

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
1 CONGRESS STREET - SUITE 1100
BOSTON, MASSACHUSETTS 02114

FACT SHEET

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

NPDES PERMIT NO.: **MA0100668**

NAME AND ADDRESS OF APPLICANT:

**Concord Wastewater Treatment Plant
Department of Public Works
133 Keyes Road
Concord, Massachusetts 01742**

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

**Concord Wastewater Treatment Plant
509 Bedford Street
Concord, Massachusetts 01742**

RECEIVING WATER: **Concord River** (Concord Basin)
USGS Hydrologic code: 01070005

CLASSIFICATION: **Class B warm water fishery**

I. Proposed Action, Type of Facility and Discharge Location

The above named applicant has applied to the U.S. Environmental Protection Agency ("EPA") for the reissuance of its NPDES permit to discharge into the designated receiving waters. The facility is engaged in the collection and treatment of domestic wastewater and septage. The discharge from this secondary wastewater treatment facility is via Outfall 001 to the Concord River.

The Town of Concord's Wastewater Treatment Plant (WWTP) is a 1.2 million gallon per day (MGD) secondary wastewater treatment facility located in Concord, Massachusetts, serving a population of about 6,000. The facility also accepts up to 13,000 gallons per day of septage from the Town of Concord. There are currently no industrial users contributing wastewater to this facility.

This facility uses clarithickeners for primary clarification followed by plastic media trickling filters for biological treatment. This is followed by secondary clarification, several sand filter beds used seasonally for additional treatment, chlorination and final discharge to the Concord River via an underground concrete pipe. Aluminum sulfate, ferric chloride, or ferric sulfate is used for chemical phosphorus removal.

II. Permit Limitations and Conditions.

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

III. Permit Basis and Explanation of Effluent Limitation Derivation

Under Section 301(b)(1)(C) of the Clean Water Act (CWA), discharges are subject to effluent limitations based on Water Quality Standards. The Massachusetts Surface Water Quality Standards at 314 CMR 4.00 include the requirements for the regulation and control of toxic constituents and also require that EPA criteria established pursuant to Section 304(a) of the CWA shall be used unless site specific criteria are established. The state will limit or prohibit discharges of pollutants to surface waters to assure that surface water quality standards of the receiving waters are protected and maintained or attained.

According to 40 CFR 122.44(l), when a permit is reissued, effluent limitations, standards or conditions must be at least as stringent as the final effluent limitations, standards or conditions in the previous permit unless the circumstances on which the previous permit was based have materially and substantially changed since the time the permit was issued.

Waterbody Classification and Usage

The Concord River, at the point of this facility's discharge, is classified as a Class B - warm water fishery in the Massachusetts Surface Water Quality Standards (314 CMR 4.00). Class B waters are designated as a habitat for fish, other aquatic life, and wildlife, for primary and secondary contact recreation and as a source for drinking water with treatment. The Town of Billerica uses the Concord River downstream of this discharge as a source of drinking water. These waters shall also be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses.

A warm water fishery is defined in the Massachusetts Surface Water Quality Standards (314 CMR 4.02) as waters in which the maximum mean monthly temperature generally exceeds 20° Celsius during the summer months and are not capable of supporting a year-round population of cold water stenothermal aquatic life.

Eutrophic conditions persist in the Concord River and have resulted in its listing on the *Massachusetts Year 2002 Integrated List of Waters* (MADEP 2002), formerly referred to as the 303(d) list. Section 303(d) of the Federal Clean Water Act (CWA) requires states to identify those waterbodies 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 loads (TMDL). The Concord River appears in Category 5 of the integrated list for waters requiring a TMDL. Water quality impairments in the Concord River are attributed to nutrients, metals, and pathogens. Due to nutrient loading, the majority of the water quality concerns associated with the Concord River are directly related to eutrophication (USACOE, MADEP, ENSR 2003). As discussed below (pages 7 - 10), the majority of phosphorus entering this river basin (which includes the Sudbury and Assabet Rivers) during the critical summer period is from Publicly Owned Treatment Works (POTW) discharges.

Conventional Pollutants

Under Section 301(b)(1)(B) of the CWA, POTWs must have achieved effluent limitations based upon **secondary treatment** by July 1, 1977. The secondary treatment requirements are set forth at 40 CFR Part 133. Effluent limitations for monthly and weekly average Biochemical Oxygen Demand (BOD₅) and Total Suspended Solids (TSS) are based on requirements under Section 301(b)(1)(B) of the Clean Water Act (CWA) and 40 CFR 133.102. Limits for fecal coliform bacteria are based upon State Certification requirements for Publicly Owned Treatment Works (POTW) under Section 401(d) of the CWA, 40 CFR 124.53 and 124.55, and water quality considerations.

The permittee discharges an average of 0.94 MGD to the Concord River. The annual average flow limit of 1.2 MGD reflects the facility design flow and has been maintained in the permit.

The BOD and TSS draft limits are based on secondary treatment requirements and are the same as those in the current permit. Discharge monitoring data was reviewed from April 2003 - May 2004. There have been no violations for BOD or TSS during this period with discharge levels typically well below permit limitations. Mass limits have also been included for BOD and TSS. The BOD and TSS removal percentages have met the 85% removal requirement.

The pH range requirement has been maintained at 6.0 S.U. to 8.3 S.U. The pH monitoring frequency has been increased to 3/day. The variability of pH has been high with many values approaching the minimum limit of 6.0 and one value exceeding the minimum limit.

Phosphorus

EPA has produced several guidance documents which contain recommended total phosphorus criteria for receiving waters. The 1986 Quality Criteria of Water (“the Gold Book”) recommends in-stream phosphorus concentrations of 0.05 mg/l in any stream entering a lake or reservoir, 0.1 mg/l for any stream not discharging directly to lakes or impoundments, and 0.025 mg/l within the lake or reservoir.

In December 2000, EPA released “Ecoregional Nutrient Criteria,” (USEPA 2000) established as part of an effort to reduce problems associated with excess nutrients in water bodies located within specific areas of the country. The published criteria represent conditions in waters within each specific ecoregion which are minimally impacted by human activities, and thus are

representative of waters without cultural eutrophication. Concord is within Ecoregion XIV, Eastern Coastal Plains (level III ecoregion 59). The recommended total phosphorus criteria for Ecoregion XIV is 24 ug/l (0.024 mg/l) and can be found in the *Ambient Water Quality Criteria Recommendations, Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Ecoregion XIV*.

More recently, Mitchell, Liebman, Ramseyer, and Card (in draft 2004), in conjunction with the New England States, developed potential nutrient criteria for rivers and streams in New England. Using several river examples representative of typical conditions for New England streams and rivers, they investigated several approaches for the development of river and stream nutrient criteria that would be dually protective of designated uses in both upstream reaches and downstream impoundments. Based on this investigation an instream total phosphorus concentration of 0.020 - 0.022 mg/l was identified as protective of designated uses for New England rivers and streams. The development of this New England-wide total phosphorus concentration was based on more recent data than the National Ecoregional nutrient criteria, and have been subject to quality assurance measures. Additionally, the development of the New England-wide concentration included reference conditions for waters presumed to be protective of designated uses.

The Massachusetts Surface Water Quality Standards (314 CMR 4.00) do not contain numerical criteria for total phosphorus. The narrative criteria for nutrients is found at 314 CMR 4.05(5)(c), which states that nutrients “shall not exceed the site specific limits necessary to control accelerated or cultural eutrophication.” The Water Quality Standards also require that “any existing point source discharges containing nutrients in concentrations which encourage eutrophication or the growth of weeds or algae shall be provided with the highest and best practical treatment (HBPT) to remove such nutrients (314 CMR 4.04). MADEP has established that a monthly average total phosphorus limit of 0.2 mg/l represents highest and best practical treatment for POTWs.

It is well documented that reaches along the Concord River suffer from eutrophication, a condition primarily caused by excessive nutrients entering and accumulating in the river (Goldman Environmental Consultants 1994, MADEP 1990, USACOE, MADEP, ENSR 2003). Phosphorus and other nutrients (i.e., nitrogen) promote the growth of nuisance algae and rooted aquatic plants. Typically, elevated levels of nutrients will cause excessive algal and/or plant growth resulting in reduced water clarity and poor aesthetic quality. Also, through respiration, and the decomposition of dead plant matter, excessive algae and plant growth can reduce in-stream dissolved oxygen concentrations to levels that could negatively impact aquatic life and/or produce strong unpleasant odors.

Dry weather data collected from seven survey stations along the mainstem of the Concord River (July 24th and 26th, 2001 and September 24th and 26th, 2001), yielded total phosphorus concentrations ranging between 0.01 mg/l - 0.10 mg/l (USACOE, MADEP, ENSR 2003). Instream flows measured in the Concord River during the July 2001 and September 2001

surveys were 132 cfs and 47 cfs respectively. Ambient total phosphorus concentrations would be expected to be higher if flows were nearer the 7Q10 flow.

While phosphorus is often used as a causal indicator of eutrophication because its presence results in plant growth, macrophytes, chlorophyll *a* and dissolved oxygen are response indicators. Measures of chlorophyll *a* in surface waters may be correlated with the amount of suspended algae (“phytoplankton”). The recommended chlorophyll *a* criteria for aggregate Ecoregion XIV streams is 3.75 ug/l. This value can be found in the *Ambient Water Quality Criteria Recommendations, Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Ecoregion XIV*.

During water quality surveys conducted July 26 and September 7, 2001, total chlorophyll *a* concentrations increased with distance downstream. Instream measures of chlorophyll *a* ranged from 5.6 to 25 ug/l. These chlorophyll *a* measures included only phytoplankton. In addition to the high chlorophyll *a* levels, macrophytes are also abundant in the Concord River representing the bulk of the total biomass (USACOE, MADEP, ENSR 2003).

During the July and September 2001 surveys, the percent saturation of dissolved oxygen was measured in the Concord River at several stations along the mainstem. Supersaturation can occur under conditions of excessive algae/plant growth which produce oxygen during photosynthesis (Thomann and Mueller 1987). Hence, the supersaturated conditions can be indicative of eutrophic conditions. Of fifteen samples collected from the Concord River, thirteen were supersaturated. The average percent saturation of DO for this data set ranged between 82 % and 159 %, with maximum values as high as 182 % (USACOE, MADEP, ENSR 2003). These supersaturated conditions serve as another indicator of eutrophic conditions in the Concord River.

The draft permit contains the HBPT total phosphorus concentration of 0.2 mg/l. Based on narrative and the national and regional criteria, a limit of at least 0.2 mg/l is necessary to meet water quality standards. An alternative limit may be required upon completion of a future TMDL, an updated water quality analysis, or a numeric water quality criteria. Therefore, this permit may be re-opened and modified prior to the expiration date.

The monthly average total phosphorus limit (0.2 mg/l) is a seasonal limit in effect from April through October. In addition, the maximum daily value must be reported for each month.

In addition to the seasonal total phosphorus limit of 0.2 mg/l, the permit contains a total phosphorus limit of 1.0 mg/l during November through March. The winter period limitation on phosphorus is necessary to ensure that the higher levels of phosphorus discharged in the winter period do not result in the accumulation of phosphorus in the sediments. The limitation assumes that the dissolved fraction of the total phosphorus will pass through the system given the short detention time of the impoundments and the lack of plant growth during the winter period. A monitoring requirement for orthophosphorus has been included for the winter period in order to determine the particulate fraction.

Ammonia

The year round monitoring requirement in the existing permit has been maintained in the draft permit. Discharge ammonia levels are consistently less than 3.0 mg/l as a result of nitrification at the existing treatment facility. Even in the absence of nitrification, expected discharge levels of 15 - 20 mg/l ammonia do not represent a reasonable potential to exceed the ambient criteria value of approximately 3.0 mg/l.

Bacteria Limitations

The Fecal Coliform limits are a geometric mean of no more than 200 colony forming units (cfu) per 100 ml and a daily maximum limit of 400 cfu per 100 ml. These limits are consistent with Class B water requirements of the MA DEP and shall be measured seven times per week. The increased monitoring frequency is to ensure protection of Billerica's drinking water which is withdrawn from the Concord River downstream of the Concord discharge.

Total Residual Chlorine (TRC)

Chlorine and chlorine compounds produced by the chlorination of wastewater can be extremely toxic to aquatic life. Effluent limits are based water quality criteria for TRC which are specified in the water quality criteria document, often referred to as the EPA Goldbook. The criteria states that the average TRC in the receiving water should not exceed 11 ug/l for protection from chronic toxicity and the maximum TRC should not exceed 19 ug/l to protect fresh water aquatic life from acute toxicity.

The 7Q10 dilution (see **Attachment A**) and plant design flow are necessary to calculate the appropriate TRC limits. The 7Q10 dilution multiplied by the chronic and acute fresh water criteria provide the appropriate TRC limits. As shown in **Attachment B**, the calculated limits are 0.21 mg/l monthly average and 0.36 mg/l maximum daily and these are the proposed draft permit limits. Year round disinfection and TRC limits are required because of the water supply withdrawal downstream of this facility.

A requirement to report continuous monitoring data for chlorine has been included in the permit. This requirement is necessary to determine if grab samples are adequate for ensuring compliance with the permit limits and to ensure protection of the downstream water supply.

Metals Toxicity

Lead and copper are the primary metals that are of concern in municipal wastewater discharges. A review of the effluent metals levels measured as part of the whole effluent toxicity testing requirements of the existing permit indicate that lead ranges from <1.0 ug/l - 2.0 ug/l and copper ranges from 5 ug/l - 36 ug/l. At a hardness of 50 mg/l, the chronic ambient criteria for lead is 1.3 ug/l and for copper is 5.2 ug/l. With a 7Q10 dilution factor of 19 (see Attachment A), there is no

reasonable potential for the discharge to exceed water quality criteria for either lead or copper. A monitoring requirement for aluminum has been included in the permit. If the discharge data for aluminum indicate a reasonable potential to exceed ambient criteria for aluminum, a limit will be established in future permits.

Whole Effluent Toxicity

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

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

Pursuant to EPA Region 1 policy, discharges having a dilution of between 10:1 and 20:1 require chronic and modified acute toxicity testing four times per year. 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 analyses; (2) bio-availability of pollutants after discharge is best measured by toxicity testing including any synergistic effects of pollutants; and (3) pollutants for which there are inadequate chemical analytical methods or criteria can be addressed. Therefore, toxicity testing is being used in conjunction with pollutant specific control procedures to control the discharge of toxic pollutants.

The draft permit requires that the Concord WTP conduct WET testing for the Outfall 001 effluent four times per year and that each test include the use of the daphnid, Ceriodaphnia only, since this species was found to be more sensitive than the fathead minnow in previous WET results. Concord has consistently met the WET limits in the existing permit. EPA Region I WET protocol found in permit Attachment A shall be followed. Upstream river water shall be used for dilution in the WET testing. If WET tests conducted in accordance with the requirements of this permit indicate that the upstream river water results in invalid tests, the permittee may follow the procedures identified in the permit for changing to an alternate dilution water.

V. Sewage Sludge Information and Requirements

The Concord WTP generates about 280 dry metric tons of sludge per year. This sludge is sent to the Upper Blackstone WPAD for incineration. In February 1993, the Environmental Protection Agency (EPA) promulgated standards for the use and disposal of sewage sludge. The regulations

were promulgated under the authority of §405(d) of the Clean Water Act (CWA). Section 405(f) of the CWA requires that these regulations be implemented through permits. This permit is intended to implement the requirements set forth in the technical standards for the use and disposal of sewage sludge, commonly referred to as the Part 503 regulations.

Section 405(d) of the CWA 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 proposed Standards for the Disposal of Sewage Sludge to be codified at 40 CFR Part 503 (February 19, 1993 - Volume 58, pp 9248-9415). These conditions are outlined in the draft permit.

VI. Essential Fish Habitat Determination (EFH):

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

Essential fish habitat is only designated for species for which federal fisheries management plans exist (16 U.S.C. § 1855(b) (1) (A)). EFH designations for New England were approved by the U.S. Department of Commerce on March 3, 1999. EPA has determined that a formal EFH consultation with NMFS is not required because the Concord River is not an EFH designated waterbody and the proposed discharge will not adversely impact EFH.

VII. State Certification Requirements

EPA may not issue a permit unless the Massachusetts Department of Environmental Protection 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 the Massachusetts Department of Environmental Protection has 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.

VIII. 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 U.S. EPA, Office of Ecosystem Protection (CMA), One Congress Street, Suite 1100, Boston, Massachusetts 02114-

2023. 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.

IX. 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 the EPA and DEP contacts below:

Dave Pincumbe, Massachusetts Office of Ecosystem Protection
One Congress Street Suite 1100 - Mailcode CMA
Boston, MA 02114-2023
Telephone: (617) 918-1695 FAX: (617) 918-1505
Email: Pincumbe.David@EPA.gov

Paul Hogan, Massachusetts Department of Environmental Protection
Division of Watershed Management, Surface Water Discharge Permit Program
627 Main Street, 2nd Floor Worcester, Massachusetts 01608
Telephone: (508) 767-2796 FAX: (508) 791-4131
Email: Paul.Hogan@state.MA.US

Date

Linda M. Murphy, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

To obtain an estimate of a 7Q10 flow at a point between the two USGS gages listed below, the drainage areas (DA) between them must be calculated and other flows included or excluded as explained below. All drainage area values for the locations below are estimated from USGS topographic maps and the USGS gazetteer of 1984 for the SUASCO (Sudbury-Assabet-Concord) river basin.

Lowell, MA USGS gage, 7Q10 for the period 1971 - 2000: **38 cfs**
 Maynard, MA USGS gage, 7Q10 for the period 1971 - 2000: **14 cfs⁽¹⁾**

Flow factor calculation for main stretch of river between Maynard and Lowell gages:

$$400 \text{ square miles} - 116 \text{ square miles} = 284 \text{ sq. mi.}$$

(Lowell gage DA) (Maynard gage DA) (DA between Maynard to Lowell)

Low flow attributable to this stretch of river:

$$38 \text{ cfs} - 14 \text{ cfs} - 1.5 \text{ cfs}^{(2)} = 22.5 \text{ cfs}$$

(7Q10 @ Lowell) (7Q10 @ Maynard)

Flow factor for this stretch of river:

$$22.5 \text{ cfs} / 284 \text{ square miles} = \mathbf{0.079 \text{ cfs/sq. mile}}$$

Estimated 7Q10 flow at Concord MCI:

$$14 \text{ cfs} + 1.5 \text{ cfs} + (168 \text{ mi}^2 - 116 \text{ mi}^2) 0.079 = \mathbf{20 \text{ cfs}}$$

(DA between Maynard gage and Concord MCI discharge)

Estimated 7Q10 flow at Concord POTW:

$$20 \text{ cfs} + (345 \text{ mi}^2 - 168 \text{ mi}^2) 0.079 = \mathbf{34 \text{ cfs}}$$

(DA between Concord MCI and Concord POTW)

- (1). This is the estimated 7Q10 at the Maynard USGS gage.
- (2). This is the average effluent flow from the Maynard WWTF average flow from the period of June to Sept of 1989 - 1999, reflecting the low flow season over that period. This discharge is just downstream of the Maynard gage.

WATER QUALITY BASED EFFLUENT LIMIT DERIVATION

Parameter: Chlorine, Total Residual (TRC)

Water Quality Criteria: Fresh water - Chronic, Acute- 0.011 mg/l, 0.019 mg/l

Plant Design Flow: 1.2 MGD (1.9 cfs)

Design Flow Dilution:

$$\frac{\text{Design flow} + 7\text{Q10 flow}}{\text{Design flow}} = \frac{1.9 + 34}{1.9} = \mathbf{19}$$

Effluent Limitations: Monthly Average: Daily Maximum:

$$19 (.011 \text{ mg/l}) = \mathbf{0.21 \text{ mg/l}}$$

$$19 (0.019 \text{ mg/l}) = \mathbf{0.36 \text{ mg/l}}$$