalent or lower ML shall be used for sample results less than 0.50 ug/l.
10. The minimum detection limit (ML) for cadmium is defined as 0.50 ug/l. This value is the minimum detection level for cadmium using the Inductively Coupled Plasma Mass Spectrometry analytical method (EPA Method) or the Furnace Atomic Absorption. These methods or another EPA-approved method with an equivalent or lower ML shall be used for sample results less than 0.50 ug/l.
11. A seasonal (November–March) total phosphorus limit of 0.50 mg/l for the first three years the Permit is in effect has been included in the permit. A seasonal (November–March) total phosphorus limit of 0.30 mg/l shall be in effect at the beginning of the fourth year of the permit and shall remain in effect until the permit expires. For example, if the permit becomes effective on February 1, 2012, the limit becomes effective on February 1, 2015.  
  
A seasonal (April–October) total phosphorus limit of 0.20 mg/l for the first three years the Permit is in effect has been included in the permit. A seasonal (April–October) total phosphorus limit of 0.10 mg/l shall be in effect at the beginning of the fourth year of the permit and shall remain in effect until the permit expires. For example, if the permit becomes effective on February 1, 2012, the limit becomes effective on February 1, 2015.
12. The aluminum samples shall be collected concurrently with the phosphorus and orthophosphate samples.
13. The permittee shall conduct chronic and modified acute toxicity tests four times per year. The permittee shall test the daphnid, Ceriodaphnia dubia, only. Toxicity test samples shall be collected during the second week of the months of January, April, July and, October. The test results shall be submitted by the last day of the month following the completion of the test. The results are due February 28<sup>th</sup>, May 31<sup>st</sup>, August 31<sup>st</sup> and November 30<sup>th</sup>). The tests must be performed in accordance with test procedures and protocols specified in **Attachment A, Freshwater Chronic Toxicity Test Procedures and Protocols** of this permit.

Test Dates Second week	Submit Results By:	Test Species	Acute Limit LC <sub>50</sub>	Chronic Limit C-NOEC
January April July October	February 28 <sup>th</sup> May 31 <sup>st</sup> August 31 <sup>st</sup> November 30 <sup>th</sup>	<u>Ceriodaphnia dubia</u> (daphnid)  See Attachment A	≥ 100%	≥ 18%

14. 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.
15. 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 “18% or greater” limit is defined as a sample which is composed of 18% or greater effluent, the remainder being dilution water.
16. 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 on the EPA, Region I web site at <http://www.epa.gov/region1/enforcementandassistance/dmr.pdf>. 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**.

Part I.A.1 (continued)

- a. The discharge shall not cause an excursion of the water quality standards of the receiving waters.
- b. The pH of the effluent shall not be less than 6.5 nor greater than 8.3 at any time.
- c. The discharge shall not cause objectionable discoloration of the receiving waters.
- d. The effluent shall contain neither a visible oil sheen, foam, nor 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 results of sampling for any parameter done in accordance with EPA approved methods above its required frequency must also be reported.
- g. 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 that POTW from an indirect discharger which would be subject to Section 301 or Section 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 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 MassDEP Regional Office telephone numbers). The reporting form and instruction for its completion may be found on-line at <http://www.mass.gov/dep/water/approvals/surffms.htm#sso>.

## C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance of the sewer system shall be in compliance with the General Requirements of Part II and the following terms and conditions. The permittee is required to complete the following activities 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 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), 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 submitted and implemented 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; and
- (7) An educational public outreach program for all aspects of I/I control, particularly private inflow.
- (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 [1.22 MGD flow value] 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).

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

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 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. See 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 CFR 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) 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

less than 290	1/ year
290 to less than 1500	1 /quarter
1500 to less than 15000	6 /year
15000 +	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

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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>

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:
  - Name and address of contractor(s) responsible for sludge preparation, use or disposal
  - 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. 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 all 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 the 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 (see address below) until further notice from MassDEP.

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 is 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

Monitoring results shall be summarized for each calendar month and reported on separate hard copy Discharge Monitoring Report Form(s) (DMRs) postmarked no later than the 15<sup>th</sup> day of the month following the completed reporting period. All reports required under this permit, including MassDEP Monthly Operation and Maintenance Reports, shall be submitted as an attachment to the DMRs. Signed and dated originals of the DMRs, and all other reports or notifications required herein or in Part II shall be submitted to the Director at the following address:

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

And

**MassDEP – Central Region  
Bureau of Resource Protection (Municipal)  
627 Main Street  
Worcester, MA 01608**

Signed and dated copies of reports (excluding hard copies of monthly discharge monitoring reports) including, toxicity reports, nitrogen evaluations, and annual reports required by this

permit shall also be submitted to the State at:

**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.

**F. 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.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
NEW ENGLAND  
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.

NPDES PERMIT NO.: MA0100978

NAME AND ADDRESS OF APPLICANT:

**Kenneth Feeney, Director  
Department of Public Works  
Town of Medfield  
459 Main Street  
Medfield, MA 02052**

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

**Medfield Wastewater Treatment Plant  
101 West Street  
Medfield, MA 02052**

RECEIVING WATER: **Charles River, Segment (MA72-05)**

CLASSIFICATION: **Class B, Warm Water Fishery**

**I. Proposed Action, Type of Facility, and Discharge Location**

The Town of Medfield has requested that the U.S. Environmental Protection Agency (EPA) reissue its NPDES permit to discharge into the Charles River. The Medfield Wastewater Treatment Plant is engaged in the collection and treatment of municipal wastewater.

The existing NPDES permit was signed on February 7, 2005, became effective on April 7, 2005 and expired on April 7, 2010. The applicant filed a complete application as required by 40 Code of Federal Regulations (CFR) Part 122.6 so the existing permit has been administratively extended and will remain in effect until a renewed permit has been issued. The existing permit and Draft Permit authorize a discharge only from Outfall 001 at the facility. The Draft Permit has been written to reflect the current operations and conditions at the facility.

**II. Quantitative Data and Tables and Figures in the fact sheet**

A quantitative description of the treatment plant's discharge in terms of significant effluent parameters based on recent monitoring data is shown in Table 1 of this fact sheet, Medfield Wastewater Treatment Plant - Discharge Monitoring Report Data. The data in Table 2, Charles River Hardness Downstream of the Medfield WWTP, and, Table 3, Chemistry Data from Whole Effluent Toxicity Tests were used in calculating the Draft Permit's proposed water quality- based effluent limits for lead, nickel, cadmium and zinc.

Table 4, Aluminum Data from Whole Effluent Toxicity Tests Table 5, Background Copper Concentration and Table 6, Proposed Copper Limit provides data used in the calculation of the Draft Permit's proposed copper and aluminum limits.

Table 7, Ammonia Data and In-stream Criteria and Table 8, Background Ammonia data show ammonia data from the facility's recent whole effluent toxicity tests used to determine the need for winter ammonia limits in the Draft Permit.

Figure 1 of the fact sheet is a site locus map of the facility, Figure 2 of the fact sheet is an aerial view of the facility and, Figure 3 is a diagram of the facility's flow process.

### **III. Limitations and Conditions**

The proposed effluent limitations and monitoring requirements may be found in the draft NPDES permit.

### **IV. Permit Basis and Explanation of Effluent Limitation Derivation**

The Town of Medfield operates a 1.52 million gallon per day (MGD) advanced wastewater treatment facility located in Medfield, Massachusetts that serves approximately 14,500 people. There are no significant industrial users contributing wastewater to the plant and the collection system consists of separate sewers.

Sewage enters the plant through a gravity interceptor sewer and flows through an automatic bar screen that prevents trash and debris from entering a wet well. A manual bar rack, parallel to the bar screen, is used as a back-up system. Wastewater is then pumped to one of two primary sedimentation tanks where sludge settles out and is processed through a sludge thickening press and stored prior to being hauled off-site for incineration.

The primary effluent flows to one of two aeration tanks equipped with fine air bubble diffusers. Sufficient air is added to the aeration tank to support biological treatment, including seasonal nitrification. The wastewater then flows into one of two 40 foot diameter clarifiers where the activated sludge settles out. The settled solids flow into the return activated sludge (RAS) tank and are pumped to the head of the aeration cycle. The secondary effluent passes through tertiary sand filters before flowing through the ultraviolet disinfection units and down a cascade into the river. Waste secondary sludge is pumped back to the sludge thickening press where it is treated with polymer and thickened with dissolved air before being hauled off-site for incineration.

### **Overview of Federal and State Regulations**

#### **General Requirements**

The Clean Water Act (CWA or the Act) prohibits the discharge of pollutants to waters of the United States without an NPDES permit unless such a discharge is otherwise authorized by the Act. An NPDES permit is used to implement technology- based and water quality- based effluent limitations as well as other requirements including monitoring and reporting. This draft NPDES permit was developed in accordance with statutory and regulatory authorities established pursuant to the Act. The regulations governing the NPDES program are found in 40 CFR Parts 122, 124, and 125.

EPA is required to consider technology and water quality requirements when developing permit effluent limits. Technology-based treatment requirements represent the minimum level of control that must be imposed under Sections 402 and 301(b) of the Act. Under Section 301(b)(1)(B) of the CWA, publicly owned treatment works (POTWs) must have achieved effluent limitations based upon secondary treatment by July 1, 1977. The secondary treatment requirements are set forth at 49 CFR Part 133.



Under Section 301(b)(1)(C) of the CWA, discharges are subject to limits more stringent than technology-based limits where necessary to meet water quality standards. The Massachusetts Surface Water Quality Standards include requirements for the regulation and control of toxic constituents and also require that EPA criteria, established pursuant to Section 304(a) of the CWA, be used unless a site specific criterion is established. Massachusetts Surface Water Quality Standards also require that discharges of pollutants to surface waters be limited or prohibited to assure that surface water quality standards of the receiving waters are protected and maintained or attained. See 314 CMR 4.03(1)(a).

EPA regulations at 40 CFR 122.44(d)(1)(i), require that the permit limit any pollutant or pollutant parameter (conventional, non-conventional, toxic, and whole effluent toxicity) 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. An excursion occurs if the projected or actual in-stream concentrations exceed the applicable criterion. In determining reasonable potential, EPA considers existing controls on point and non-point sources of pollution, variability of the pollutant in the effluent, sensitivity of the species to toxicity and, where appropriate, the dilution of the effluent in the receiving water.

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 requirement of the CWA. EPA's anti-backsliding provisions, found in Sections 402(o) and 303(d)(4) of the CWA and at 40 CFR 122.44(l), prohibit the relaxation of permit limits, standards, and conditions, except under certain, limited conditions. Therefore, the effluent limits in the reissued permit must be at least as stringent as those in the previous permit, unless a relaxation is allowed under the provisions of the law and regulations.

### **Waterbody Classification and Usage**

The Medfield Wastewater Treatment Plant discharges to segment (MA72-05) of the Charles River as stated on page 37 of the Charles River Watershed 2002-2006 Water Quality Assessment Report published by MassDEP in April 2008. A copy of the Assessment Report can be reviewed at <http://www.mass.gov/dep/water/resources/wqassess.htm>. The Massachusetts Department of Environmental Protection (MassDEP) lists this segment of the river as a Class B water body.

*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. Where designated in 314 CMR 4.06, they shall be suitable as a source of public water supply with appropriate treatment ("Treated Water Supply"). Class B waters shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.*

The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. To meet this goal, the CWA requires states to develop information on the quality of their water resources and report this information to the EPA, the U.S. Congress, and the public. To this end, the EPA released guidance on November 19, 2001, for the preparation of an integrated "List of Waters" that could combine reporting elements of both §305(b) and §303(d) of the CWA. The integrated list format allows the states to provide the status of all their assessed waters in one list. States choosing this option must list each water body or segment in one of the following five categories:

1) Unimpaired and not threatened for all designated uses; 2) Unimpaired waters for some uses and not assessed for others; 3) Insufficient information to make assessments for any uses; 4) Impaired or threatened for one or more uses but not requiring the calculation of a Total Maximum Daily Load (TMDL); and 5) Impaired or threatened for one or more uses and requiring a TMDL. Section 303(d) of the CWA requires states to identify and list those water bodies that are not expected to meet surface water quality standards after the implementation of technology based controls and, as such, require the development of Total Maximum Daily Load.

The MassDEP combines the requirements in Sections 305(b) and 303(d) of the CWA into one report and it is available on the MassDEP website at <http://www.mass.gov/dep/water/resources/08lists2.pdf> as the “*Final Massachusetts Year 2008 Integrated Lists of Water*”.

Segment MA72-05 of the Charles River is listed as not being in attainment of state water quality standards and requiring a TMDL for the following pollutants: dissolved oxygen, dissolved oxygen saturation, excess algal growth, turbidity, nutrient/eutrophication biological indicators, mercury in fish tissue, total phosphorus and, aquatic macroinvertebrate bioassessments. See page 105 of the report.

### **River Flow and Available Dilution**

Water quality based effluent limits in the Draft Permit are determined using water quality criteria and the available dilution during the lowest mean stream flow for seven consecutive days with a ten year recurrence interval commonly known as the 7Q10 low flow. For rivers and streams, Title 314 CMR 4.03(3)(a) requires that the 7Q10 low flow be used to represent the critical hydrologic conditions at which the in-stream water quality criteria must be met. The 7Q10 low flow at the discharge and the plant’s flow upstream of the discharge are used to calculate a dilution factor. The dilution factor is used in calculating water quality based effluent limits in the Draft Permit.

EPA and MassDEP calculated the dilution factor for the existing permit using the 7Q10 low flow measured at the USGS gage in Dover<sup>1</sup> (01103500), average flows from the wastewater treatment plants discharging into the Charles and Stop Rivers upstream of the Dover gage during the week of August 7 through August 13, 1999, and the drainage areas upstream of the Dover gage and upstream of the treatment plant’s discharge. The treatment plant flows from this week were used because flows in the Charles River were approximately equal to the 7Q10 flows. EPA and MassDEP believe that this approach and data are still valid for use in this Draft Permit.

The dilution factor was calculated using 1.52 MGD as the design flow. The dilution factor is 5.43.

Dilution Factor Calculation:

***7Q10 at USGS station 0110350 Charles River at the Dover gage = 12.0 cfs***

*Contributing flows from WWTPs upstream of the USGS gage (August 7 - 13, 1999):*

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<sup>1</sup> 7Q10 low flow at the Dover gage is estimated at 12.0 cfs based on USGS data.

Milford WWTP	3.64 cfs
CRPCD	5.38 cfs
Medfield WWTP	1.11 cfs
Wrentham Developmental Ctr	0.114 cfs
MCI-Norfolk WPCF	0.569 cfs
Total	10.81cfs

*Base flow at USGS Dover*

(7Q10) - (contributing upstream flows from WWTPs)  
12.0 cfs - 10.81 cfs = 1.19 cfs

*Base flow per square mile of drainage area:*

The total drainage area upstream of the Dover gage is 183 sq mi, therefore the flow factor for the watershed is:

$$(1.19 \text{ cfs}) / (183 \text{ sq mi}) = 0.00650 \text{ cfs/sq mi}$$

*Base Flow at Medfield Wastewater Treatment:*

Using the calculated flow factor for the watershed and the estimated drainage area upstream of Medfield's discharge of 109 sq mi, the base flow in the Charles River at the discharge point is:

$$(0.00650 \text{ cfs/sq mi}) (109 \text{ sq mi}) = 0.70879 \text{ cfs}$$

7Q10 flow at treatment plant is the sum of the base flow in the river at Medfield's point of discharge plus the flow discharged from treatment plants upstream of the Medfield discharge during the week of August 7 -13, 1999

$$7Q10 = (0.70879 \text{ cfs}) + (3.64 \text{ cfs}) + (5.38) + (0.114) + (0.569) = 10.41 \text{ cfs (6.73 MGD)}$$

*Dilution factor:*

$$\text{Medfield flow} = 1.52 \text{ MGD} = 2.35 \text{ cfs}$$

$$\text{Dilution Factor} = \frac{7Q10 + \text{design flow}}{\text{design flow}} = \frac{10.41 \text{ cfs} + 2.35 \text{ cfs}}{2.35 \text{ cfs}} = 5.43$$

**Permit Limits and Effluent Data**

**Effluent Flow**

The annual average flow limit in the Draft Permit is the same as in the existing permit, 1.52 MGD (2.35 cfs). The range of 12 month average flows for the period from January 2008 through February 2011 was from 0.812 MGD to 1.23 MGD.

**Biochemical Oxygen Demand (BOD<sub>5</sub>) and Total Suspended Solids (TSS), Dissolved Oxygen (DO), pH**

## and Bacteria

The limits for BOD<sub>5</sub>, TSS, pH, the DO concentration, and bacteria are based on Massachusetts Water Quality Standards and, have been established to achieve State Water Quality Standards for Class B receiving water.

## BOD<sub>5</sub> and TSS

The mass (lbs/day) and concentration (mg/l) limits for BOD<sub>5</sub>, and TSS in the Draft Permit are the same as in the existing permit. The limits are more stringent than technology based secondary requirements found at 40 CFR Part 133. The existing and proposed limits are based on a waste load allocation calculated for the Charles River by MassDEP. For a review of the waste load allocation, refer to *The Charles River Basin 1976 Water Quality Management Plan*, chapters VI and VIII.

The BOD<sub>5</sub> average monthly limits are 15.0 mg/l and 190 lbs/day and, the average weekly limits are 25 mg/l and 317 lbs/day. The “report only” requirements for the BOD<sub>5</sub> maximum daily mass and concentration levels have been carried over to the Draft Permit.

The TSS average monthly limits are 15.0 mg/l and 190 lbs/day and, the average weekly TSS limits are 25 mg/l and 317 lbs/day. The “report only” requirements for the TSS maximum daily mass and concentration levels have been carried over to the Draft Permit.

There was one BOD<sub>5</sub> and no TSS exceedances between January 2008 and February 2011. See Table 1 of the fact sheet for recent discharge monitoring reports (DMR) data.

The Draft Permit also contains 85% BOD<sub>5</sub> and TSS removal limitations based on the requirements of 40 CFR 133.102(3). These limitations are the same as in the existing permit. The DMR data shows the facility has been in continuous compliance with this requirement since January 2008.

## DO and pH

The dissolved oxygen limit, “no less than 6.0 mg/l”, is based on water quality considerations for this segment of the river and will remain “no less than 6.0 mg/l” in accordance with the existing permit. See Table 1 of the fact sheet for recent DO data submitted on the facility’s DMRs.

The Draft Permit has pH limits that are at least as stringent as the requirements set forth at 40 CFR 133.102(c) and the Massachusetts Water Quality Standards for Class B waters. The State’s water quality standards require Class B waters maintain a pH range of 6.5 through 8.3 standard units with not more than 0.5 standard units outside of the receiving water background range. The water quality standards also require there be no change from background conditions that would impair any use assigned to this class. There have been no DO or pH exceedances reported from January 2008 through February 2011.

## Fecal coliform bacteria and *Escherichia coli* (*E. coli*) bacteria

On December 29, 2006 the State revised the bacteria criteria in its water quality standards for Class B waters, changing the criteria from fecal coliform bacteria to *Escherichia coli* (*E. coli*) bacteria. EPA approved this revision on September 19, 2007, and the Draft Permit reflects this change.

The fecal coliform limits will be in effect for the duration of the first disinfection season (April-November) following the effective date of the permit. Fecal coliform limits in the Draft Permit are the same as in the existing permit; a monthly average geometric mean of 200 colony forming units (cfu) per 100 ml and a daily

maximum geometric mean of 400 cfu per 100 ml. After the first disinfection period, limitations on *E.coli* bacteria will become effective, and the fecal coliform monitoring requirements and effluent limits will end. The *E.Coli* limits will then be in effect for the remaining permit term.

The permit provides a one year period for the operators at the facility to make adjustments at the treatment plant to consistently attain the new *E.Coli* limits, but *E.coli* monitoring and reporting is required to begin upon the effective date of the permit.

The *E. coli* bacteria limitations proposed in the Draft Permit are a monthly average geometric mean of 126 colony forming units per 100 ml (cfu/ml) and a maximum daily value of 409 cfu/100 ml. The maximum daily value is the 90% distribution of the geometric mean of 126 cfu/ml. Prior to the limits becoming effective, the monitoring frequency is once per month. When the limits become effective, the monitoring frequency is twice per week.

### Metals

Relatively low concentrations of trace metals in receiving waters can be toxic to resident aquatic life species. EPA is required to limit any pollutant that is, or may be discharged at a level that caused, or has reasonable potential to cause, or contribute to an excursion above any water quality criterion. See 40 CFR 122.44(d)(1)(vi). Effluent metals data submitted with whole effluent toxicity test reports and monthly discharge monitoring reports were reviewed to determine if metals in the discharge have the potential to exceed aquatic life criteria in this segment of the Charles River.

The EPA recommended approach to set and measure compliance with water quality standards is to use dissolved metals, because dissolved metals more closely approximates the bioavailable fraction of metal in the water column rather than total recoverable metal. Most toxicity to aquatic organisms is by adsorption or uptake across the gills which would require the metal to be in dissolved form.

When toxicity tests were originally conducted to develop EPA's Section 304(a) metals criteria, the concentrations were expressed as total metals. Subsequent testing determined the percent of the total metal that is dissolved in the water column. However, the regulations in 40 CFR 122.45(c) require that the permit limits be based on total recoverable metals. The chemical differences between the effluent and the receiving water may cause changes in the partitioning between dissolved and particulate forms of metals. As the effluent mixes with the receiving water, adsorbed metals from the discharge may dissolve in the water column. Because of this phenomenon, measuring dissolved metals would underestimate the impact on the receiving water, so an additional calculation, using a site specific translator is used to determine total metal criteria.

If site-specific studies for partitioning have not been conducted, EPA's Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion (EPA-823-B-96-007), recommends using a translator equivalent to the conversion factor found in EPA's water quality criteria. There is no site specific translator available, so in subsequent calculations, conversion from dissolved metals to total recoverable metals have been done using the conversion factor for the particular metal found in Appendix A of the National Recommended Water Quality Criteria: 2002.

### Hardness Dependent Metals

EPA's Office of Water - Office of Science and Water Technology stated in a letter dated July 7, 2000 that;

“The hardness of water containing the discharged toxic metal should be used for determining the applicable criterion. Thus the downstream hardness should be used.” The theoretical hardness of the Charles River downstream of the treatment plant under 7Q10 low flow conditions were calculated based on ambient and effluent hardness data reported in the recent toxicity tests conducted in July and October as shown below in Table 2, Charles River Hardness Downstream of the Medfield WWTP. The hardness is reported as an equivalent concentration of calcium carbonate. The downstream hardness of 62 mg/l was selected as this would be the most protective of aquatic life during the warm weather months.

**Table 2. Charles River Hardness Downstream of the Medfield WWTP**

WET Test Date	Effluent Hardness, mg/l	Ambient Hardness, mg/l	Calculated Downstream Hardness, mg/l
07/10	100	96	79.40
10/09	110	72	96.77
07/09	N/A	44	N/A
10/08	86.7	56	61.65
07/08	96.20	86.4	88.31

**Calculation of hardness in the receiving water:**

In order to determine the hardness downstream of the treatment plant during the 7Q10 low flow periods, the effluent and ambient hardness values from whole effluent toxicity tests conducted in July and October were used in the mass balance equations:

$$C_r = \frac{Q_d C_d + Q_s C_s}{Q_r}$$

Where:

- Q<sub>s</sub> 7Q10 river flow upstream of plant is 10.41 cfs
- Q<sub>d</sub>, Discharge flow from plant is 1.52 MGD (2.35 cfs)
- Q<sub>r</sub>, Combined river flow (7Q10 + plant flow) is 12.76 cfs
- C<sub>s</sub>, Upstream hardness concentration is 56
- C<sub>d</sub> Effluent hardness is 86.7
- C<sub>r</sub> Receiving water hardness downstream is 62 mg/l

Calculation:

$$C_r = \frac{Q_d C_d + Q_s C_s}{Q_r} = \frac{(2.35)(86.7 \text{ mg/l}) + (10.41)(56 \text{ mg/l})}{(12.76 \text{ cfs})} = 61.65 \text{ mg/l}$$

**Water Quality Criteria equation for hardness-dependent metals:**

$$\text{Chronic criteria (dissolved)} = \exp \{m_c [\ln (\text{hardness})] + b_c\} \text{ (CF)}$$

Where :  $m_c$  = pollutant-specific coefficient  
 $b_c$  = pollutant-specific coefficient  
 $h$  = hardness of the receiving water = 62 mg/l as  $\text{CaCO}_3$   
 $\ln$  = natural logarithm  
 $CF$  = pollutant specific conversion factor used to convert total recoverable to dissolved metal

Acute criteria (dissolved) =  $\exp\{m_a [\ln(\text{hardness})] + b_a\}$  (CF)

Where:  $m_A$  = pollutant-specific coefficient  
 $b_A$  = pollutant-specific coefficient  
 $h$  = hardness of the receiving water = mg/l as  $\text{CaCO}_3$   
 $\ln$  = natural logarithm  
 $CF$  = pollutant specific conversion factor used to convert total recoverable to dissolved metal

### ***Reasonable Potential Analysis for Lead, Nickel, Cadmium and Zinc***

#### ***Lead***

A reasonable potential analysis for lead using a hardness of 62 was performed to determine the need for limits in the Draft Permit. The acute and chronic criteria values for lead are 44.43 ug/l and 1.73 ug/l as shown in **Attachment B, Lead, Nickel, Cadmium reasonable potential analysis** of this fact sheet.

A review of lead data from the Town's recent toxicity tests show concentrations upstream of the discharge (ambient) and in the effluent as non-detect as shown in **Table 3, Effluent Chemistry Data from Whole Effluent Toxicity Tests**. Based on the data, it appears that there is not a reasonable potential for the concentration of lead to cause or contribute to an exceedance of water quality criteria. However, EPA's Chronic Freshwater Toxicity Test Procedure and Protocol specifies that an approved test method capable of achieving a minimum detection level of 0.0005 mg/l be used for the lead analysis. The test method used in several of the Town's toxicity test showed a reporting level was 0.005 mg/l, which is less stringent than the minimum detection level required. Due to this discrepancy, it is unclear whether reasonable potential exists, so a monitoring and reporting requirement for lead has been added to the Draft Permit to obtain sufficient data to make a reasonable potential determination.

#### ***Nickel***

A reasonable potential analysis using a hardness of 62 was calculated for nickel to determine the need for limits in the Draft Permit. The acute and chronic criteria values for nickel are 313.11 ug/l and 34.81 ug/l as shown in **Attachment B, Lead, Nickel, Cadmium reasonable potential analysis** of this fact sheet.

A review of nickel data from the Town's recent toxicity tests show concentrations upstream of the discharge (ambient) and in the effluent as non-detect as shown in **Table 3, Effluent Chemistry Data from Whole Effluent Toxicity Tests**. Based on the data, there is not a reasonable potential for the concentration of nickel to cause or contribute to an exceedance of water quality criteria.

#### ***Cadmium***

A reasonable potential analysis using a hardness of 62 was calculated for cadmium to determine the need for limits in the Draft Permit. The acute and chronic criteria values for cadmium are 1.31 ug/l and 0.19 ug/l as shown in **Attachment B, Lead, Nickel, Cadmium reasonable potential analysis** of this fact sheet.

A review of cadmium data from the Town's recent toxicity tests show concentrations upstream of the discharge (ambient) and in the effluent as non-detect as shown in **Table 3, Effluent Chemistry Data from Whole Effluent Toxicity Tests**. Based on the data, it appears that there is not a reasonable potential for the concentration of cadmium to cause or contribute to an exceedance of water quality criteria. However, EPA's Chronic Freshwater Toxicity Test Procedure and Protocol specifies that an approved test method capable of achieving a minimum detection level of 0.0005 mg/l be used for the cadmium analysis. The test method used in several of the Town's toxicity test showed a reporting level was 0.001 mg/l, which is less stringent than the minimum detection level required. Due to this discrepancy, it is unclear whether reasonable potential exists, so a monitoring and reporting requirement for cadmium has been added to the Draft Permit to obtain sufficient data to make a reasonable potential determination.

**Zinc**

A reasonable potential analysis using a hardness of 62 was calculated for zinc to determine the need for limits in the Draft Permit. The acute and chronic criteria values for zinc are shown below.

$$CMC = \text{Acute zinc criteria (total recoverable)} = \exp(0.8473 [\ln(62)] + 0.8840) = 79.91 \text{ ug/l}$$

$$CCC = \text{Chronic zinc criteria (total recoverable)} = \exp(0.8473 [\ln(62)] + 0.8840) = 79.91 \text{ ug/l}$$

The potential for the concentration of zinc in the effluent to cause or contribute to an excursion above water quality criteria was determined by statistically projecting the maximum and average concentrations of the pollutant in the receiving water downstream from the discharge. **Table 3. Effluent Chemistry Data from Whole Effluent Toxicity Tests** show the zinc data used in this analysis.

Calculating the 99<sup>th</sup> percentile measurement of the existing effluent data set the projected maximum concentration of zinc was found to be 81.24 ug/l. Calculating the 95<sup>th</sup> percentile measurement of the existing effluent data set the projected average concentration of zinc at 68.43 ug/l. The analysis is shown in **Attachment C-Zinc Performance Based Limits**.

The maximum and average projected concentrations were use in a mass balance equation to determine if the concentration of zinc in the effluent could cause or contribute to an excursion from water quality criteria under critical conditions. The background concentrations used in the mass balance equation were from the 2008 through 2010 Toxicity Tests data.

<b>Reasonable Potential Analysis for Zinc</b>	
Where	
$C_r$	=Concentration downstream of the outfall =x ug/l
$Q_d$	=Discharge flow =1.52 MGD
$C_d$	=Average discharge concentration =81.24 µg/l
$Q_s$	=Upstream flow =6.73 MGD
$C_s$	=Background concentration =32 µg/l
$Q_c$	=Streamflow below outfall =8.25 MGD (effluent +



**Reasonable Potential Analysis for Zinc**

Where

- $C_r$  =Concentration downstream of the outfall =x ug/l
- $Q_d$  =Discharge flow =1.52 MGD
- $C_d$  =Average discharge concentration =68.43  $\mu\text{g/l}$
- $Q_s$  =Upstream flow =6.73 MGD
- $C_s$  =Background concentration =20  $\mu\text{g/l}$
- $Q_r$  =Streamflow below outfall =8.25 MGD(effluent + upstream)

Therefore,

$$C_r = \frac{(1.52 \text{ MGD} \times 68.43 \mu\text{g/l}) + (6.73 \text{ MGD} \times 20 \mu\text{g/l})}{8.25 \text{ MGD}}$$

$$= 28.92 \text{ ug/l} < 79.1 \mu\text{g/l (chronic criterion)}$$

Therefore, there is **not a reasonable potential** for the discharge to cause or contribute to an excursion from the chronic water quality criterion for zinc.

	Lead, mg/l	Nickel, mg/l	Cadmium, mg/l	Zinc, mg/l

	Ambient	Effluent	Ambient	Effluent	Ambient	Effluent	Ambient	Effluent
Oct-2010	n/d*	n/d	n/d	n/d	n/d	n/d	0.011	0.039
July-2010	n/d	n/d	n/d	n/d	n/d	n/d	0.017	0.054
Apr-2010	n/d	n/d	n/d	n/d	n/d	n/d	0.031	0.029
Jan-2010	n/d	n/d	n/d	n/d	n/d	n/d	0.011	0.053
Oct-2009	n/d	n/d	n/d	n/d	n/d	n/d	0.016	0.057
July-2009	n/d	n/d	n/d	n/d	n/d	n/d	0.016	0.027
Apr-2009	n/d	n/d	n/d	n/d	n/d	n/d	0.023	0.056
Jan-2009	n/d	n/d	n/d	n/d	n/d	n/d	0.032	0.053
Oct-2008	n/d	n/d	n/d	n/d	n/d	n/d	0.019	0.046
July-2008	n/d	n/d	n/d	n/d	n/d	n/d	0.018	0.044
Apr-2008	n/d	n/d	n/d	n/d	n/d	n/d	0.028	0.054
Average							0.020	

**Table 3. Chemistry Data from Whole Effluent Toxicity Tests**

\*n/d is non-detect

***Reasonable Potential Analysis for Aluminum***

The existing permit includes a monthly average aluminum limit of 447 ug/l. The acute and chronic water quality criteria of aluminum are 87 ug/l and 750 ug/l and, are expressed in terms of total recoverable metal in the water column. These criteria are not dependent on the hardness of the receiving water.

The aluminum concentration routinely achieved through treatment was determined by a statistical analysis using discharge monitoring data from January 2008 through February 2011. The analysis was based on the methodology set forth in the “Technical Support Document for Water Quality based Toxics Control, Appendix E”, published in March 1991, EPA/505/2-90-001. The maximum daily and average monthly limits are based on the 99th and 95th percentile of a lognormal distribution, based on the facility’s monthly average effluent data as shown in **Attachment D, Aluminum Performance Based Analysis**. EPA projected the maximum aluminum concentration to be 1968.63 ug/l by calculating the 99<sup>th</sup> percentile measurement of the existing effluent data set, and the average aluminum concentration to be 944.94 ug/l by calculating the 95<sup>th</sup> percentile measurement of the existing effluent data set.

These calculations show that there is reasonable potential for the discharge to cause or contribute to exceedances of chronic water quality criteria. Accordingly, the monthly average aluminum limit from the current permit has been carried forward in the Draft Permit. The monitoring frequency shall remain once per month.

**Reasonable Potential Analysis for Aluminum**

Where

- C<sub>r</sub> =Concentration downstream of the outfall = x ug/l
- Q<sub>d</sub> =Discharge flow = 1.52 MGD
- C<sub>d</sub> =Average discharge concentration = 1967 µg/l
- Q<sub>s</sub> =Upstream flow = 6.73 MGD
- C<sub>s</sub> =Background concentration = 160 µg/l
- Q<sub>r</sub> =Streamflow below outfall = 8.25 MGD(effluent + upstream)

**Reasonable Potential Analysis for Aluminum**

Where

- $C_r$  =Concentration downstream of the outfall = x ug/l
- $Q_d$  =Discharge flow = 1.52 MGD
- $C_d$  =Average discharge concentration = 945  $\mu\text{g/l}$
- $Q_s$  =Upstream flow = 6.73 MGD
- $C_s$  =Background concentration = 68  $\mu\text{g/l}$
- $Q_r$  =Streamflow below outfall = 8.25 MGD(effluent + upstream)

Therefore,

$$C_r = \frac{(1.52 \text{ MGD} \times 945 \mu\text{g/l}) + (6.73 \text{ MGD} \times 68 \mu\text{g/l})}{8.25 \text{ MGD}}$$

$$= 230 \mu\text{g/l} > 87 \mu\text{g/l} \text{ (chronic criterion)}$$

Therefore, there is **a reasonable potential** for the discharge to cause or contribute to an excursion from the chronic water quality criterion for aluminum

**Table 4. Aluminum Data from Whole Effluent Toxicity Tests**

	Aluminum, ug/l	
	Ambient	Effluent

Oct-2010	20	260
Jul-2010	20	600
Apr-2010	140	1,100
Jan-2010	56	840
Oct-2009	20	190
July-2009	130	180
Apr-2009	20	620
Jan-2009	160	760
Oct-2008	20	90
July-2008	100	150
Apr-2008	60	570
Average	67.82	

### *Copper*

The existing permit includes a monthly average copper limit of 22 ug/l and a maximum daily copper limit of 30 ug/l. The chronic and acute criteria for these limits were calculated using hardness (40 mg/l) reported as an equivalent concentration of Calcium Carbonate (CaCO<sub>3</sub>) of the receiving water, as recommended in the EPA 1998 National Recommended Water Quality Criteria for Copper. The calculation for these limits can be reviewed in the fact sheet issued with the 2004 Draft Permit which is in the administrative file for this facility.

In December 2006, the Massachusetts Surface Water Quality Standards were revised to include site specific copper criteria that were developed for certain water bodies in the State where national criteria are invalid due to site-specific physical, chemical, or biological considerations, and do not exceed the safe exposure levels determined by toxicity testing [314 CMR 4.05(5)(e) Table 28]. MassDEP adopted an acute dissolved copper criterion of 25.7 ug/l and a chronic dissolved criterion of 18.1 ug/l for the Charles River from river mile 73.4 to 9.8. The total recoverable acute copper criteria is 26.8 ug/l and the total recoverable chronic copper criteria is 18.9 ug/l. EPA approved these criteria on March 26, 2007. The point of discharge from the facility is at river mile 29.0, therefore, the site specific criteria apply. Effluent limits based on the site specific copper criteria were calculated and considered in the analysis of the copper limits in the Draft Permit as set forth in the State guidance, "Protocol for and Determination of Site specific Copper criteria for Ambient Waters in Massachusetts" and, the anti-backsliding provisions of the Clean Water Act 402(o) and 303(d)(4).

Page 7 of the "Protocol for and Determination of Site specific Copper Criteria For Ambient Waters In Massachusetts" states, "While site specific copper criteria are being established, prudence dictates that loads of copper and other metals be minimized. Therefore, as part of the site specific criteria, all reasonable efforts to minimize the load of metals (copper in this case), are part of the criteria revision protocol and copper limits will be developed on a case-by-case basis. 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 achieved at the facility in order to minimize copper loads and thereby reduce its accumulation in the sediment."

Anti-backsliding requirements found at CWA 402(o) and 40 CFR 122.44(l) generally prohibit relaxation of effluent limits. Water quality based effluent limits can only be relaxed if one of the exceptions found at CWA 402(o)(2) is met or if the requirements of CWA 303(d)(4) are met. In this case, the requirements in

CWA 303(d)(4) apply. CWA 303(d)(4) requires that a determination be made whether the receiving water is attaining the applicable water quality standard. If the receiving water is in attainment of the standard, a relaxation of the limit may be allowed subject to the state anti-degradation policy. If the receiving water is not in attainment of the applicable standard, the limit cannot be relaxed except in accordance with a wasteload allocation or a total maximum daily load

Thus, determination of the appropriate effluent limits under the site specific protocol requires calculating both (i) the actual effluent concentrations achieved by the facility based on DMR data, hereinafter referred to as the facility “performance-based limits”, and (ii) the required effluent limits that would meet the site specific numeric criteria, hereinafter referred to as the “criteria-based limits”. Both sets of calculated limits must be compared with the limits in the existing permit.

In determining the appropriate limits, water quality data must first be reviewed to ascertain whether the receiving water is attaining the site-specific water quality standards for copper. If it is not, limits cannot be relaxed. If it is, then limits may be relaxed only to the extent that the proposed limits ensure attainment of the site-specific water quality standards and are not less stringent than the performance achieved by the facility.

**Monitoring Data**

Copper is monitored as part of the facility’s monthly discharge monitoring requirement. Table 1 provides copper data collected by the permittee during the months of January 2008 through February 2011. This data shows that the concentration of copper in the plant effluent ranged from 0 ug/l to 90 ug/l, with an average value of 12 ug/l.

Copper concentrations in the receiving water upstream of the discharge are also measured, in conjunction with quarterly whole effluent toxicity tests. This data is shown on **Table 5, Background Copper Concentrations**. The analytical method in EPA’s Chronic Toxicity Tests Procedure and Protocol requires the analysis for copper have a minimum level of 5.0 ug/l. Therefore, non-detects were estimated as one-half of the minimum detection level or 2.5 ug/l. The data shows that the site-specific criteria have been attained in the receiving water, with the exception of a single test conducted in January 2008. EPA believes that this anomalous result was not representative of the receiving water quality and has not used it in further calculations. Since the receiving water upstream of the discharge is attaining water quality standards, a relaxation of the effluent limits can be considered.

**Table 5. Background Copper Concentration**

January 2008	1.5 ug/l
April 2008	1.5 ug/l
July 2008	29.1 ug/l
October 2008	2.5 ug/l
January 2009	2.5 ug/l
April 2009	2.5 ug/l
July 2009	2.5 ug/l
October 2009	2.5 ug/l
January 2010	2.5 ug/l
April 2010	2.5 ug/l
July 2010	2.5 ug/l
October 2010	2.5 ug/l
<b>Median</b>	<b>2.5 ug/l</b>

Average	2.3 ug/l (without 7/2008 value)
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**Facility Performance- Based Copper Limits**

The copper concentration routinely achieved through treatment was determined by a statistical analysis of discharge monitoring data for the period of January 2008 through July 2010. The analysis was based on the methodology set forth in the “Technical Support Document for Water Quality based Toxics Control, Appendix E”, published in March 1991, EPA/505/2-90-001. The maximum daily limits and average monthly are based on the 99th and 95th percentile of a lognormal distribution, based on the facility’s monthly average effluent data as shown in **Attachment E, Copper Performance Based Analysis.** Applying this method, based solely on the past performance of the facility, results in a maximum daily limit of 36 µg/l and a monthly average limit of 25 µg/l.

**Site Specific Criteria-Based Copper Limits**

The effluent copper concentration necessary to achieve the site-specific water quality criteria downstream of the discharge was determined using a mass balance equation. The site-specific criteria, the upstream copper data reported in Medfield’s WET tests, the receiving water 7Q10 low flow, and facility design flow used in this calculation.

$$C_d = \frac{(Q_r C_r - Q_s C_s)}{Q_d}$$

Q<sub>r</sub> = receiving water flow downstream of the discharge (7Q10 + plant flow)

C<sub>r</sub> = copper concentration in the receiving water downstream of the discharge (equal to the site-specific criteria)

Q<sub>d</sub> = design flow of the discharge

C<sub>d</sub> = copper concentration in the discharge (the allowable effluent limit)

Q<sub>s</sub> = receiving water flow upstream of the discharge

C<sub>s</sub> = copper concentration in the receiving water upstream of the discharge

A background concentration of 2.3 ug/l was used in the calculation for the upstream copper concentration. As shown in Table 5 above, this is the average of the ambient data supplied in the Town’s WET tests over the last two years.

In the equation above, the monthly average and daily maximum effluent limits were calculated with the in-stream copper concentration equivalent to the new site specific copper criteria. Using an upstream concentration of 2.3 ug/l (C<sub>s</sub>), the treatment plant design flow 1.52 MGD (Q<sub>d</sub>), the upstream 7Q10 low flow of 6.73 MGD, (Q<sub>s</sub>), the downstream flow of 8.25 MGD (Q<sub>r</sub>), and downstream copper concentration equal to the total recoverable criteria (C<sub>r</sub> = 18.9 ug/l- chronic and 26.8 ug/l) the monthly average copper limit would be 92 ug/l and the maximum daily limit would be 135 ug/l.

$$C_d = \frac{Q_r C_r - Q_s C_s}{Q_d}$$

Where:

$$Q_s = 6.73 \text{ MGD}$$

$$C_s = 4.6 \text{ ug/l, } 29.1 \text{ ug/l}$$

$$Q_d = 1.52 \text{ MGD}$$

$$C_r = 18.9 \text{ ug/l chronic, } 26.8 \text{ ug/l acute, total recoverable criteria}$$

$$Q_r = 8.25 \text{ MGD}$$

$$C_d(\text{chronic}) = \frac{(8.25)(18.9) - (6.73)(2.3)}{1.52} = 92.39 \text{ ug/l}$$

$$C_d(\text{acute}) = \frac{(8.25)(26.8) - (6.73)(2.3)}{1.52} = 135.27 \text{ ug/l}$$

**Table 6. Comparison of Proposed Copper Limits**

	Monthly Average Limit	Daily Maximum Limit	Dissolved Copper Downstream of the Discharge
Existing Permit Limits	22 ug/l	30 ug/l	5.94 ug/l and 7.05 ug/l
Site Specific Criteria Based Limits	92 ug/l	135 ug/l	18.1 ug/l and 25.7 ug/l
Facility Performance Based Limits	25 ug/l	36 ug/l	7.25 ug/l and 9.82 ug/l

Consistent with the site-specific protocol, the Draft Permit monthly average limit has been relaxed to 25 ug/l and the maximum daily limit has been relaxed to 36 ug/l. The monitoring frequency shall remain once per month.

### ***Ammonia***

Ammonia can reduce the receiving stream's dissolved oxygen concentration through nitrification and can be toxic at elevated levels.

The effluent limitations for ammonia-nitrogen from June through October will remain the same as in the existing permit. These limits are consistent with a waste load allocation calculated by MassDEP, established to ensure that dissolve oxygen criteria are attained in the receiving water.

### **Winter Ammonia Limits**

Winter limits may be necessary to ensure that ammonia toxicity does not cause or contribute to violations of water quality standards for a Class B water. In the existing permit, the facility is required to report the ammonia concentration once per month from November 1 through May 31. The highest concentration of ammonia reported on the Town's DMRs, for the cold weather season was 11.9 mg/l in May 2010 as shown on Table 1, Medfield Wastewater Treatment Plant – Discharge Monitoring Report Data.

In-stream ammonia criteria for the cold weather season are dependent on pH and temperature of the receiving water as explained in the 1999 Update of Ambient Water Quality Criteria for Ammonia, Volume 64, Number 245, Federal Register pages, 71973-71980. Table 8, Ammonia Data and In-stream

Criteria show pH and temperature data from recent toxicity tests used to determine the in-stream criteria for the cold weather season.

A30Q10<sup>2</sup> flow was also used to determine the need for winter ammonia limits. The 30Q10 is defined as the mean stream flow for thirty consecutive days with a ten year recurrence interval and was used to calculate cold weather water quality based limits in the Draft Permit.

A mass balance calculation below shows there is not a reasonable potential for the ammonia concentration in the effluent to exceed the in-stream criteria at this time and, effluent limits for the months of November through May have not been included in the Draft Permit. Monthly monitoring shall remain the same as in the existing permit.

Charles River Basin estimate of 30Q 10 for period of November 1 to April 30.

Charles River at Dover gaging stations  
30Q10 =72.0 cfs at the gaging station

The contributing flows for the estimated 30Q10 are based on the design flow from treatment plants upstream of Medfield's discharge. The contributing flow from upstream of the Medfield Plant is 17.4 cfs.

Contributing flows from upstream WWTPs:

Milford WWTP	4.3 MGD	6.60	cfs
CRPCD	4.5 MGD	6.96	cfs
Medfield WWP	1.52 MGD	2.35	cfs
Wrentham Developmental Ctr	0.454 MGD	0.70	cfs
<u>MCI-Norfolk</u>	<u>0.484 MGD</u>	<u>0.749</u>	<u>cfs</u>
Total contributing flows		17.359	cfs

Base flow at USGS Dover = (30Q10) - (contributing flows) = 72.0 cfs - 17.4 cfs = 54.6 cfs

Treatment Plant Design flow is 1.52 MGD = 2.35 cfs

30Q10 base flow = 54.6 cfs at the WWTP

Base flow factor = 54.6 cfs/183 sq.miles = 0.298 cfs/sq. miles

30Q10 = Base flow at Medfield WWTP + Milford flow + CRPCD flow + Wrentham flow + MCI flow

30Q10 = 0.298 cfs/sq.miles (109 sq.miles) + 6.60 cfs + 6.96 cfs + 0.70 cfs + 0.749 cfs = 47.48 cfs

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2 The estimated 30Q10 is based on treatment plant design flows in contrast to the estimated 7Q10 low flow, where the flows were based on the actual discharge volumes during a period when 7Q10 low flow conditions existed in the river.



**Table 7. Ammonia Data and In-stream Criteria**

Month	pH	Temp	In-stream Criteria
December 2009	6.7	1	6.44
January 2008	6.8	3	6.29

**Table 8. Background Ammonia Data**

<i><b>WET Tests Data upstream</b></i>	<i><b>Ammonia, mg/l<sup>3</sup></b></i>
<i>January 10, 2010</i>	<i>0.20</i>
<i>January 12, 2010</i>	<i>0.20</i>
<i>January 14, 2010</i>	<i>0.23</i>
<i>January 12, 2009</i>	<i>0.20</i>
<i>January 14, 2009</i>	<i>0.26</i>
<i>January 16, 2009</i>	<i>0.22</i>
<i>January 11, 2008</i>	<i>0.30</i>
<i>January 14, 2008</i>	<i>0.27</i>
<i>January 16, 2008</i>	<i>0.28</i>
<i><b>Average</b></i>	<i><b>0.24</b></i>

$$C_r = \frac{Q_d C_d + Q_s C_s}{Q_r}$$

Where:

Q<sub>s</sub> 30Q10 river flow upstream of plant is 47.48 cfs

Q<sub>d</sub>, Discharge flow from plant is 1.52 MGD (2.35 cfs)

Q<sub>r</sub>, Combined river flow (30Q10 + plant flow) is 49.83 cfs

C<sub>s</sub>, Average upstream ammonia concentration is 0.24 mg/l

C<sub>d</sub> Effluent ammonia concentration is x

C<sub>r</sub> Receiving water ammonia concentration downstream is 6.29 mg/l

$$C_r = \frac{(2.35 \text{ cfs})(x, \text{ mg/l}) + (47.48 \text{ cfs})(0.24 \text{ mg/l})}{49.83 \text{ cfs}} = 6.29 \text{ mg/l}$$

$$x = (6.29 \text{ mg/l})(49.83 \text{ cfs}) - (0.24 \text{ mg/l})(47.48 \text{ cfs}) / (2.35 \text{ cfs})$$

$$x = 128.53 \text{ mg/l}$$

As shown in Table 1 the concentration of ammonia the treatment plant's effluent is significantly less than 128.53 mg/l. There is not a reasonable potential for the concentration of ammonia in the effluent to cause or contribute to an exceedance of the in-stream ammonia criterion.

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3 Data reported in whole effluent toxicity tests upstream of the treatment plant discharge.

### *Phosphorus*

Phosphorus is an essential nutrient for plant growth, but excessive amounts of phosphorus in a water body has the potential to accelerate stream eutrophication, characterized by excessive plant growth, low dissolved oxygen, and large diurnal swings in dissolved oxygen in the water body.

The “Charles River Basin 2002-2006 Water Quality Assessment Report”, published in April 2008 by MassDEP provides water quality data and information for the river segments in the Charles River Watershed. The report documents that segment MA72-05, the segment that receives the treatment plant’s discharge is impaired by nutrient enrichment. The Assessment Report categorizes the status of designated uses for this segment of the river for aquatic life, aesthetics, primary and secondary recreational contact as impaired due to excess algal growth, elevated phosphorus, biological indicators of organic enrichment, and list NPDES Municipal discharges as a source of the impairment.

Similarly, the “Massachusetts Year 2008 Integrated Lists of Waters” lists this segment as impaired, and requiring a TMDL for dissolved oxygen saturation, excess algal growth, oxygen dissolved, turbidity, nutrient/eutrophication biological indicators and total phosphorus, mercury in fish, and aquatic macroinvertebrate bioassessments.

The existing permit has a 0.2 mg/l monthly average limit for total phosphorus from April 1 through October 31, which is based on Highest and Best Practical Treatment (HBPT) pursuant to 314 CMR 4.05(5)(c) of the Massachusetts Water Quality Standards, and a 1.0 mg/l monthly average limit from November 1 through March 31. The range of the monthly average phosphorus data from the facility’s DMRs was from 0.07 mg/l to 0.65 mg/l during the months of January 2008 through February 2011.

### **Regulatory Background**

Massachusetts Water Quality Standards do not include numeric criteria for phosphorus. The Standards do include narrative criteria, including, in 314 CMR 4.05(5)(c) that states “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.”

In the absence of numeric criteria or a TMDL, EPA would interpret the narrative criteria using the procedures found at 40 CFR Part 122.44(d)(1)(vi), including the use of available guidance and other relevant information. This information would include EPA- published national guidance documents which contain recommended total phosphorus criteria and other indicators of eutrophication. The “Quality Criteria for Water 1986” document, <http://www.epa.gov/waterscience/criteria/library/goldbook.pdf> commonly known as the “Gold Book”, follows an effects-based approach and, recommends maximum threshold concentrations designed to prevent or control adverse nutrient-related impacts from occurring in-stream. The “Quality Criteria for Water 1986” document recommends that in-stream phosphorus concentrations not exceed 0.05 mg/l in any stream entering a lake or reservoir, 0.1 mg/l for any stream not discharging directly into lakes or impoundments, and 0.025 mg/l within a lake or reservoir.

More recently, EPA has released recommended 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. The published criteria represent conditions in waters within ecoregions that are minimally impacted by human activities, and thus free from the effects of cultural eutrophication. Medfield is located within Ecoregion XIV, Eastern Coastal Plains. The recommended total phosphorus criterion for this ecoregion, found in “Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Ecoregion XIV” [http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/upload/2007\\_09\\_27\\_criteria\\_nutrient\\_ecoregions\\_rivers\\_rivers\\_14.pdf](http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/upload/2007_09_27_criteria_nutrient_ecoregions_rivers_rivers_14.pdf) published by EPA in December 2000 is 24 ug/l (0.024 mg/l).

However, MassDEP re-submitted the “Total Maximum Daily Load for Nutrients in the Upper/Middle Charles River, Massachusetts” report for EPA review and approval on June 3, 2011 and on June 10, 2011, EPA approved the final TMDL. See <http://www.mass.gov/dep/water/resources/ucharles.doc>. A TMDL is a calculation of the maximum amount of a single pollutant that a water body can receive and still meet water quality standards. The TMDL provides individual waste load allocations for all point sources discharging to the water body.

The TMDL includes a phosphorus waste load allocation for the major POTWs discharging to the Charles River, including the Medfield treatment plant. Section 3 of the TMDL report discusses nutrient enrichment as it relates to this stretch of the river and presents data used in the formulation of the suggested waste load allocation for the major POTWs. Section 7 of the TMDL recommends that reissued NPDES permits for the major POTWs in this reach of the river include total phosphorus limits of 0.10 mg/l from April through October and 0.30 mg/l from November through March. Regulations at 40 CFR 122.44(d)(1)(vii)(B) require that effluent limitations developed to protect water criteria are consistent with the assumptions and requirements of any available wasteload allocation for the discharge prepared by the State and approved by EPA pursuant to 40 CFR 130.7.

### Limit Derivation/Compliance Schedule

To confirm that the TMDL limits are sufficiently stringent to achieve Gold Book –recommended criteria, the effluent limitations necessary to ensure attainment of the 0.1 mg/l criteria for free flowing streams was calculated. As shown in the calculation below, a limit of 0.36 mg/l is required to meet that criterion. Both the current permit limit and the TMDL limit are more stringent than this limit. Also, given the proximity of downstream impoundments (the South Natick Dam impoundment is less than eight miles downstream) a limit based on achieving the Gold Book-recommended criteria of 0.05 mg/l for streams entering impoundments was also calculated. This calculation yielded a limit of 0.1 mg/l, the same as the TMDL limit.

#### Limit to Achieve 0.1 mg/l Criterion

$$C_d = \frac{C_r Q_r - Q_s C_s}{Q_d}$$

Where:

$C_d$  = Phosphorus concentration in the discharge (effluent limitation)

$Q_s$  = 7Q10 river flow upstream of plant – 6.73 MGD (10.41 cfs)

$Q_d$  = Discharge flow from plant - 1.52 MGD (2.35 cfs)

$Q_r$  = River flow downstream of the discharge (7Q10 + plant flow) = 8.25 MGD (12.76 cfs)

$C_s$  = Upstream phosphorus concentration = 0.041 mg/l (average of TMDL sampling at upstream station 290S)

$C_r$  Receiving water phosphorus concentration (Gold Book Criterion) = 0.1 mg/l

$$C_d = 0.36 \text{ mg/l}$$

Limit to Achieve 0.05 mg/l Criterion

$$C_d = \frac{C_r Q_r - Q_s C_s}{Q_d}$$

Where:

$C_d$  = Phosphorus concentration in the discharge (effluent limitation)

$Q_s$  = 7Q10 river flow upstream of plant – 6.73 MGD (10.41 cfs)

$Q_d$  = Discharge flow from plant - 1.52 MGD (2.35 cfs)

$Q_r$  = River flow downstream of the discharge (7Q10 + plant flow) = 8.25 MGD (12.76 cfs)

$C_s$  = Upstream phosphorus concentration = 0.041 mg/l (average of TMDL sampling at upstream station 290S)

$C_r$  = Receiving water phosphorus concentration (Gold Book Criterion) = 0.05 mg/l

$C_d$  = 0.1 mg/l

Since the TMDL limits are as, or more stringent than the limit which would have otherwise been calculated, the TMDL limits have been included in the Draft Permit. A review of phosphorus data submitted on the Town's DMRs from January 2008 through February 2011 indicates that the facility's effluent phosphorus concentrations are greater than the proposed permit limits, indicating that upgrades to the facility may be necessary to achieve both the April to October limits and the November through March limits. See **Table 1, Medfield Wastewater Treatment Plant – Discharge Monitoring Report Data**. The State Implementation Guidance for the TMDL suggests an interim winter limit of 0.50 mg/l for treatment plants that cannot achieve the winter limit of 0.30 mg/l without significant plant upgrades.

Therefore, a three year schedule of compliance has been included in the Draft Permit for attaining the proposed phosphorus limits. The schedule includes one year for planning, one year for design, and one year for construction of necessary facilities. EPA believes this is a reasonable schedule of compliance, but invites comments from the permittee and other interested parties regarding the length of this schedule. The Draft Permit also includes an interim monthly average limit of 0.2 mg/l for the months of April through October, (the limit from the existing permit) and an interim monthly average limit of 0.5 mg/l for the months of November through March (based on the TMDL recommendation and also determined to be attainable based on a review of past effluent data).

### **Whole Effluent Toxicity Testing**

Under Section 301(b)(1) of the CWA, discharges are subject to effluent limitations based on water quality standards. The State Surface Water Quality Standards at 314 CMR 4.05(5)(e.), include the following narrative statements and require that EPA criteria established pursuant to Section 304(a)(1) of the CWA be used as guidance for interpretation of the following narrative criteria:

*All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife. For pollutants not otherwise listed in 314 CMR 4.00, the National Recommended Water Quality Criteria: 2002, EPA 822-R-02-047, November 2002 published by EPA pursuant to Section 304(a) of the Federal Water Pollution Control Act, are the allowable receiving water concentrations for the affected waters, unless the Department either establishes a site specific criterion or determines that naturally occurring background concentrations are higher. Where the Department determines that naturally occurring background concentrations are higher, those concentrations shall be the allowable receiving water concentrations. Site specific limits, human health risk levels and permit*

*limits will be established in accordance with 314 CMR 4.05(5)(e)(1)(2)(3)(4).*

National studies conducted by the EPA have demonstrated that industrial and domestic sources contribute toxic constituents, such as metals, chlorinated solvents aromatic hydrocarbons, and other pollutants to POTWs. The impact of such complex mixtures is often difficult to assess. Therefore, the toxicity of several constituents in a single effluent can only be accurately examined by whole effluent toxicity testing. In addition, 40 CFR 122.44 (d) requires whole effluent toxicity limits in NPDES permits when the effluent has a reasonable potential to cause toxicity.

The principal advantages of biological techniques are: (1) the effects of complex discharges of many known and unknown constituents can be measured only by biological analysis; (2) bioavailability of pollutants after discharge is measured by toxicity testing including any synergistic effect of pollutants; and (3) pollutants for which there are inadequate analytical methods or criteria can be addressed. Therefore, toxicity testing is used in connection with pollutant-specific control procedures to control the discharge of toxic pollutants.

Therefore, the Draft Permit includes modified acute and chronic whole effluent 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/505-90-001). The LC<sub>50</sub> limitation prohibits acute effects, lethality, to more than 50% of the test organisms when exposed to POTW undiluted effluent for 48 hours. The chronic-no observed effect concentration (C-NOEC) limitation in the Draft Permit prohibits chronic adverse effects such as survival growth, and reproduction when aquatic organisms are exposed to the POTW discharges at the calculated available dilution.

The LC<sub>50</sub> limitation in the Draft Permit is 100%, consistent with MassDEP’s “Implementation Policy for the Control of Toxic Pollutants in Surface Waters”, February 23, 1990, which requires an effluent limitation of 1 toxic unit (LC<sub>50</sub> = 100%) for discharges with dilution factors less than 100.

The Chronic - No Observed Effect Concentration (C-NOEC) limitation in the Draft Permit prohibits chronic adverse effects that adversely affect survival, growth, or reproduction when aquatic organisms are exposed to the POTW effluent at the available dilution. The C-NOEC is established equal to the receiving water concentration, (the inverse of the dilution factor) consistent with MassDEP’s “Implementation Policy for the Control of Toxic Pollutants in Surface Waters”, February 23, 1990. The C-NOEC in the existing permit is 19%, the change is due to the slight increase in the dilution factor.

$C\text{-NOEC} = 1/\text{dilution factor} = 1/5.43 = 0.1841$  or 18%

This Draft Permit continues to require four toxicity tests per year for the daphnid (*Ceriodaphnia dubia*) only. Tests are to be conducted in January, April, July and October using the protocols in Attachment A, Freshwater Chronic Toxicity Test Procedure and Protocol of the Draft Permit.

The chronic and modified acute results of the January 2009 toxicity test failed to meet the permit limit of 100% for the acute toxicity test. The test result was 67.1%. The results for all other toxicity tests between January 2008 and February 2011 met the permit limit of 100% for the acute limit and 19% for the chronic limit.

## **V. Sludge Information and Requirements**

Sludge generated at the Medfield WTP is treated with polymers and thickened by dissolved air flotation. It is stored until it is incinerated at Synagro Northeast in Rhode Island or the Upper Blackstone POTW in Millbury MA. In 2009, the facility produced 257 dry metric tons of sludge.

Section 405(d) of the CW A requires that sludge conditions be included in all municipal permits. The sludge conditions in the Draft Permit satisfy this requirement and are taken from EPA's Standards for the Disposal of Sewage Sludge codified at 40 CFR Part 503 (February 6, 1989-54 FR 5746). The pollutants listed are those which are to be limited by 40 CFR Part 503.

## **VI. Unauthorized Discharges**

The permittee is only authorized to discharge wastewater from the wastewater treatment plant outfall 001. Other discharges of wastewater, such as pump station emergency overflows or sanitary sewer overflows must be reported in accordance with reporting requirements found in Section D.1.e of Part II of the permit (24 hour reporting), including requirements for both oral notice within 24 hours and written notice within 5 days.

## **VII. Anti-Backsliding**

Federal anti-backsliding provisions are found in Section 402(o) of the Clean Water Act and at 40 CFR §122.44(l) and generally prohibit the relaxation of permit limits, standards, and conditions. Anti-backsliding provisions apply to effluent limits based on technology, water quality, Best Professional Judgement and State Certification requirements.

The limits for copper are slightly less stringent than the limits in the existing permit, but are consistent with the anti-backsliding provisions found in 402(o) of the Clean Water Act and 40 CFR 122.44(l). Specifically, Section 402(o) specifies that water quality based effluent limits may be relaxed only in compliance with water quality standards and anti-degradation. See the discussion under the heading titled "Copper" beginning on page 11 for a further discussion.

## **VIII. Anti-Degradation Review**

The Massachusetts anti-degradation regulations (314 CMR 4.04) require that all existing uses of the Charles River must be protected. MassDEP has indicated that it believes there will be no lowering of water quality and/or no loss of existing water uses for this segment of the river as a result of the Draft Permit and that no additional anti-degradation review is warranted.

## **IX. Essential Fish Habitat Determination**

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 Service (NMFS) if EPA's action or proposed actions that it funds, permits, or undertakes, "may adversely impact any essential fish habitat," 16 U.S.C. § 1855(b).

The Amendments broadly define "essential fish habitat" (EFH) as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity," 16 U.S.C. § 1802(10). "Adverse 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 (e.g., loss of prey, reduction in species' fecundity), site specific or habitat-wide impacts, including individual, cumulative, or synergistic

consequences of actions. Id.

Essential fish habitat is only designated for fish 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.

There is no “habitat of particular concern,” as defined under § 600.815 (a)(9) of the Magnuson-Stevens Act, designated for this site.

EPA and MassDEP have determined that a formal EFH consultation with NMFS for this discharge is not required. The proposed discharge permit is developed to meet State Surface Water Quality Standards and will not adversely impact EFH.

#### **X. 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 have 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) administer Section 7 consultations for freshwater species. The National Marine Fisheries Service (NOAA Fisheries) administers Section 7 consultations for marine species and anadromous fish.

EPA and the MassDEP have determined that an ESA consultation is not required for this discharge, since no listed species or critical habitats are located in an area that could be affected by the facility’s discharge.

#### **XI. Monitoring and Reporting**

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

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

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

NetDMR is a national web-based tool for regulated Clean Water Act permittees to submit discharge monitoring reports (DMRs) electronically via a secure Internet application to 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> This website provides further information about NetDMR, including contacts for EPA Region 1.

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” requests process. Permittees, who believe they can not 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 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.

## **XII. State Certification Requirements**

EPA may not issue a permit unless the Massachusetts Department of Environmental Protection with jurisdiction over the receiving water certifies that the effluent limitations contained in the permit are stringent enough to assure that the discharge will not cause the receiving water to violate State Water Quality Standards. The staff of MassDEP have reviewed the Draft Permit and advised EPA that the limitations are adequate to protect water quality. EPA has requested permit certification by the State pursuant to 40 CFR 124.53 and expects that the Draft Permit will be certified.

## **XIII. Public Comment Period and, Procedures for Final Decision**

All persons, including applicants, who believe any condition of the Draft Permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to the United States Environmental Protection Agency, 5 Post Office Square-Suite 100, Mailcode OEP06-1, Boston, Massachusetts 02109-3912. Any person, prior to such date, may submit a request in writing for a public hearing to consider the Draft Permit to EPA and the State Agency. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public hearing may be held after at least thirty days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on the Draft Permit the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

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

## **XIV. EPA and MassDEP Contacts**

Additional information concerning the Draft Permit may be obtained between the hours of 9:00 a.m. and 5:00



p.m., Monday through Friday, excluding holidays from:

Betsy Davis  
US Environmental Protection Agency  
5 Post Office Square – Suite 100  
Mailcode: OEP06-1  
Boston, Massachusetts 02109-3912  
Telephone: (617) 918-1576

or

Kathleen Keohane  
Massachusetts Department of Environmental Protection  
Division of Watershed Management  
627 Main Street  
Worcester, MA 01608  
Telephone: (508) 767-2856

Date:

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

**Attachment A of the Fact Sheet  
Medfield Wastewater Treatment Plant  
Summary of NPDES Permit Reporting Requirements Dates**

Permit Page	Requirement and Dates	Submit to:
5	Whole Effluent Toxicity Tests results are due February 28, May 31, August 31 and November 30.	EPA/MassDEP
8	The permittee shall develop and implement a plan to control I/I to the separate sewer system. The plan shall be submitted to EPA and MassDEP six months from the effective date of the permit. See Part 1.C.3.	MassDEP
10	A summary report of all actions taken to minimize I/I during the previous calendar year shall be submitted to EPA and the MassDEP annually by the permittee by the anniversary date of the effective date of the permit	EPA/MassDEP
12	The permittee shall submit an annual report containing the information specified in the sludge section of the permit by February 19.	EPA/MassDEP
12/13	Monitoring results obtained during the previous month shall be summarized for each month and reported on separate Discharge Monitoring Report Form(s) postmarked no later than the 15 <sup>th</sup> day of the month following the effective date of the permit.	EPA/MassDEP

**Attachment B – Lead, Nickel, Cadmium reasonable potential analysis**

**Lead**

$CMC = \text{Acute lead criteria (total recoverable)} = \exp(1.2730[\ln(62)] - 1.4600) = 44.43 \text{ ug/l}$

$CCC = \text{Chronic lead criteria (total recoverable)} = \exp(1.2730[\ln(62)] - 4.7050) = 1.73 \text{ ug/l}$

A projected pollutant level of half the minimum detection level as required in EPA's Chronic Toxicity Tests Procedure and Protocol was used in a mass balance equation for the average discharge concentration ( $C_d$ ) to determine if a concentration of lead could cause or contribute to an excursion of water quality standards under critical conditions. Upstream concentration of for each pollutant was assumed zero.

**Reasonable Potential Analysis for Lead**

Where

$C_r$	=Concentration downstream of the outfall	= x ug/l
$Q_d$	=Discharge flow	=1.52 MGD
$C_d$	=Average discharge concentration	=0.25 $\mu\text{g/l}$
$Q_s$	=Upstream flow	=6.73 MGD
$C_s$	=Upstream concentration	=0 $\mu\text{g/l}$
$Q_r$	=Streamflow below outfall	=8.25 MGD(effluent + upstream)

Therefore,

$$C_r = \frac{(1.52 \text{ MGD} \times 0.25 \text{ } \mu\text{g/l}) + (6.73 \text{ MGD} \times 0 \text{ } \mu\text{g/l})}{8.25 \text{ MGD}}$$

$$= 0.0461 \text{ ug/l} < 1.73 \text{ } \mu\text{g/l (chronic criterion)}$$

$$= 0.0461 \text{ ug/l} < 44.43 \text{ } \mu\text{g/l (acute criterion)}$$

Therefore, there is **not a reasonable potential** for the discharge to cause or contribute to an excursion from the chronic water quality criterion for zinc.

*Nickel*

A reasonable potential analysis using a hardness of 62 was calculated for nickel to determine the need for limits in this permit reissuance. The acute and chronic criteria values for each metal is are shown below.

$$CMC = \text{Acute nickel criteria (total recoverable)} = \exp(0.8460 [\ln(62)] + 2.2550) = 313.11 \text{ ug/l}$$

$$CCC = \text{Chronic nickel criteria (total recoverable)} = \exp(0.8460 [\ln(62)] + 0.0584) = 34.81 \text{ ug/l}$$

A projected pollutant level of half the minimum detection level as required in EPA's Chronic Toxicity Tests Procedure and Protocol was used in a mass balance equation for the average discharge concentration ( $C_d$ ) to determine if a concentration of nickel could cause or contribute to an excursion of water quality standards under critical conditions. Upstream concentration of for each pollutant was assumed zero.

**Reasonable Potential Analysis for Nickel**

Where

$C_r$	= Concentration downstream of the outfall	= x ug/l
$Q_d$	= Discharge flow	= 1.52 MGD
$C_d$	= Average discharge concentration	= 2.5 $\mu\text{g/l}$
$Q_s$	= Upstream flow	= 6.73 MGD
$C_s$	= Upstream concentration	= 0 $\mu\text{g/l}$
$Q_r$	= Streamflow below outfall	= 8.25 MGD (effluent + upstream)

Therefore,

$$C_r = \frac{(1.52 \text{ MGD} \times 2.5 \text{ } \mu\text{g/l}) + (6.28 \text{ MGD} \times 0 \text{ } \mu\text{g/l})}{8.25 \text{ MGD}}$$

$$= 0.461 \text{ ug/l} < 34.81 \text{ } \mu\text{g/l} \text{ (chronic criterion)}$$

$$= 0.461 \text{ ug/l} < 313.11 \text{ ug/l} \text{ (acute criterion)}$$

Therefore, there is **not a reasonable potential** for the discharge to cause or contribute to an excursion from the chronic water quality criterion for nickel.

**Cadmium**

A reasonable potential analysis using a hardness of 62 was calculated for cadmium to determine the need for limits in this permit reissuance. The acute and chronic criteria values for cadmium are shown below.

$$CMC = \text{Acute cadmium criteria (total recoverable)} = \exp(1.0166 [\ln(62) - 3.924]) = 1.31 \text{ ug/l}$$

$$CCC = \text{Chronic cadmium criteria (total recoverable)} = \exp(0.7409 [\ln(62)] - 4.72) = 0.19 \text{ ug/l}$$

A projected pollutant level of half the minimum detection level as required in EPA's Chronic Toxicity Tests Procedure and Protocol was used in a mass balance equation for the average discharge concentration ( $C_d$ ) to determine if a concentration of cadmium could cause or contribute to an excursion of water quality standards under critical conditions. Upstream concentration of for each pollutant was assumed zero.

**Reasonable Potential Analysis for Cadmium**

Where

$C_r$	= Concentration downstream of the outfall	= x ug/l
$Q_d$	= Discharge flow	= 1.52 MGD
$C_d$	= Average discharge concentration	= 0.25 ug/l
$Q_s$	= Upstream flow	= 6.73 MGD
$C_s$	= Upstream concentration	= 0 ug/l
$Q_r$	= Streamflow below outfall	= 8.25 MGD (effluent + upstream)

Therefore,

$$C_r = \frac{(1.52 \text{ MGD} \times 0.25 \text{ ug/l}) + (6.73 \text{ MGD} \times 0 \text{ ug/l})}{8.25 \text{ MGD}}$$

$$= 0.0461 \text{ ug/l} < 0.19 \text{ ug/l (chronic criterion)}$$

$$= 0.0461 \text{ ug/l} < 1.31 \text{ ug/l (acute criterion)}$$

Therefore, there is **not a reasonable potential** for the discharge to cause or contribute to an excursion from the chronic water quality criterion for cadmium.

Figure 1. Location of Medfield Wastewater Treatment Facility

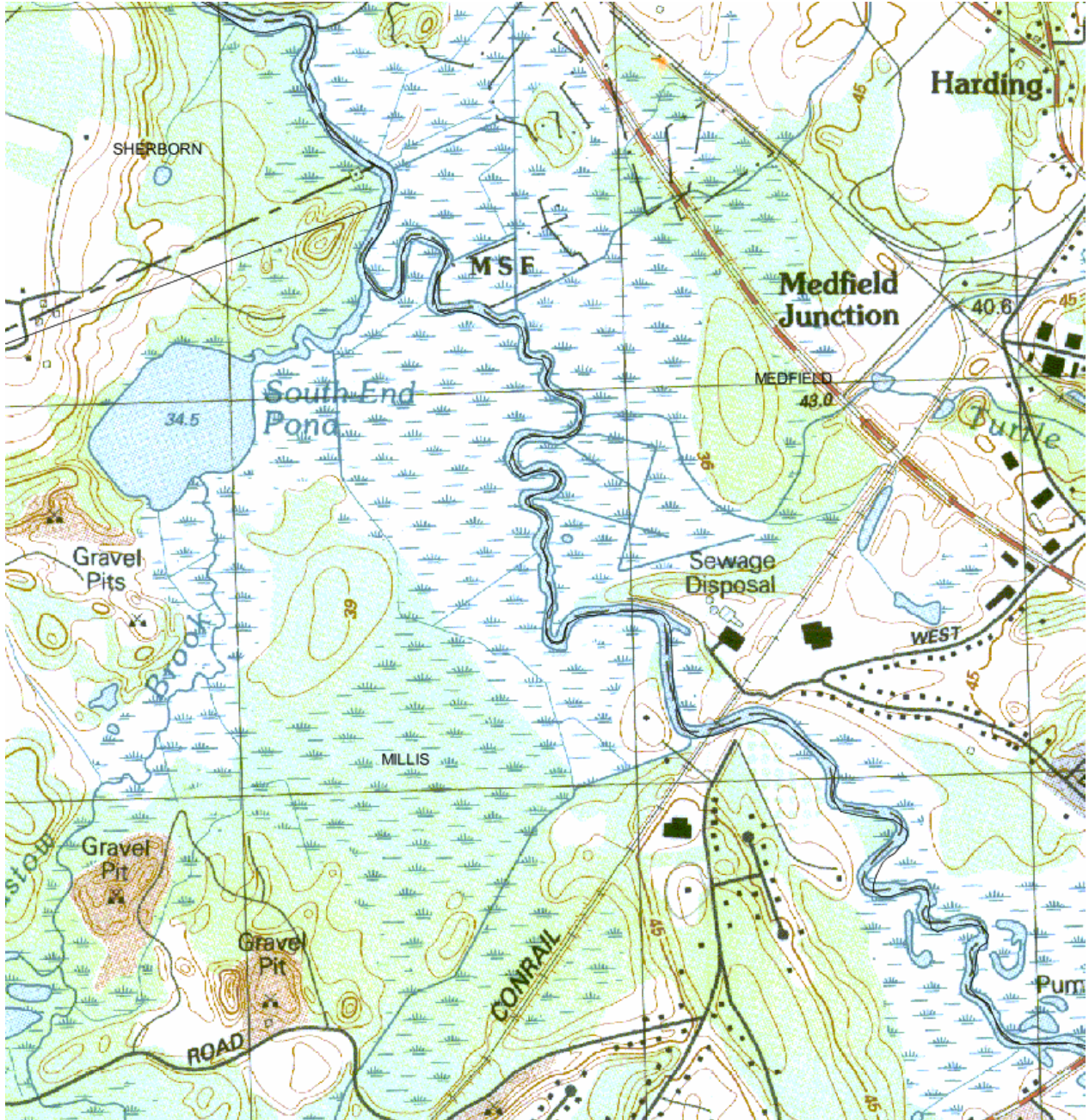




Figure 2. Aerial Photo of Medfield Wastewater Treatment Facility

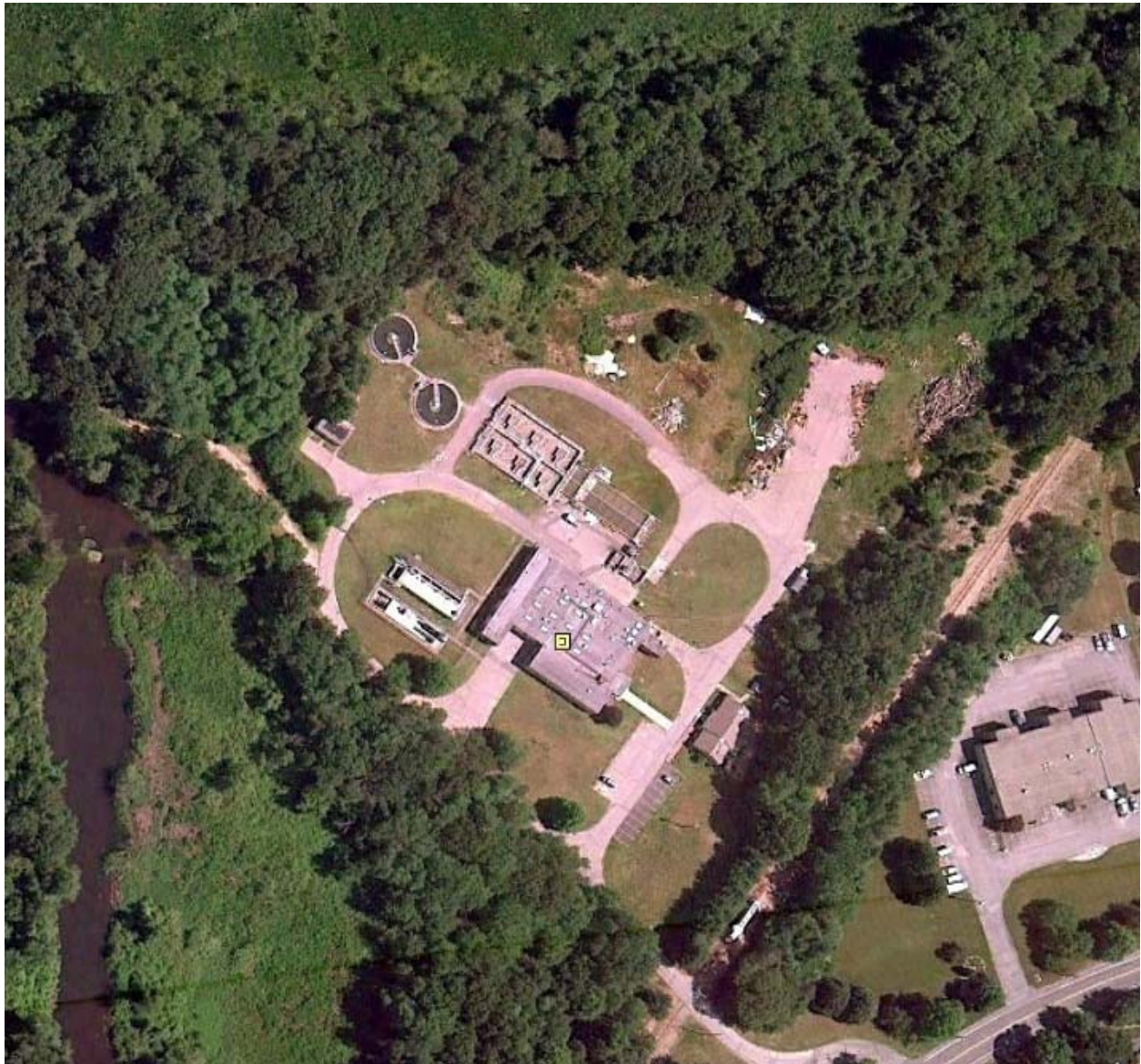
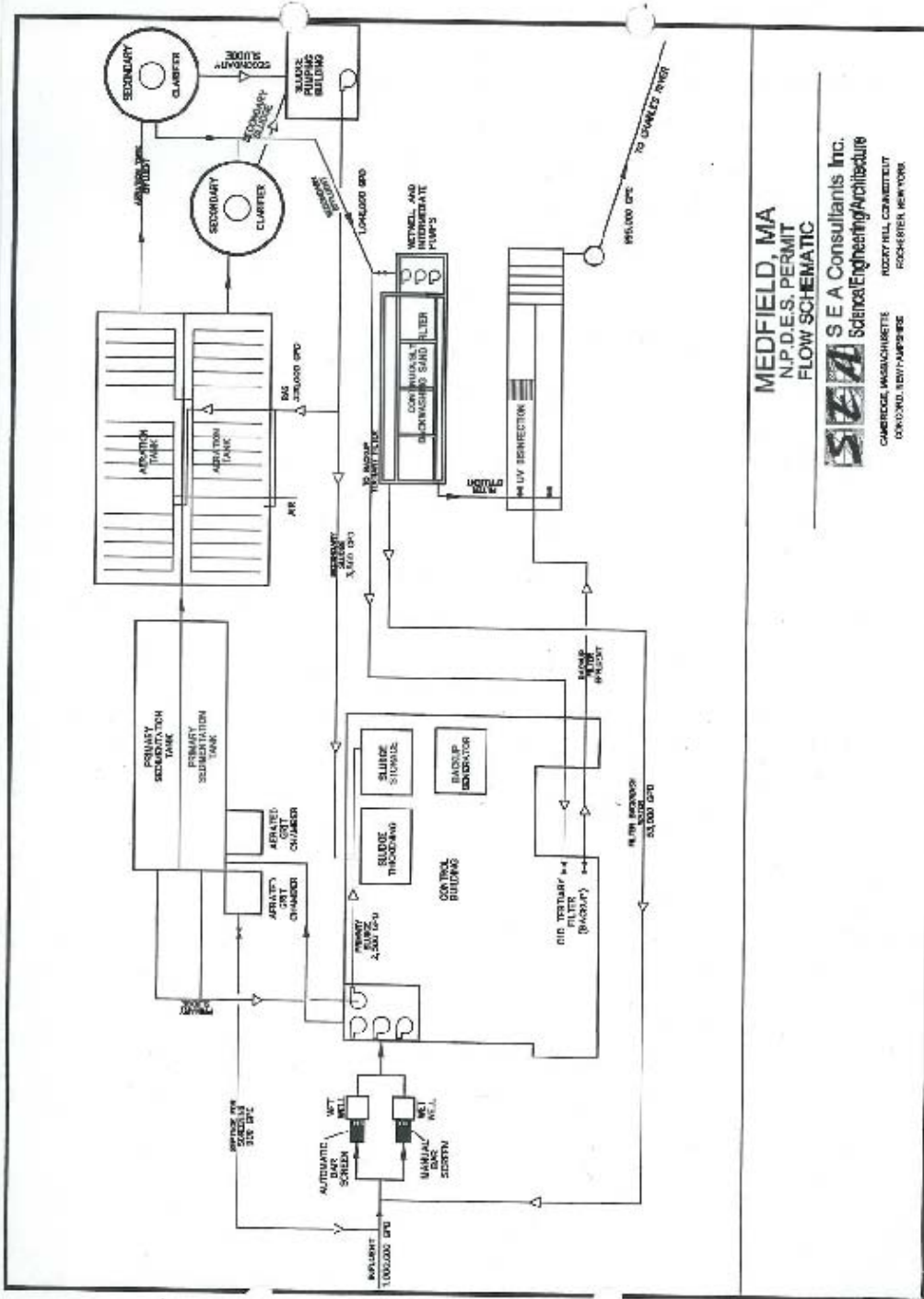


Figure 3. Medfield Wastewater Treatment Plant Flow Schematic



MEDFIELD, MA  
 N.P.D.E.S. PERMIT  
 FLOW SCHEMATIC

**S E A Consultants Inc.**  
 Science/Engineering/Architecture

CAMBRIDGE, MASSACHUSETTS  
 CHICAGO, ILLINOIS  
 ROCKFELL, CONNECTICUT  
 ROCKEFER, NEW YORK



**EPA AND MASSDEP JOINT RESPONSE TO PUBLIC COMMENTS  
MEDFIELD WASTEWATER TREATMENT PLANT  
NPDES PERMIT NO. MA0100978**

From July 27, 2011 to August 25, 2011, the United States Environmental Protection Agency Region 1 (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) solicited Public Comments on a Draft NPDES Permit for the Medfield Wastewater Treatment Plant. The Draft Permit was developed pursuant to a reapplication from Mr. Kenneth Feeney, Superintendent, Department of Public Works, Medfield, Massachusetts for reissuance of its NPDES Permit to discharge treated wastewater to the Charles River. Upon considering the comments received, EPA has made a final decision to reissue the Permit authorizing the discharge. The following response to comments briefly describes and responds to the comments and briefly describes the changes made to the Permit. A copy of the Final Permit may be obtained from the permit writer, whose contact information is as follows:

Betsy Davis  
United States Environmental Protection Agency  
5 Post Office Square-Suite 100  
Mailcode: OEP06-1  
Boston, Massachusetts 02109-3912  
Tel: (617) 918-1576.  
Email: [davis.betsy@epa.gov](mailto:davis.betsy@epa.gov)

A copy of the final permit and response to comments may also be obtained from the EPA Region 1 web site at <http://www.epa.gov/region1/npdes/index.html>.

**Comments submitted by Nigel Pickering, Ph.D., P.E. Charles River Watershed Association, Weston, Massachusetts, on August 24, 2011.**

**Comment #1**

Phosphorus

Phosphorus remains a real threat to the health and beauty of the Charles River. The most persistent water quality problems in the Charles are associated with excessive nutrients especially phosphorus. We are pleased to see that the new Upper/Middle Charles Nutrient TMDL (2011) discharge limits for phosphorus have been adopted (0.1 mg/L summer, 0.3 mg/L winter), however, we think that a three-year phase in period (0.2 mg/L summer, 0.5 mg/L winter) is not necessary for this facility, given that the reported phosphorus concentrations for discharge have been meeting the lower numbers since August 2010.

The phosphorus loads presented in the draft permit are incorrect. The Upper/Middle TMDL did not use a simple flat-line for permitted flow, instead it used a seasonal flow curve with higher flows in the winter/spring and lower flows in the summer/fall, resulting in an average flow equal to the permitted flow of 1.52 mgd. Therefore, TMDL loads are not a simple multiplication of seasonal concentration by constant flow. To avoid future confusion, we suggest just using only the concentration limits in the draft permit, as was done in other recent draft NPDES permits in the Charles.

Additionally, all new NPDES permits in the Charles should include periodic orthophosphate reporting. Water quality modeling for the Upper/Middle Charles had to use spot monitoring in a single year to determine orthophosphate discharge loads. Orthophosphate concentrations could be very useful for any future water quality water quality modeling to refine the TMDL. This draft permit requires orthophosphate reporting only in the winter. Why is there no summer reporting? As a compromise, we propose having monthly orthophosphate reporting year-round (12 samples) instead of weekly reporting only in the winter (20 samples).

### **Response #1**

When the Draft Permit was being developed, EPA and MassDEP had several conversations with the Town about achieving the more stringent total phosphorus limits. The Town stated that they would need to make chemical adjustments at the plant to meet the lower limits. A review of total phosphorus data reported in the facility's discharge monitoring reports (DMR) verifies that the lower limits will not be consistently met without changes at the facility.

Specifically, from January 2009 through June 2011 the total phosphorus concentration was consistently greater than 0.10 mg/l during the warm weather months. During the cold weather months there may be fewer adjustments necessary to reach the 0.30 mg/l limit, but there were several months between 2009 and 2011 that the facility reported total phosphorus greater than 0.30 mg/l. EPA believes the schedule of compliance in the Draft Permit is reasonable and has retained it in the Final Permit.

EPA agrees that the mass limit in the Draft Permit were not consistent with the TMDL, because they allowed a higher mass loading during the summer months than was modeled in the TMDL. Accordingly, the mass limits for total phosphorus have been removed in the Final Permit.

Also, during review of the total phosphorus mass limits, EPA became concerned that the concentration limits in the Draft Permit were given only to the tenth decimal place, perhaps implying that monitoring results could be rounded to the tenth decimal place (e.g. 0.14 mg/l could be rounded to 0.1 mg/l), when it was the intent of the TMDL to require the total phosphorus discharge to be equal to, or less than, the prescribed concentration limits (i.e. that the monthly average discharge in the warm weather months be 0.10 mg/l or less). The limits for total phosphorus in the Final Permit have been changed from 0.1 mg/l from April through October and 0.3 mg/l from November through March to 0.10 mg/l and 0.030 mg/l respectively.

As suggested by the commenter, orthophosphate monitoring and reporting has been changed in the Final Permit to monthly monitoring and reporting throughout the year. This will provide year-round data but be a net reduction in required sampling.

### **Comment #2**

#### Flow

The permitted flow limit for this and other permits in the Charles should not be increased. The TMDL loads for the Upper/Middle TMDL were determined using the current permitted flows so phosphorus loads are tied to these numbers. Any increase in flow should be avoided by encouraging conservation and reduction of infiltration and inflow. Any unavoidable increase in future flow should be offset by a concomitant reduction in phosphorus concentration so that the Upper/Middle TMDL load for the WWTF is preserved. In addition,

reported flow in monthly Discharge Monitoring Reports should be reported as both a rolling average (current plus 11 previous months) and as a true monthly average (average over all days in the month). The true average monthly flow is extremely important for seasonal water resources analysis like Water Budgets (CRWA, 2007) or the Sustainable Yield Estimator / Massachusetts Indicators projects (USGS, 2009).

## **Response #2**

The design flow of the facility has not changed since it has been in operation, and the Town did not request a flow increase in this permit reissuance. In the future, should the Town believe a flow increase is necessary to meet its future wastewater needs, it would have to complete a Comprehensive Wastewater Management Plan as required by MassDEP, which includes the opportunity for public input, and a requirement that alternatives to the flow increase be evaluated. Any flow increase authorized in an NPDES permit could only be done in accordance with Massachusetts Water Quality standards, including antidegradation provisions.

Footnote 2 in the Draft (and Final) Permit requires the facility to report the rolling twelve month average flow, the monthly average flow, and the daily maximum flow on its discharge monitoring reports.

## **Comment #3**

### BOD<sub>5</sub>

Why not use CBOD<sub>5</sub> instead? There is no consistency across NPDES permits in watershed. The CRPCD facility uses CBOD<sub>5</sub> while other permits use BOD<sub>5</sub>. CBOD<sub>5</sub> is far more important for water quality modeling for TMDLs. Why is there no winter limit? It seems to be inconsistent with the proven need for a winter TP limit.

## **Response #3**

The effluent limits for BOD<sub>5</sub> in the Draft Permit are based on a wasteload allocation prepared by the MassDEP and are more stringent than secondary treatment standards. These limits are in effect year-round. EPA and MassDEP believe the limits are sufficient to ensure that the discharge does not cause or contribute to exceedances of water quality standards. While the commenter may believe that CBOD<sub>5</sub> data is more important for water quality modeling, the approved TMDL makes no recommendation regarding CBOD<sub>5</sub> limits.

Regarding consistency among NPDES Permits in a watershed, there are no regulatory requirements for limits and conditions to be consistent among groups of permits. The Environmental Appeals Board had ruled that "Permits are issued on an individual basis, taking into account individual differences as appropriate." (see "*In re City of Attleboro*, NPDES Appeal Nos. 08-08 & 08-09, slip op. at 36 (EAB Sept. 15, 2009); see also *In re City of Port St. Joe*, 7 E.A.D. 275, 304 n.44 (EAB 1997).

In the case of CRPCD, the District specifically requested that the permit limit be changed from BOD<sub>5</sub> to CBOD<sub>5</sub> when their permit was being developed during the 2000 renewal process, and EPA and MassDEP agreed that the CBOD<sub>5</sub> limit was protective of water quality standards.

Accordingly, the BOD<sub>5</sub> limits have not been changed.

**Comment #4**

Total nitrogen

Although there is no need for a discharge limit, reporting of total nitrogen should be at least monthly. Water quality modeling for the Upper/Middle Charles had to use spot monitoring in a single year to determine nitrogen discharge loads. These monthly data would be very useful for future water quality modeling as the TMDL is refined.

**Response #4**

The executive summary of the Upper/Middle Charles TMDL states that phosphorus is the pollutant of concern contributing to the excessive algal biomass in the Upper/Middle and Lower portions of the Charles River, and it explicitly states that phosphorus is the limiting nutrient in the receiving water. Section 3 of the TMDLL, provides a detailed explanation on why phosphorus rather than nitrogen is the limiting nutrient in the receiving water.

While nitrogen loads to the river were used in the TMDL model, there was no indication in the TMDL that lack of nitrogen data compromised the results or that further data was necessary at this time. If the need for such data is determined to be necessary to support future TMDL modeling efforts, a comprehensive sampling plan will be established by MassDEP as part of that effort. If EPA determines that such data is necessary for other reasons, EPA has the authority, pursuant to Section 308 of the Clean Water Act, to require collection of monitoring data independent of permit requirements.

Therefore, a total nitrogen monitoring requirement has not been added to the Final Permit.

**Comment #5**

Ammonia nitrogen

Why are there only two reporting periods? There is no consistency among NPDES permits in watershed. Some facilities use two periods and some use four.

**Response #5**

As described in Response # 3, NPDES permit are tailored to individual facilities. The limits and conditions in individual permits are developed on a case-by-case basis. Upon receiving a permit application, EPA and MassDEP develop the permit from a variety of available information and data. Such information includes, but is not limited to, information in the permit application, requirements in the previous permit, data in the discharge monitoring reports, technology and water quality standards, ambient water quality data and other reports and data that apply to the specific facility and the waterbody receiving the discharge.

Regarding the number of reporting periods for ammonia nitrogen, a facility with four rather than two reporting periods may be the result of a facility requesting a longer start up period to establish nitrification, and the Agencies concurring that less stringent limits during the start-up period are sufficient to ensure that water quality standards are achieved.

## Section 401 Certification

In its Section 401 certification of the permit, the Massachusetts Department of Environmental Protection (MassDEP) included the following statement:

The Department recognizes that the permit condition at Part 1, Section C.4 is a new requirement and the 30 month compliance schedule in which to complete all collection system mapping may not be sufficient in all cases. Technical knowledge and capacity to perform this work may need to be supported initially to accomplish these goals, and some permittees may want to coordinate this work with separately required stormwater collection system mapping requirements expected during the permit term. Initial feedback from a variety of permittees indicated that 48 months may be needed to accomplish this task, aligning the results with the permit compliance evaluation cycle. The Department supports a deadline of 48 months to reasonably accomplish this task. However, if at any time before the current schedule has expired, the permittee determines compliance with the current schedule will not be met, the permittee may submit in writing a request to both agencies to change the deadline in accordance with the regulatory provisions of each agency through permit modification establishing an alternative schedule. Such request must include: a) specific reasons why the extension is necessary; b) documentation dating the progress made to date; c) a proposed alternative date for completing the work; and d) any other relevant information supporting the request for a modified schedule.

Section 401(a)(1) of the CWA requires all NPDES permit applicants to obtain a certification from the appropriate state agency validating the permit's compliance with the pertinent federal and state water pollution control standards. *See* CWA § 401(a)(1). The regulatory provisions pertaining to state certification provide that EPA may not issue a permit until a certification is granted or waived by the state in which the discharge originates. 40 C.F.R. § 124.53(a). The regulations further provide that "when certification is required...no final permit shall be issued...unless the final permit incorporates the requirements specified in the certification under § 124.53(e)." 40 C.F.R. § 124.55(a). Section 124.53(e) provides that the State certification shall include "any conditions more stringent than those in the draft permit which the State finds necessary to "assure compliance with, among other things, state water quality standards, 40 C.F.R. § 124.53(e)(2), and shall include "[a] statement of the extent to which each condition of the draft permit can be made less stringent without violating the requirements of State law, including water quality standards," *id.* § 124.53(e)(3). Under 40 C.F.R. § 124.55(c), "a State may not condition or deny a certification on the grounds that State law allows a less stringent permit condition."

EPA's "duty under CWA section 401 to defer to considerations of State law is intended to prevent EPA from *relaxing* any requirements, limitations, or conditions imposed by the State law." *In re City of Jacksonville*, 4 E.A.D. 150, 157 (EAB 1992); *In re City of Moscow*, 10 E.A.D. 135, 151 (EAB 2001); *accord In re Ina Rd. Water Pollution Control Facility*, 2 E.A.D. 99, 100 (CJO 100).

EPA believes that the 30 month schedule for completing the required mapping included in the draft permit is reasonable and notes that there were no comments regarding this schedule submitted during the public comment period. The 30 month schedule has been included in the final permit.

EPA acknowledges that EPA's recent draft NPDES municipal stormwater general permit for affected Massachusetts municipalities contains storm sewer mapping requirements as a component of the illicit discharge detection and elimination program, and that municipalities may want to conduct storm sewer mapping in conjunction with sewer system mapping. Further, EPA generally agrees with MassDEP that if the permittee submits information showing that despite its best efforts it is unable to complete the required sewer system mapping within the specified period (e.g. if field work for both sewer system mapping and collection system mapping is longer than for mapping the sewer system alone), EPA may allow a reasonable extension of the schedule. However, EPA will not be inclined to grant extensions to municipalities that seek schedule extensions that are based on a delay in initiating collection system mapping because they were awaiting issuance of the municipal stormwater permit.