RESPONSE TO COMMENTS
NPDES PERMIT NO. MA0100668
CONCORD WASTEWATER TREATMENT PLANT
CONCORD, MASSACHUSETTS

From July 13 through August 11, 2012, the U.S. Environmental Protection Agency Region 1 (EPA-New England) and the Massachusetts Department of Environmental Protection (MassDEP) solicited public comments on the draft National Pollutant Discharge Elimination System (NPDES) permit to be reissued to the Concord Wastewater Treatment Plant in Concord, MA.

EPA-New England and MassDEP received comments from the Town of Concord (the Town), the Concord Business Partnership, OARS, Inc. (OARS), the River Stewardship Council and the National Park Service. The following are responses by EPA-New England to those comments and descriptions of any changes made to the public-noticed permit as a result of those comments.

The final permit is substantially identical to the draft permit that was available for public comment. Although EPA's knowledge of the facility has benefited from the various comments and additional information submitted, the information and arguments presented did not raise any substantial new questions concerning the permit. EPA did, however, make certain clarifications in response to comments. These improvements and changes are detailed in this document and reflected in the final permit. A summary of the changes made in the final permit are listed below. The analyses underlying these changes are explained in the responses to individual comments that follow.

A copy of the final permit and this response to comments document will be posted on the EPA Region 1 web site: http://www.epa.gov/region1/npdes/permits_listing_ma.html.

A copy of the final permit may also be obtained by writing or calling Robin Johnson, United States Environmental Protection Agency, 5 Post Office Square, Suite 100 (Mail Code: OEP06-1), Boston, Massachusetts 02109-3912; Telephone (617) 918-1045.

This response to comment document contains the following attachments:

Figure 1 7Q10 Map

Appendix A Updated 7Q10 and Water Quality-Based Limits

1. **Changes made to the final permit**
    a. Page 2 of 14: A monitoring requirement for ammonia nitrogen was added to the effluent limit table. (See Response C9)
    b. Page 2 of 14: The minimum effluent pH was changed from 6.0 to 6.5. (see Response C6)
    c. Page 2 of 14: The monitoring requirement for dissolved oxygen was reduced from once per day to once per week. Also, the date range for the

dissolved oxygen limit was removed. The limit is in effect year-round. (See Response A12)

d. Page 2 of 14: The whole effluent toxicity testing frequency has been reduced from four times per year to twice per year.
e. Page 2 of 14: The aluminum limit has been changed from 306 ug/L to 255 ug/L due to a correction in the 7Q10 calculation. (see Response C7 and Response to Comments Appendix A)
f. Page 3 of 14: In Footnote 11 (Footnote 10 in draft permit), the words "the second week of" have been removed. (see Response A11).
g. Page 4 of 14: Footnote 11 of the final permit (Footnote 10 in draft permit) requires separate acute and chronic toxicity tests.
h. Page 4 of 14: Footnote 15 was added. This footnote requires the permittee to report certain parameters from the whole effluent toxicity test on the DMR (see Response to Comments Appendix A).
i. Page 13 of 14: Part I.F. was added, describing the procedure whereby the minimum pH limit may be modified.

2. COMMENTS FROM THE TOWN OF CONCORD

OPENING COMMENT:

The Town of Concord, Massachusetts has reviewed the draft NPDES permit for its wastewater treatment plant (WWTP), which was placed on public notice for the period of July 13- August 11, 2012. The Town offers the following comments on this draft permit and hopes USEPA will review the context of each comment and make appropriate changes to the final permit.

Background

The town currently has a 1.2 MGD advanced wastewater treatment facility, which is operating under an NPDES permit (MA0100668), issued to the Town by USEPA and MassDEP. This permit expired in 2011 but remains administratively in force and will be updated and reissued following the completion of the current public notice process. The existing and proposed permit requires the WWTP to treat its wastewater to an extremely high level using advanced treatment technologies including the use of Co-Mag for phosphorus removal. The Town is approximately 30% sewered with the remaining parcels relying on Title 5 systems.

In 2003, the Town completed a Comprehensive Wastewater Management Plan (CWMP). Due primarily to collection system infill and modest expansion of the municipal sewer system to several neighborhoods where it had been determined to be a net environmental benefit, the Town has reached its flow capacity at the WWTP. Over the past several years, the Town has undertaken an extensive technical review of options to increase its ability to treat wastewater through a centralized of sub-regional treatment system, where necessary. This review has subsequently led to a detailed evaluation of options for treatment which have been captured within an in-depth wastewater capacity alternatives analysis.

In addition to treatment system expansion alternatives, the Town has continued to invest considerable amount of resources into an inflow/infiltration (I/I) reduction program, an exemplary groundwater recharge program which has been designed to capture stormwater from new developments (which includes an evaluation for enhanced recharge through existing sites), and one of the more comprehensive water conservation efforts in the state[1]. Our conservation program was developed by a full-time conservation coordinator and includes demand management incentives for both residential and commercial customers. One notable measure of success is our Residential Gallons Per Capita Day level of 63 gpdpc, which is above the stated adopted performance standard of 65 gpdpc.

Ultimately, as communicated directly to your staff prior to the issuance of this draft permit, the Town continues to believe that it would be best served if the permitting of our wastewater needs could be integrated with other regulated water resource management programs. While Concord regrets that EPA's permitting schedule cannot be modified to allow for such an approach, we are encouraged that our interest has at least been acknowledged in the Fact Sheet.

RESPONSE TO OPENING COMMENT:

EPA acknowledges the comment and commends Concord's commitment to stewardship of its water resources. Responses to specific comments are provided below.

Comments Regarding Permit Conditions

The Town has three significant areas for comments and several other comments about the conditions in the draft permit. The major comments are:

COMMENT A1:

1. Flow Limits: Concord has been actively engaged in wastewater planning activities which will supplement our Comprehensive Wastewater Management Plan, certified by DEP back in 2004. As part of these efforts, an Integrated Planning Initiative, completed in early 2009, concluded that an additional flow of 320,000 gallons per day was necessary to meet existing wastewater requirements resulting from development and re-development under current zoning. Projected wastewater flows associated with objectives referenced in Concord's 2005 Comprehensive Long Range Plan and 2004 Planned Production Housing Plan and quantified in the a February 2009 report by the Wastewater Planning Task Force Report [*sic*] would require additional treatment capacity of 600,000 gpd. The Wastewater Planning Task Force (convened at the direction of Concord Board of Selectmen), subsequently presented these findings to the 2009 Annual Town meeting where they received strong community support. More information and documents are available at:
http://www.concordma.gov/pages/ConcordMA_BComm/Wastewater%20Task%20Force

[1] MA DEP Water Conservation Award Winner 2008 & 2010

The wastewater needs identified above led to comprehensive planning activities that have focused on the identification of alternatives for creating additional wastewater capacity. Despite the complementary efforts placed on wastewater flow mitigation via water conservation and infiltration/inflow programs noted above, it has become increasingly evident that additional capacity at the Concord municipal WWTF is needed. Review of the options for effluent disposal includes possible groundwater discharge to supplement the WWTF surface water discharge. The town has been working towards evaluating a possible groundwater disposal site adjacent to the existing WWTF. As we continue to explore opportunities associated with each wastewater capacity alternative evaluated, it is clear that an increase in the effluent discharge capacity under the WWTF surface water discharge permit may be the most viable alternative available.

The effluent flow limit of 1.2 MGD annual average included within this draft permit has already placed constraints on the development and re-development opportunities within the Town of Concord. The Town understands that a formal request for a flow increase will require a future modification to the permit and will be initiated via a notice of project change to be via the Massachusetts EOEEA-MEPA office.

RESPONSE A1:

The commenter is correct that a flow increase will require a modification to the permit and a Notice of Project Change through MEPA. Authorizing an increased flow in a permit is not a simple process.

First, EPA will not process an NPDES permit authorizing an increased discharge from a POTW until the Commonwealth has approved a comprehensive wastewater management plan that justifies the flow increase. The permit authorizing the increase must then include limits that attain water quality standards, including antidegradation requirements. The difficulty of satisfying these requirements for a receiving water that is already listed as impaired and is effluent-dominated during low flow periods, should not be underestimated.

EPA does not necessarily agree with the claim that development cannot move forward without additional wastewater capacity. It may be possible to plan developments that generate little to no offsite wastewater flow, using water reuse technology. Wrentham Outlet Mall and Gillette Stadium are two examples of successful commercial developments where no expansion of point source discharges were necessary. In each case, an on-site wastewater treatment plant generates water for reuse in toilet flushing and other non-potable uses. While the appropriate wastewater system will vary by site, these are two examples of how onsite wastewater treatment and reuse can be integrated into commercial development.

Furthermore, EPA encourages the Town of Concord to consider cluster sewer treatment plants to recharge headwater streams, which might also be less expensive when costs to extend the central sewer system are considered. This alternative is identified as 4.3.1 in the Concord Wastewater Planning Task Force Summary Report. The Town of Littleton

is using this strategy in its "smart sewering" plan. We encourage Concord to consider these techniques when expanding the sewer system.

Also, the report seems to discount the benefits of further infiltration/inflow (I/I) reduction and water conservation. The Comprehensive Wastewater Management Plan (CWMP) recommended the removal of 98,000 gallons of I/I to compensate for higher flows from the sewer system, which have not yet been completed. In 2007, however, the Town concluded that only 20,000 to 45,000 gpd of I/I could be cost-effectively removed.

Review of the flow monitoring data submitted by the Town that was included in the draft permit fact sheet shows that the lowest monthly average flow to the plant was 0.67 MGD, in July 2010. This compares to an overall average flow of 1.06 MGD. Assuming that the lowest flow is indicative of the sewage base flow, this would mean that on average the flow to the plant includes 0.387 MGD of I/I. This is not an insignificant amount. The removal of I/I is part of proper collection system maintenance and should not be done solely on the basis of cost-effectiveness. I/I deprives headwater streams of baseflow, adding to the effect of drinking water withdrawals. It requires additional chemical and energy usage by wastewater treatment facilities. The Town of Concord expresses concerns about energy and chemical usage in its comments on the draft permit (see Comment A7), so surely it is aware that it is expending energy on treating I/I, which is approximately 20% of base flow to the WWTP.

In conclusion, EPA believes that Concord may be able to find capacity for its development plans without a flow increase through further I/I reduction, cluster sewering, further water conservation, and innovative on-site technologies. Concord can meet its wastewater needs without further degradation to headwater streams and the Concord River.

COMMENT A2:

2. Phosphorus limits: The Town is pleased to see no change in the Total Phosphorus (TP) limit for the summer and winter seasons. For the record

a. Since the design and construction of the state of the art CoMag process placed on line in February of 2008, the WWTF has consistently met permit limits for TP.
b. The fact sheet for the draft permit shows that, even at very low flow (7Q10) conditions, the WWTF (even if discharging right at the permit limits) raises the instream concentration of phosphorus in the Concord River only minimally (from 45 μg/L to 53 μg/L) and the resulting concentration is well below EPA's Gold Book criterion of 100 μg/L. Therefore, the WWTF is not causing or contributing to any phosphorus-related impairment.
c. Moreover, as the Fact Sheet notes, Concord's summer TP limit of 0.2 mg/L represents highest and best practicable treatment (i.e. limit of technology) for POTWs.
d. The Town is pleased to see that the orthophosphate monitoring requirement has been removed from the permit. This is appropriate, given the TP (of which orthophosphate is a subset) is consistently below the permit limit.

RESPONSE A2:

The comment is noted for the record. EPA would like to clarify, however, that while a monthly average limit of 0.2 mg/L has been used by MassDEP to define its "highest and best" requirements in 314 CMR 4.05(5)(c) for POTWs, treatment technologies are available that routinely achieve more stringent limits. EPA has determined that in this case, more stringent limits are not required to achieve water quality standards.

COMMENT A3:

3. Aluminum Limit: The aluminum limit for total aluminum at 306 µg/L average monthly is troublesome and incorrectly applied for several reasons:

a. The effluent taken from the WWTP consistently passes its effluent toxicity tests with no acute or chronic toxicity.

RESPONSE A3:

When determining reasonable potential for a discharge to cause or contribute to an excursion from water quality standards, EPA uses three approaches: biological assessment, chemical-specific criteria, and whole effluent toxicity testing.
With the advent of different ways of assessing the health of aquatic systems comes the possibility of conflicting results. To address such conflicts, EPA developed the policy of independent application. Independent application states that where different types of monitoring data are available for assessment of whether a water body is attaining aquatic life uses or for identifying the potential of pollution sources to cause or contribute to non-attainment of aquatic life uses, any one assessment is sufficient to identify an existing or potential impact/impairment, and **no one assessment can be used to override a finding of existing or potential impact or impairment based on another assessment.**[2]

Since each type of criteria (biological criteria, chemical-specific criteria, or whole-effluent toxicity evaluations) has different sensitivities and purposes, a criterion may fail to detect real impairments when used alone. As a result, these methods are used together in an integrated water quality assessment, each providing an independent evaluation of nonattainment of a designated use.

If any one type of criteria indicates impairment of the surface water, regulatory action can be taken to improve water quality. However, no one type of criteria can be used to confirm attainment of a use if another form of criteria indicates nonattainment. When these three methods are used together, they provide a powerful, integrated, and effective foundation for waterbody management and regulations.

For example, whole effluent toxicity (WET) tests are intended to measure toxicity on specific organisms from unknown toxins or synergistic toxicity between two or more

[2] EPA's Technical Support Document for Water Quality-Based Toxics Control, March 1991, EPA/505/2-90-001, Responsiveness Summary, page 2.

toxins. WET tests are not designed to measure the toxic effect of each toxin on organisms most sensitive to that pollutant, so are intended to be used in conjunction with chemical-specific criteria, which are intended to protect organisms sensitive to that chemical.

The aluminum criteria and limit in the draft permit were determined from analysis of the instream and effluent data provided by the Town of Concord, using the MassDEP numeric criteria specified in 314 CMR 4.05(5)(e). EPA is required to include numeric water quality-based limits for pollutants where the discharge has the reasonable potential to cause or contribute to an excursion above any State water quality standard (40 CFR 122.44 (d)). Compliance with whole effluent toxicity limits does not support removal of chemical-specific limits necessary to attain a State water quality criterion.

Regarding the WET test results submitted by the Town, the facility does routinely achieve its acute whole effluent toxicity limit (the permit does not include a chronic limit but does require chronic testing). However, during the period from March 2011 – March 2012 the measured Chronic-NOEC was 50, 100, 25, and 50 percent effluent, demonstrating some chronic toxicity. The cause of this toxicity was not identified.

Also, please note that review of the 7Q10 calculations done in response to Comment No. C7 resulted in a slightly lower 7Q10 and therefore a lower aluminum limit. The calculations for the revised 7Q10 and the new aluminum limit can be found in Fact Sheet Appendix A.

COMMENT A4:

b. The aluminum criteria upon which the limit is based introduces numerous scientific questions as to its applicability to Massachusetts waters. Most notably, the criteria document published by USEPA (National Recommended Water Quality Criteria: 2002, EPA-822-R-02-47) notes the chronic criterion for aluminum at 87 μg/L "is based on a toxicity test with the striped bass in water with pH 6.5-6.6 and hardness <10 mg/L. Data….indicate that aluminum is substantially less toxic at higher pH and hardness." These conditions are not representative of the ambient conditions for the Concord River – See e.g. monitoring results available at http://www.oars3rivers.org/river/waterquality/reports.

RESPONSE A4:

EPA is required to use approved state water quality standards in establishing water quality-based effluent limits in NPDES permits. The State of Massachusetts' Water Quality Standards require that effluent limitations for metals be based upon the criteria published in the National Recommended Water Quality Criteria: 2002 (USEPA 2002 [EPA-822-R-02-047]), unless site-specific criteria are established or MassDEP determines that natural background concentrations are higher than the criteria (314 CMR § 4.05(5)(e)).

The specific comments about the applicability of the water quality criteria are potentially valid in the setting of a water quality criteria revision, which is currently ongoing at MassDEP with assistance from certain municipalities. However, as discussed above, in the context of a permit reissuance, EPA is required to use the water quality criteria currently approved by the state to set permit limits.

EPA would note, however, that the striped bass was not the only sensitive species cited in the aluminum criteria document. Rainbow trout shows an increased ventilation rate at 75 µg/L aluminum concentration, and brook trout experiences reduced behavior at an aluminum concentration of 238 µg/L, at pH 7.3 to 7.8. Finally, goldfish larvae experienced significant death and deformation at 150 µg/L aluminum concentration, an effect that occurred with pH 7.4 and hardness of 150 mg/L.

COMMENT A5:

c. The aluminum calculations used to determine "reasonable [risk] potential" (Fact Sheet Appendix C) included all aluminum effluent data, not those obtained during the low flow periods when the proposed mixing calculation was conducted. The review of the data clearly shows that effluent aluminum concentrations are higher in the winter, when instream flows are much higher than during the critical low flow summer period. The Town requests that USEPA recalculate the "reasonable [risk] potential" during the months of May to October using effluent data from those time periods,

RESPONSE A5:

Because the instream aluminum concentration (75 µg/L) is relatively close to the water quality criterion (87 µg/L), there is very little assimilative capacity in the Concord River to dilute the discharge. EPA examined the relationship between background aluminum levels and streamflow at USGS Gage 01099500 (Concord River at Lowell) to determine if the background level used to calculate the permit limit is representative of 7Q10 conditions. As the chart below shows, none of the data was collected at 7Q10 flow (28 cfs), and there is only a weak correlation between streamflow and background aluminum concentrations. At the lowest streamflow, 54 cubic feet per second (cfs), the background aluminum concentration was 73 µg/L, close to the value (75 µg/L) used in the reasonable potential analysis in the draft permit.

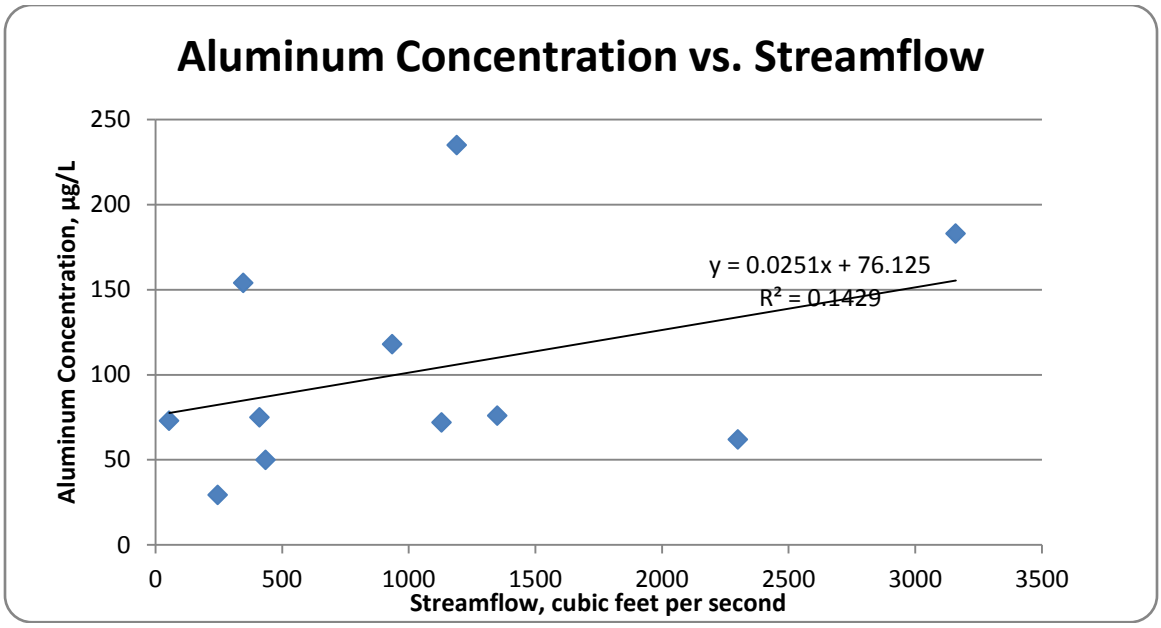

Table 1. Comparison of Background Aluminum Concentration and Streamflow.

Date	Concentration, µg/L	Streamflow, cfs
3/10/2008	183	3160
6/18/2008	154	347
9/8/2008	235	1190
12/8/2008	118	935
3/18/2009	76	1350
6/10/2009	29.4	246
9/14/2009	50*	435
12/7/2009	72	1130
3/8/2010	62	2300
6/7/2010	75	411
9/13/2010	73	54
12/13/2010	565**	253
Average	141.0	
Median	75.5	

*concentration originally non-detect (<100 µg/L). Value changed to ½ detection level for this analysis.
**outlier; excluded from chart.

As the calculation below shows, the maximum projected effluent concentration would have to be 255 µg/L or less for there to be no reasonable potential to cause or contribute to an exceedance of the water quality criteria. The levels of aluminum reported in the Concord WWTF discharge are consistently above this amount.

Effluent Concentration Necessary to Cause Reasonable Potential

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r	=	Concentration below outfall	=	87 µg/L
Q_d	=	Discharge flow	=	1.2 MGD
Q_s	=	Upstream flow	=	16.8 MGD
C_s	=	Upstream concentration	=	75 µg/l
Q_r	=	Streamflow below outfall	=	18 MGD (effluent + upstream)

Therefore,

$$C_d = (Q_sC_s - Q_rC_r)/Q_d$$

$$C_d = \frac{(18\ \text{MGD} \times 87\ \mu g/l) - (16.8\ \text{MGD} \times 75\ \mu g/l)}{1.2\ \text{MGD}}$$

$$= \mathbf{255\ \mu g/l}$$

As the table below shows, 88% of the May – October 2009-2011 effluent data cited by the commenter exceeds this concentration. The 95th percentile concentration of this data is 1,428 µg/L. Although this value is indeed lower than the projected 95th percentile value (2,720 µg/L) of all data used to determine reasonable potential in the draft permit, it still indicates a reasonable potential for the discharge to cause or contribute to an excursion from water quality standards for aluminum.

Table 1. Concord WWTF Aluminum Effluent Monthly Data (highlighted values exceed 255 µg/L)

Date	Conc. (µg/L)	Date	Conc. (µg/L)	Date	Conc. (µg/L)
05/31/2009	737.	05/31/2010	893.	05/31/2011	781.
06/30/2009	375.	06/30/2010	662.	06/30/2011	599.
07/31/2009	598.	07/31/2010	329.	07/31/2011	407.
08/31/2009	415.	08/31/2010	1280.	08/31/2011	465.
09/30/2009	625.	09/30/2010	1210.	09/30/2011	87.
10/31/2009	283.	10/31/2010	191.	10/31/2011	179.

Because there is demonstrated reasonable potential for the discharge to cause or contribute to an exceedance of water quality criteria in the Concord River, no changes have been made to the aluminum limit as a result of this comment.

COMMENT A6:

d. The Town understands that the MassDEP and others are currently evaluating aluminum criteria for Massachusetts' waters and such a project will likely result in developing new, less restrictive criteria. The Town feels that it is premature and unreasonable to include a limit in this permit based upon a criteria value that is very likely to be changed.

RESPONSE A6:

We are aware that MassDEP is considering developing site-specific aluminum criteria. If MassDEP were to propose, and EPA approve, less stringent criteria, these would be the basis for future limits.

Until such time, the acute and chronic criteria adopted by MassDEP into its water quality standards and approved by EPA must be used as the basis for the effluent limitations. EPA must limit pollutants that have the reasonable potential to cause or contribute to exceedances of those water quality standards. As shown elsewhere in this response and in the fact sheet, EPA has determined that the discharge of aluminum from the facility has reasonable potential to cause or contribute to a violation of water quality standards in the Concord River.

COMMENT A7:

e. Not only will an aluminum limit result in increased and needless operating cost, it will require the Town to use more chemicals, produce more sludge, utilize more electricity, and increase its "carbon footprint" all for the purpose of meeting a flawed water quality criteria value.

RESPONSE A7:

We are supportive of Concord's efforts to operate in the most environmentally sustainable manner necessary to meet the effluent limits. These considerations, however, come into play in selection of the appropriate treatment technologies and operational procedures – not in setting water quality-based effluent limits. Cost and technological considerations are not factors in establishing water quality-based limits.

The commenter claims that an aluminum limit will cause the Town to use more chemicals and produce more sludge, a statement that cannot be independently verified by EPA. Regardless, the most cost-effective and environmentally sustainable method of achieving effluent limits while managing sludge should be carefully considered as part of an updated CWMP. There are treatment processes that can be pursued that minimize the need for chemical addition and/or minimize the chemicals in the discharge and the sludge. For example, polyaluminum chloride (PAC) may be used instead of or in conjunction with alum to reduce sludge volume and effluent aluminum concentrations while still meeting phosphorus limits.

Regarding the carbon footprint of the Town's wastewater treatment operations, we believe it is important to examine energy efficiency holistically, across a utility's management and operations. One opportunity for gains in energy efficiency at Concord WWTF is through control of flows to the treatment facility. Concord has reduced its I/I significantly in recent years. The Town estimates that 0.3 MGD, or 24% of total influent flow, is inflow/infiltration. *See* NPDES Permit Application. We commend Concord on reducing the percent of flow from I/I to 24%, which is less than many POTWs. Nevertheless, pumping and treating extraneous flow is still a very energy-intensive process. A more aggressive infiltration/inflow control program could be an important component of an overall plan to reduce energy consumption. Concord has made significant progress in I/I removal, and it can continue to be a leader in this area and push for further I/I reductions.

EPA is very supportive of efforts to reduce power use and associated costs at wastewater treatment facilities. Energy is the largest expense for many facilities and one of the top three expenses at almost all of them. Reducing the amount of energy these facilities use without compromising the quality of treatment, results in both lower public expenditure money and greater overall environmental protection.

Through an energy management plan that sets goals for energy efficiency and optimizes the use of renewable sources of energy, the impacts of conventional energy use can be mitigated. A holistic plan could consider equipment choices, HVAC, lighting, vehicle use, methane capture, energy generation from microturbines, wind or solar, and the purchase of energy from renewable sources. To address this issue, EPA New England has produced an energy management guidebook[3] to help utilities set measurable energy goals, manage energy issues and reduce consumption.

COMMENT A8:

f. The Town views this permitting approach to be inconsistent with USEPA's "sustainability" mission and believes the effluent limit should not be included in the final permit.

RESPONSE A8:

Wastewater infrastructure sustainability is a concept that EPA supports and that the Town should embrace – not simply in evaluation of treatment to meet the new limits, but also across management and operations of the entire system. Sustainability arguments are not, however, part of the statutory and regulatory requirements for setting water quality-based effluent limitations.

Through their water quality standards, states determine the level of protection needed for receiving waters. Where EPA (or other permitting authorities) concludes there is a

[3] Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities http://water.epa.gov/infrastructure/sustain/upload/Final-Energy-Management-Guidebook.pdf

reasonable potential that a discharge will cause or contribute to a violation of the standards, EPA must then set an effluent limit necessary to ensure the standards are met. *See* 40 CFR §122.44(d)(1)(i). Costs and technical considerations are not considered at this point in the process of establishing water quality-based effluent limits. Once these limits are established and set forth in a final permit, however, the regulations include a mechanism[4] to allow relief from meeting the limits where they are demonstrated to be unaffordable. Under certain circumstances, permittees can conduct an analysis of affordability issues for the purposes of determining whether a designated use cannot be obtained or for obtaining a variance under the Water Quality Standards.

COMMENT A9:

4. Collection System Mapping and Operations and Maintenance Plans: The collection system mapping (page 7) and operation and maintenance plan (pages 7-8) are too prescriptive in format and introduce a significant level of effort and paperwork. These conditions also expand greatly upon what could be reasonably be considered NPDES authority. The Town has a robust mapping system of its sewer collection system and has regular operation and maintenance procedures in place. The Town acknowledges the value of such a system but feels the requirements outlined in the draft permit and the annual reporting are too detailed and are prescribing elements of a program that are not necessary in a NPDES permit. The Town recommends and requests the following actions be taken with respect to these plans:

a. The permit language should be significantly modified to include a more general requirement for proper mapping and an operation and maintenance plan. For example, the statement "Such map(s) shall include, but not be limited to the following" should be stricken as it imposes a subjective and unattainable limit for compliance
b. The requirement for a submittal of an annual report should be stricken.

RESPONSE A9:

The Operations and Maintenance requirements included in the draft permit are intended to minimize the occurrence of permit violations that have a reasonable likelihood of adversely affecting human health or the environment. The elements of the O&M plan in the draft permit are reasonable and are now being included as standard requirements in NPDES permits for POTWs in both NH and MA. Smaller towns with fewer financial resources than the Town of Concord have complied with the O&M plan.

As mentioned in the fact sheet Section IV. Operation and Maintenance, the Concord WWTF is a Publicly Owned Treatment Works (POTW) as defined at 40 C.F.R. § 403.3. This definition also includes sewers, pipes, and other conveyances that convey wastewater to a POTW treatment plant. Conditions applicable to all permits include the regulation of proper operation and maintenance (see 40 C.F.R. § 122.41(e)). This

[4] This mechanism is commonly referred to as a compliance schedule. It is noted that Concord has neither claimed that meeting the aluminum limits are unaffordable, nor requested a compliance schedule to allow more time for compliance. Therefore EPA is not offering a compliance schedule for the aluminum effluent limit.

regulation requires that "the permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit." The treatment plant and collection system are included in the definition "facilities and systems of treatment and control" and are therefore subject to proper operation and maintenance requirements. The General requirements for proper operation and maintenance, and mitigation are typically found in Part II, Standard Conditions. Recently, EPA has included the specific permit conditions found in Parts I.C, I.D, and I.E in all reissued municipal permits as reasonable and logical practices that will ensure "proper operation and maintenance."

If a permittee submits information showing that despite its best efforts it is unable to complete the required sewer system mapping within the specified period, EPA may allow a reasonable extension of the schedule.

The commenter does not specify which of the requirements in the Collection System mapping requirements are "subjective and unattainable." The items listed in Section I.C.4., such as manhole identifications, flow direction, and location of pump stations are basic attributes of the collection system of which operators should be aware. The statement in the draft permit that "[s]uch map(s) shall include, but not be limited to the following:" merely allows municipalities to add extra features to the map that will assist them in operating and maintaining their sewer systems. EPA cannot anticipate what these features will be for each town, therefore the above language allows municipalities to add information to their maps as necessary, even if the information is not specifically included in the mapping requirements.

With regard to the annual report requirement, this is a typical requirement for permittees that operate collection systems in Massachusetts and New Hampshire. The commenter has not cited any unique circumstances that merit an exemption from this requirement; therefore, the annual reporting requirement remains unchanged.

COMMENT A10:

c. Whole Effluent Toxicity: The whole effluent toxicity (WET) limits (LC50 >/= 100%) and "report" C-NOEC) should be set with recognition of the fact that the Concord facility has a long record of no toxicity events (see data presented in the Fact Sheet). The one acute toxicity excursion seems to be an anomaly as there was not corresponding chronic toxicity identified. Based on this history, the town believes is more than justified to requests the following:

i. WET testing requirements be reduced to 2 times per year for acute toxicity only.

RESPONSE A10:

In establishing WET test monitoring frequency and limits, EPA looks to the Massachusetts Toxics Policy (the Policy). For discharges with dilution factors between 10 and 20, the Policy recommends an LC50 limit of >100% effluent, chronic toxicity

monitoring, and a testing frequency of 4 times per year with 2 species. Concord WWTP, with a dilution factor of 19, belongs in this category.

The Concord WWTP's WET test requirements generally mirror the Policy, except EPA and MassDEP have authorized a reduction in the number of species from two to one, *Ceriodaphnia dubia*. The table below summarizes the WET test results for the months of March 2008 through March 2012. As can be seen, 16 of the 17 test results were an LC50 of 100% or greater. During that time, the chronic C-NOEC has ranged from 25% to 100% effluent. Contrary to the comment, the acute toxicity that occurred in March 2008 does not appear to be an anomaly, as the C-NOEC for that test was 12.5% effluent.

Table 2. Concord WWTF WET test performance March 2008 – March 2012

Date	Acute LC50	C-NOEC
03/31/2008	60.2	12.5
06/30/2008	100.	100.
09/30/2008	100.	100.
12/31/2008	100.	100.
03/31/2009	100.	100.
06/30/2009	100.	100.
09/30/2009	100.	100.
12/31/2009	100.	100.
03/31/2010	100.	100.
06/30/2010	100.	100.
09/30/2010	100.	100.
12/31/2010	100.	100.
03/31/2011	100.	50.
06/30/2011	100.	100.
09/30/2011	100.	50.
12/31/2011	100.	25.
03/31/2012	100.	50.

However, Concord has met its acute toxicity limits for four years, or 16 straight tests. Given the record of compliance, EPA has decided to reduce WET test requirements to twice per year. Concord must conduct two chronic and acute WET tests per year; one in the month of March, and one in the month of September, using *Ceriodaphnia dubia*.

It should also be noted that the final permit requires separate acute and chronic toxicity tests in accordance with recent changes in EPA New England practice. The modified acute toxicity test in the current permit, which is conducted as part of the chronic toxicity test, is not an approved method under 40 CFR Part 136. As of March 2013 the modified acute testing requirement is being replaced by a stand-alone acute toxicity test. The acute toxicity testing protocol is Attachment A to the final permit.

COMMENT A11:

ii. The required "second week of month" testing constraint be changed to any time within each designated month as the Town understands that the MassDEP has

received numerous such requests regarding toxicity testing from those laboratories that perform this work as it would eliminate a significant imbalance in their workload. The Town understands that MassDEP is not opposed to only designating the months for testing.

RESPONSE A11:

The requirement for taking toxicity test samples in the second week of the month has been removed; however, in accordance with footnote 3 of the final permit, WET test sampling must occur the same week each March and September.

COMMENT A12:

d. Dissolved oxygen: The WWTF has had many years of consistent compliance with Dissolved Oxygen (DO). It is observed that the DO in the effluent is, at times, higher than the receiving water. It is therefore requested that the permit reflect a decrease in DO monitoring from once per day to once per week.

RESPONSE A12:

Since April of 2009, Concord WWTF's effluent dissolved oxygen has ranged from 7.6 mg/l to 10.8 mg/L, with an average of 9.0 mg/L. Because the Concord WWTF has met its dissolved oxygen limit (>5.0 mg/L) for the last 72 months, the dissolved oxygen monitoring frequency will be reduced to once per week. Also, the date range for the dissolved oxygen limit in the draft permit, which was added in error, has been removed. The dissolved oxygen must be at least 5.0 mg/L year-round, which is the limit in the current permit.

COMMENT A13:

e. Di(2-Ethylhexyl) Phthalate (DEHP): The Town understands that the Concord River is used as a public water supply by the Town of Billerica. We also recognize that like other Class B rivers in Massachusetts used for water supply with treatment, such protection has been afforded Class B standard waters for many years. While it is plausible that the inclusion of DEHP has been added because of this, it is noted that DEHP is a chemical found in the plastic pipes which are commonly used in water supply, sewer collection, and storm water as well. Trace-levels of DEHP, similar to the level detected in the Town's effluent, are universally detected. The Town has no industries which could discharge DEHP in the effluent. Hence, its origins are most likely traced to the newer plastic sewer mains and services only. As there are no conventional treatment technologies available which could provide effective treatment, the Town requests that the monitoring requirement of DEHP be removed from the permit. If not eliminated, the monitoring should be reduced with an "opt-out" provision if such monitoring provides no value.

RESPONSE A13:

The draft permit does not require the Town to remove DEHP from its effluent, only to monitor for it on a quarterly basis.

It is possible that EPA will set an effluent limit for DEHP in the future, if data shows that the discharge has the reasonable potential to cause or contribute to an exceedance of water quality standards. In the case of a water quality-based limit, feasibility of treatment is not a factor that the CWA allows permitting authorities to consider.

While there is not yet sufficient data to require an effluent limit for DEHP in Concord's permit, monitoring data submitted in the reapplication indicates it is present in quantities that exceed the human health criteria before dilution in the receiving water. Given that there is a drinking water source downstream, there is ample justification for the monitoring requirement. Regardless of whether it is feasible to remove this chemical from the discharge, more data on the discharge of this chemical will supply important information to the Town of Billerica and to the agencies that manage the Concord River.

The Town should be aware that stringent QA/QC controls should be exercised in conducting DEHP sampling and analyses. It is possible that plastics used in sampling or analyses have skewed previous sampling results.

COMMENT A14:

f. pH: The Town agrees with the pH range as provided for within the draft permit. Specifically, the lower limit of 6.0 SU acknowledges natural dilution from the Concord River which is more environmentally advantageous than requiring the unnecessary introduction of additional chemical treatment.

RESPONSE A14:

See Comment C6 and Response C6. After receiving a comment about the lower pH limit from OARS, EPA examined the available pH data more closely and found that upstream receiving water tests conducted in conjunction with WET tests occasionally measured pH values less than the water quality standard of minimum pH of 6.5, meaning that dilution cannot be used in establishing the effluent limit. Furthermore, the river often has low alkalinity, or acid buffering capacity, in the winter months, meaning that the river has little ability maintain a neutral pH in response to an acidic discharge.

Therefore, EPA has changed the minimum pH value from 6.0 to 6.5, until the Town performs testing that demonstrates that the effluent has no reasonable potential to cause or contribute to an excursion from the pH water quality standards.

COMMENT A15:

g. Reporting Format: The Town is confused about the reporting requirements (page 12) in section c which still require submittal of hard copies even though the permit previously

states that "…it will no longer be required to submit hard copies…." The Town requests a clarification of these reporting requirements in the final permit.

RESPONSE A15:

The permit requires that hard copies of the Whole Effluent Toxicity Reports be submitted to MassDEP. This is because MassDEP does not yet have the capability to view scanned copies of WET test reports on the EPA database.

COMMENT A16:

Industrial Users: The Town would like to note that it will in the near future be receiving flow from an industrial user (Welch's fruit juice), and it will properly be permitted by the Town (page 5).

RESPONSE A16:

Comment noted for the record. In allowing an industrial user, the Town should be aware of Sections I.A.2. and I.A.3. of the permit. Section I.A.2. requires that permittees give the EPA "adequate notice" of introduction of pollutants by an indirect discharger, including quantity and quality of introduced flow and the potential for the flow to affect the POTW. Section I.A.3. prohibits the discharge of pollutants to a POTW that will pass through or interfere with the treatment works.

COMMENT A17:

Aluminum: The Town notes in the discussion of TMDLs that there is no 303d listing or need for a TMDL for aluminum as MassDEP has not found aluminum to be a problem in the Concord River.

RESPONSE A17:

As noted by the commenter, the Concord River is not listed on the 2010 303(d) list for aluminum. Whether or not the water segment is included on the 303(d) list for a particular pollutant, effluent limitations must be included for that pollutant if it is shown to have the reasonable potential to cause or contribute to exceedances of water quality standards. EPA and MassDEP have included limitations for aluminum in this permit based on such a determination.

COMMENT A18:

The reasonable potential for aluminum should be re-calculated using effluent values for the months of May-October, and those results should be used in the low flow analysis. The effluent data (Fact Sheet Appendix A) shows wide differences in effluent levels with lower values present during low flow, river conditions.

RESPONSE A18:

See Response A5.

COMMENT A19:

The Town appreciates USEPA's acknowledgement of its interest in exploring planning and permitting opportunities as they relate to an integrated water resource management model. Specifically one which leverages future investment and management tools required to operate and maintain essential drinking water, wastewater, and stormwater systems. The Town feels it would be appropriate to complete that process before finalizing this permit and hopes that USEPA will use discretion and reasonableness in carrying out the guidelines in the strategy that "permit issuance…shall not be delayed while the integrated plan is being developed," as this approach will likely take away any incentive to undertake such an integrated approach.

RESPONSE A19:

EPA does not agree that it would be appropriate to complete the integrated planning process before finalizing the permit. The Clean Water Act and EPA's regulations provide for the reissuance of permits on a regular basis so that permit terms are revisited and reviewed rather than left unexamined and unchanged for long periods of time. *See* 33USC §§ 1342(a)(3) and (b)(1)(B), and 40 C.F.R. § 122.46(a). This regular and periodic review supports the CWA's goal of restoring and maintaining the chemical, physical and biological integrity of the Nation's waters. As quoted in the comment, EPA's *Integrated Municipal Stormwater and Wastewater Planning Approach Framework*. (EPA Office of Water and Office of Enforcement and Compliance Assurance. June 5, 2012) specifically discourages delaying NPDES permit issuance due to integrated planning.

We also do not agree that issuing this permit should remove the Town's incentive to undertake an integrated approach. EPA remains open to new information that may support a future modification of the permit, if justified, and also remains open to discussing schedules of compliance that prioritize environmental projects in the most logical and effective manner.

<u>Comments on the Fact Sheet:</u>

COMMENT A20:

a. Industrial Users: The Town would like to note that it will in the near future be receiving flow from an industrial user (Welch's fruit juice) and it will be properly permitted by the Town (page 5).

RESPONSE A20:

Comment noted for the record. As discussed in Response A16, the Town should be aware of sections of the permit that require POTWs to notify EPA of new industrial flow and that prohibit interference and pass-through.

COMMENT A21:

b. Aluminum: The Town notes in the discussion of TMDLs that there is no 303d listing or need for a TMDL for aluminum as MassDEP has not found aluminum to be a problem in the Concord River (page 8).

RESPONSE A21:

See Response A17.

COMMENT A22:

c. The reasonable potential for aluminum should be re-calculated using effluent values for the months May-October, and those results should be used in the low flow analysis. The effluent data (Fact Sheet Appendix A) shows wide differences in effluent levels with lower values present during lower value present during low flow river conditions.

RESPONSE A22:

See Response A5.

COMMENT A23:

d. The Town appreciates USEPA's acknowledgement of its interest in exploring planning and permitting opportunities as they relate to an integrated water resource management model. Specifically one which leverages future investment and management tools required to operate and maintain essential drinking water, wastewater and stormwater systems. The Town feels it would be appropriate to complete that process before finalizing this permit and hopes the USEPA will use discretion and reasonableness in carrying out the guideline in the strategy that "…permit issuance…shall not be delayed while the integrated plan is being developed…" as this approach will likely take away any incentive to undertake such an innovative approach.

RESPONSE A23:

See Response A19.

COMMENT A24:

The Town has invested significant resources in its wastewater system and in its future planning needs analysis and feels some of the draft permit conditions are not in concert

with its efforts for a sustainable future. The Town requests that USEPA take these comments seriously and make appropriate changes to the final permit conditions in the draft permit (particularly aluminum).

RESPONSE A24:

We believe that the limitations included in the final permit are necessary to meet the requirements of the Clean Water Act and State Water Quality Standards. With regards to aluminum, EPA has an obligation under the CWA to ensure attainment of state water quality standards. The Region's decision to move forward with an effluent limit for aluminum at this time is consistent with the CWA and EPA regulations.

2. COMMENTS FROM THE CONCORD BUSINESS PARTNERSHIP

COMMENT B1:

The Concord Business Partnership is a group of commercial property and business owners in Concord, many of whom are elected, appointed, or volunteer members of committees and boards in Town. All have a deep interest in the well being of our community. Our membership includes current and past members of the Board of Selectmen, Finance Committee, Natural Resources, Board of Assessors, and many others who volunteer on committees through the town. The group was formed over 20 years ago, and still has many of its original members. The Board of Directors of the Partnership has reviewed the draft NPDES permit issued to the Town of Concord for the wastewater treatment plant (WWTP) and offers the following comments.

Over the past decade, we have become increasingly aware of wastewater management challenges facing the Town of Concord. The Town Manager and Wastewater Planning Task Force have kept us informed of more notable wastewater system improvements including a recent overhaul of our municipal wastewater treatment plant (at a cost of $15 million dollars) as well treatment capacity constraints which have affected residents and businesses alike. In this demanding economic climate, this constraint represents one more challenge for businesses that are attempting to expand and improve upon the service that they provide.

Many of our members, including owners of neighborhood restaurants, bakeries, and retail shops as well as larger commercial and regional establishments have already been impacted by the wastewater treatment capacity constraints realized within Concord. Many have had to modify business plans and pay significant fees when attempting to expand service resulting in economic hardships and significant planning challenges. We have come to learn of the delicate balance that the community has been asked to establish between environmental protection and socioeconomic interests. It is not lost on us that we live and work in this community, in part, because of its environmental stewardship.

Notwithstanding, we are aware that with the introduction of each new NPDES permit issued, the Town has been asked to, and has for the most part accommodated, increasingly stringent water quality improvements. Ironically, we have also learned that

the permitted treatment capacity allowance has not been increased since the mid 1980s. It is our understanding that, as rate payers, we continue to fund significant efforts associated with inflow and infiltration mitigation. Water conservation rates have also been imposed on all of our members for the purpose of providing an incentive to conserve water.

At this time, we believe it imperative that you consider the merits of allowing the Town to expand the amount of wastewater which could be treated at the existing wastewater treatment facility. We are confident that this could be done in a manner which could maintain the delicate balance between environmental protection and economic development. Furthermore, we urge you to base the decisions of the EPA relative to the inclusion of additional or more stringent permit limits on sound science based on well substantiated facts and data. We trust that our interest has been appropriately registered and appreciate your consideration of this request.

RESPONSE B1:

EPA recognizes and commends the steps taken by the Town of Concord and its ratepayers to invest in the construction of the new advanced wastewater treatment facility, which incorporates technological advances into its design that will provide for a greater degree of wastewater treatment and environmental protection.

Irrespective of all other factors, EPA is required to include any limitations and conditions in NPDES discharge permits in addition to or more stringent than technology-based limits that are necessary to achieve state water quality standards in the receiving water, including narrative criteria for water quality (CWA Section 301(b)(1)(C) and 40 CFR § 122.44(d)).

As explained in Response A1, an increase in design flow at the facility may be granted to the Town only after the facilities plan has been approved by MassDEP and it has been shown that the Class B water quality standards, including antidegradation, can be achieved at the increased flow. The difficulty of getting such an authorization for a river that is already impaired and effluent dominated during low flow periods should not be underestimated.

EPA does not necessarily agree with the claim that development cannot move forward without additional wastewater capacity. It is possible to plan developments that generate little to no offsite wastewater flow, using water reuse technology. Wrentham Outlet Mall and Gillette Stadium are two examples of successful commercial developments where no expansion of point source discharges were necessary. In each case, an on-site wastewater treatment plant generates water for reuse in toilet flushing and other non-potable uses. While the appropriate wastewater system will vary by site, these are two examples of how onsite wastewater treatment and reuse can be integrated into commercial development.

COMMENTS FROM OARS

OPENING COMMENT:

Thank you for the opportunity to submit the following comments on the above referenced draft 5-year permit for the town of Concord's municipal wastewater treatment plant discharge. The draft permit has several good provisions, while others need to be strengthened. Below we provide some background on our organization and the Concord River. We then provide a detailed discussion of the draft permit's provisions.

OARS is a non-profit watershed organization established in 1986 to protect, preserve, and enhance the natural and recreational features of the Assabet River, its tributaries and watershed. In 2011 the Sudbury and Concord Rivers were added to the mission and the name changed to OARS[5].

OARS has some 900 members and operates a successful EPA-approved volunteer-based water quality and stream flow monitoring program, a biomass monitoring program, a large-scale volunteer annual river clean-up, and a variety of educational workshops, canoe trips and other activities designed to foster enjoyment and good stewardship of the rivers. OARS provides detailed Annual Water Quality Reports to the local municipalities, the public and regulators (see: http://www.oars3rivers.org/river/waterquality). The Assabet, Sudbury and Concord Rivers are federally-designated Wild and Scenic Rivers in segments flowing through the town of Concord and upstream and downstream of Concord.

As is discussed in the Comments section below, there are several positive aspects of the draft permit. However, the permit does not prevent the discharge from contributing to an existing impairment of the water quality of the Concord River.

The Concord River originates in Concord at the confluence of the Sudbury and Assabet Rivers and flows north for 15.5 miles through the towns of Concord, Carlisle, Bedford, Billerica, Chelmsford, and Tewksbury before emptying into the Merrimack River in Lowell. The Merrimack River discharges to the Atlantic Ocean in Newburyport, Mass. As shown on the draft permit's Fact Sheet, the Concord River is classified as Class B—Warm Water Fishery, Treated Water Supply. The Concord River is the sole public drinking water source of the Town of Billerica.

The *Massachusetts Year 2010 Integrated List of Waters* (and the proposed *List* for 2012) lists the Concord River under Category 5 (Waters Requiring a TMDL). The segment from the confluence of the Sudbury and Assabet Rivers to the Billerica water supply intake is listed as impaired for total phosphorus, mercury in fish tissue, and fecal coliform. From the Billerica intake to Rogers Street Bridge in Lowell the river is listed for total phosphorus, and mercury in fish tissue. From Rogers Street Bridge to the confluence with the Merrimack River it is listed for total phosphorus, mercury in fish tissue, fecal coliform and excess algal growth. Non-native aquatic plants and Eurasian

[5] Previously, the name was the Organization for the Assabet River.

water milfoil are also listed as impairments throughout its length up to Rogers Street. The Assabet River, where it meets the Concord River, is listed as Category 5 impaired for total phosphorus and fecal coliform; there is a TMDL for phosphorus for the Assabet River.[6] The Sudbury River, where it meets the Concord River, is also listed under Category 5, impaired for mercury in fish and for non-native aquatic plants. There is a *Draft Pathogen TMDL for the Concord River Watershed*, but there is no indication that it will be approved this year.

There has been a large investment in improving the water quality and reducing the phosphorus pollution of the Assabet River, which contributes about half of the Concord River's flow. This summer all four municipal wastewater treatment plants on the Assabet are meeting lower permit limits for phosphorus (100 μg/L TP seasonal and 1,000 μg/L TP winter) for the first time. Similar investments in tertiary wastewater treatment have been made by the towns of Concord and Billerica.

The Concord River has had a notable history of recreational use, particularly fishing, swimming and boating, stretching back several centuries. Despite the water quality impairments, Recreation, Scenery and Ecology were recognized as Outstandingly Remarkable Values by Congress when it was designated Wild and Scenic in 1999. RiverFest, an annual celebration of the three rivers, held 31 river-based events in 2012, from canoe trips to fishing classes. As the river's popularity as a recreational resource has grown, area residents have become increasingly active in its stewardship. Yet much of the Concord River still suffers each summer and early fall from excessive nuisance plant growth that degrades recreation, aesthetics and wildlife habitat. The Concord River is impounded by the Talbot Dam in Billerica which is said to influence water levels well upstream of its confluence with the Sudbury River.

The Concord River does not meet its designated Class B—Warm Water Fishery, Treated Water Supply water quality standard. The agencies have adopted an "adaptive management" approach in which MassDEP and EPA jointly issue NPDES discharge permits with phosphorus limits on wastewater treatment plant (WWTP) discharges designed as an initial step toward meeting water quality standards. The current permit (2005) has limits of 200 μg/L Total Phosphorus (TP) during the growing season and five times this (1,000 μg/L TP) during the winter. OARS' water quality data show that the in-stream concentrations of phosphorus entering the Concord River from the Assabet River are significantly higher than those from the Sudbury River (see: www.oars3rivers.org/river/waterquality). OARS data from 2009-2011 show summer TP concentrations in the Concord River in Bedford (the sampling site downstream of the Concord WWTP) vary from a high of 160 μg/L TP (6/21/09) to a low of 40 μg/L TP (7/17/11), with 78% of the readings above 50 μg/L TP. TP levels upstream of the Concord WWTP at Lowell Road bridge in Concord are consistently lower than the Bedford readings.[7] Excessive aquatic biomass continues to be a problem in the Concord River.

[6] *Assabet River Total Maximum Daily Load for Phosphorus, Report No: MA82B-01-2004-01*, 2004.
[7] Further analysis of the data is required to assess the sources of the TP measured at each site.

RESPONSE TO OPENING COMMENT:

EPA appreciates the comment and acknowledges that the Concord River experiences eutrophication, particularly in the summer months. EPA is confident that the limits contained in this final permit and other permits on the Assabet and Concord River will prevent excursions from water quality standards in the future.

COMMENT C1:

We support approaching NPDES permitting through the new EPA "Integrated Municipal Stormwater and Wastewater Planning Approach Framework" (May 2012).

An overarching goal in water resources management in the Concord River watershed, supported at the state and federal levels, is to restore the water balance in order to achieve sustainable water use that protects both human uses and ecosystem health. Land development and modern wastewater and stormwater infrastructure have had the unintended effect of draining water out of the headwaters of our streams and rivers and discharging it far downstream into the mainstem rivers. The result is increasingly stressed streams and aquifers, which damages wildlife habitat, drinking water supplies and recreational resources. However, the water balance can be improved significantly by recharging stormwater and wastewater, reducing impervious cover, and minimizing water withdrawals from those subwatersheds that are stressed.

We support the May 2012 "Framework" approach and efforts to optimize the human and environmental health benefits of public investments under the Clean Water Act. Concord has worked hard to properly plan its wastewater management, as shown by the Comprehensive Wastewater Management Plan (2004), the "update" to the CWMP—*The Status of Municipal Wastewater Treatment in Concord, MA* (2007), and the *Wastewater Planning Task Force Summary Report: An integrated Planning Initiative* (2009) which integrates housing and long-range community plans with wastewater plans. This work provides a very solid foundation that could be used to integrate wastewater and stormwater planning. It would make sense to integrate drinking water planning into this process as well. We do not believe that a CWMP that focuses exclusively on wastewater would be as useful.

We support the agencies' decision to maintain the current discharge flow limits as required under the Framework. No increase in discharge to the surface waters should be considered without the town demonstrating that a proposed increase of the wastewater discharge would be in compliance with applicable water quality requirements for the Concord River, that it would not cause or contribute to a violation of water quality standards, and that no feasible alternatives exist to the proposed wastewater discharge increase. Effluent-dominated river flows continue to be a concern in terms of public health and the health of aquatic life. It is clear from the foregoing reports (see, e.g., Figure 2, 2009 *Summary Report*) that between May 2004 and December 2008 there have been large seasonal variations in the effluent discharged by the Concord WWTP. Flows have often doubled from the low flow (around 0.8 mgd in the summer) to the high

(around 1.6 mgd in the spring). For this permit it would be useful to report actual monthly average flows at the WWTP as well. The actual monthly average provides information about the plant that is lost in a rolling average, particularly about seasonal trends which may be associated with infiltration/inflow, tourism, school year, etc. that may be useful for planning purposes.

RESPONSE C1:

Regarding monthly flow reporting, both the draft and final permits require that the permittee report average monthly flow for each month, in addition to the 12-month rolling average and the maximum daily flow.

We agree that drinking water planning and conservation should be considered in any potential wastewater flow increase, because groundwater pumping lowers the water table and takes water that would have replenished headwater streams and the Concord River. Furthermore, infiltration and inflow continue to be an issue. I/I elimination can both offset the need for a wastewater flow increase and restore flow to headwater streams.

COMMENT C2:

We support the inclusion of reporting on Di(2-ethylhexyl)phthalate, a carcinogen and endocrine disruptor.

The reporting requirement for this pollutant is welcome in order to start to better understand the degree of threat to human health and aquatic life that it may posed in this ecosystem.

RESPONSE C2:

Comment noted for the record.

COMMENT C3:

We support an aluminum limit that will protect aquatic life due to the documented high aluminum concentrations in the discharge.

Aluminum can be highly toxic to aquatic life and discharge permits must contain limits that protect aquatic life using established criteria. Massachusetts lacks site-specific criteria so national criteria must be used until such time as state criteria are promulgated. It is important to closely monitor instream and effluent aluminum concentrations due to possible increases in alum use with the new tertiary treatment systems being used in Concord and upstream. See comment 5(d) below, regarding calculations.

RESPONSE C3:

Comment noted for the record. The permittee will continue to measure and report upstream aluminum concentrations as part of the quarterly whole effluent toxicity testing;

therefore, any increase in background concentrations will be accounted for in the next permit reissuance.

COMMENT C4:

More information is needed on efforts to minimize wastewater generation through water conservation, water reuse, and I/I removal.

The 2004 CWMP and the subsequent reports contained very little information on the many ways to minimize water use and wastewater generation. The opportunities and examples of water reuse and conservation, for example, have increased since the CWMP was prepared. These opportunities are unlikely to be adopted by new developments or redevelopment unless there is significant pressure to do so. Package treatment plant technologies have been improved for clustered and other smaller systems. The opportunities for continued I/I removal need to be described fully as groundwater appears to have a significant impact on wet season wastewater flows. Collection system mapping, O&M planning, and annual reporting as required in the draft permit are important and will contribute useful information. There should be a special focus on reducing seasonal high flows.

RESPONSE C4:

EPA agrees and has expressed similar sentiments in our response to Comment A1. We believe that by continuing to reduce I/I and water use, the Town can at least minimize, if not avoid, the need for additional groundwater or point source discharges.

COMMENT C5:

The following total phosphorus discharge concentration limits do not ensure the attainment of the water quality standards established for Class B waters, as required by the Clean Water Act: Total Phosphorus (TP) 200 μg/L average monthly concentration (April 1-Oct. 31); Total Phosphorus (TP) 1,000 μg/L average monthly concentration (Nov. 1-March 31).

There are several problems with the way the phosphorus limits were calculated: the method used to determine the upstream concentration, the standard that was used, and the impacts of winter limits. As a result, the draft permit's TP discharge limits do not ensure the attainment of the Class B water quality standards established for the Concord River, as required by section 301(b)(1)(C) of the Clean Water Act and 40 CFR § 122.4(d).

The method used to calculate the total phosphorus limit is flawed because it uses the median phosphorus concentration at Lowell Road in Concord[8] (2009 and 2010) at 45 μg/L (Fact Sheet p. 10). However, water quality standard excursions do not occur on the basis of a median concentration. They occur when the concentration reaches its

[8] Two OARS sampling sites are Lowell Road bridge in Concord (CND-161) and Lowell Street in Billerica (CND-045). The site citation in the Fact Sheet should be corrected to avoid confusion.

maximum which is during critical low flow conditions, e.g., 7Q10 flows. In September 2010 the TP concentration at Lowell Road (upstream of the Concord WWTP) had reached 80 µg/L, nearly double the 45 µg/L mean used in the calculations. The 45 µg/L concentration is itself nearly double the instream TP concentration characteristic of a healthy, relatively unimpacted river or stream in this ecoregion (see below). The total phosphorus concentration recorded during the lowest flow period or 7Q10 should be used. The 7Q10 must also be correctly calculated based on accurate assessment of flow sources.

The correct criteria must also be selected in order to be protective of designated uses. The EPA has the authority and responsibility to interpret narrative standards (e.g., the Mass. nutrient standard) and establish water quality-based limits in waters where standards are not met but there is no TMDL or site-specific criterion, as is the case for the Concord River.[9] The most current and site-specific information should be used, as described below.

The Concord plant discharges directly into a river that is impounded downstream by the Talbot Dam in Billerica. In the case of impounded water bodies, the EPA's Gold Book standard is that total phosphorus should not exceed 25 µg/L or 50 µg/L, depending whether or not the influence of the impoundment reaches the regulated discharge point.[10] However the calculations in the Fact Sheet use the 100 µg/L TP criterion for a free-slowing river, which they should not. Regarding the summer ("seasonal") phosphorus limits in the draft permit, the most current and site-specific EPA guidance documents and reports support TP limits in the range of 20 µg/L to 24 µg/L, as follows.

In 2000, EPA issued its recommended nutrient criteria or "reference conditions" for river and streams located in Ecoregion XIV, which includes all of Massachusetts and three Level III sub-ecoregions.[11] EPA's Level III sub-ecoregion 59, also known as the Northeastern Coastal Zone, includes the Concord River watershed. The recommended TP criterion or reference condition for this sub-ecoregion is 23.75 µg/L (hereafter rounded to 24 µg/L).[12] This criterion was empirically derived to represent conditions of surface waters that are minimally impacted by human activities and protective of aquatic life and recreational uses.[13]

In 2003, the New England Interstate Water Pollution Control Commission (NEIWPCC) published a study, conducted by ENSR, of instream nutrient concentrations for New England rivers and streams.[14] This EPA-funded report, which included phosphorus concentrations measured in Massachusetts rivers and streams in 1994-1998, confirmed

[9] 40CFRi122.44(d)(1)(vi).
[10] Discharges to impounded rivers and lakes require more stringent criteria than discharges to free-flowing rivers. *Quality Criteria for Water 1986*, EPA (EPA "Gold Book").
[11] *Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria; Rivers and Streams in Nutrient Ecoregion XIV*, US EPA, Office of Water, EPA 822-B-00-022, December 2000, AR Index Reference II.F.4.a.
[12] *Ibid*., page 15, Table 3a.
[13] Based on the 25th percentile of all nutrient data assessed from Level III, sub-ecoregion 59.
[14] *Collection and Evaluation of Ambient Nutrient Data for Rivers and Streams in New England, Data Synthesis Report, Final Report*, NEIWPCC, September 2003, AR Index Reference II.E.7.c.

the earlier recommendations of EPA's 2000 guidance document. Specifically, the more comprehensive phosphorus data set analyzed by ENSR for the Northeastern Coastal Zone (EPA sub-region 59) showed that in minimally impacted rivers and streams, the expected total phosphorus concentration would be in the range of 20 μg/L–22 μg/L,[15] slightly less than the 24 μg/L total phosphorus criterion recommended in EPA's 2000 guidance document.

A higher winter limit of 1,000 μg/L TP is shown to be insufficiently protective by the US Army Corps of Engineers (ACOE) study of the contribution of sediments impounded by dams on the Assabet River to water quality impairment due to phosphorus recycling by the sediments.[16] The study showed that phosphorus discharged from wastewater treatment plants during the winter was likely to be taken up by sediments and subsequently released to fuel aquatic plant growth in the next growing season. The study recommended reducing winter total phosphorus limits below 1,000 μg/L at the Assabet River municipal WWTPs:

"This study also resulted in significant findings regarding the seasonality of sediment phosphorus flux. An additional consideration to meet the TMDL target of 90% reduction in sediment phosphorus flux is winter phosphorus discharge limits for at [sic] WWTFs. Based on results of this modeling effort, it was concluded that winter limits for the WWTFs, below the current planned limit of 1 mg/L would contribute significantly to the reduction in sediment phosphorus flux.[17]

The study did not specify what the lower winter limits should be. Because the Concord WWTP is discharging to a river with an impoundment downstream created by a dam, similar to the Assabet River, these results would be applicable.

The foregoing point to a course of action supported by the data from the EPA Ecoregion study, the NEIWPCC study and the ACOE study: the agencies need to define and establish more stringent winter and growing season phosphorus limits that will allow the river to meet water quality standards.

RESPONSE C5:

Background Phosphorus Concentration

If data shows that background concentrations during dry weather conditions were appreciably higher than during other times of the year, it is true that these values should be used as the basis for calculating effluent limitations. However, in this case, the limit is relatively insensitive to the background concentration given the low limit already in place and the relatively high dilution factor for the discharge. As shown below in the figure below (using the revised 7Q10 calculated in Response to Comments Appendix A), the

[15] *Ibid*. pages 6-12, Table 6-4.
[16] *Assabet River Massachusetts: Sediment and Dam Removal Feasibility Study*, US Army Corps of Engineers, September 2010.
[17] The current, Phase 1, permits limits for Total Phosphorus are: 1,000g/L (Nov.-March), 100 g/L (April-Oct).

background concentration would have to be about 87 µg/L for the 200 µg/L (0.2 mg/l) limit not to be protective of water quality standards, meaning that using a background of 80 µg/L would not change the finding that the 200 µg/L limit is protective. Looking at this another way, at a discharge concentration of 200 µg/L and at full design flow, the discharge raises the instream concentration by a little more than 10 µg/L.

Calculation of Upstream Phosphorus Concentration That Would Make Existing Phosphorus Limit Not Protective of Water Quality

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r	=	Concentration below outfall	=	100 ug/L
Q_d	=	Discharge flow	=	1.2 MGD
C_d	=	Discharge concentration	=	200 µg/L
Q_s	=	Upstream flow	=	16.8 MGD
C_s	=	Upstream concentration	=	
Q_r	=	Streamflow below outfall	=	18 MGD (effluent + upstream)

Therefore,

$$Cs = \frac{Q_rC_r - Q_dC_d}{Q_s}$$

$$C_r = \frac{(18\ \text{MGD} \times 100\ \mu\text{g/L}) - (1.2\ \text{MGD} \times 200\ \mu\text{g/L})}{18\ \text{MGD}}$$

$$= 87\ \mu\text{g/L}$$

Also, instream data from OARS and EPA seem to show that the implementation of low phosphorus limits in upstream Assabet River permits has resulted in declining concentrations of phosphorus in the Concord River. For this reason, historic upstream data is of limited use in determining current upstream conditions.

Selection of Phosphorus Criteria

In setting the phosphorus limit for Concord WWTF, EPA employed the *Gold Book* recommended concentration (0.1 mg/l) rather than the more stringent ecoregional criteria or the draft New England-wide value. The *Gold Book* value is based on effects as opposed to the ecoregion criterion, which was developed on the basis of reference conditions. EPA opted for the effects-based approach because it is often more directly associated with an impairment to a designated use (*i.e.* fishing, swimming). The effects-based approach provides a threshold value above which adverse effects (*i.e.*, water quality impairments) are likely to occur. It applies empirical observations of a causal

variable (*i.e.*, phosphorus) and a response variable (*i.e.*, chlorophyll *a*) associated with designated use impairments. Reference-based values are statistically derived from a comparison within a population of rivers in the same ecoregion class. Specifically, reference conditions presented are based on the 25th percentile of *all* nutrient data, including a comparison of reference conditions for the aggregate ecoregion versus subecoregions. *See* Ecoregional Nutrient Criteria, page vii. They are a quantitative set of river characteristics (physical, chemical and biological) that represent minimally impacted conditions. Thus, while reference conditions, which reflect minimally disturbed conditions, may meet the requirements necessary to support designated uses, they may also *exceed* the water quality necessary to support such requirements.

Regarding the Talbot Dam in Billerica, the impoundment created by the dam is a small, run-of-the-river impoundment. EPA does not believe that this reach of the Concord River merits the application of the Gold Book criteria intended for lakes, reservoirs, and impoundments.

Winter Phosphorus Limits

It is true that the Army Corps of Engineers recommended winter phosphorus limits lower than 1,000 µg/L for the Assabet River WWTPs. EPA is examining the possibility of lowering winter phosphorus limits in Assabet River POTW permits at the next reissuance.

The Concord River, however, is different from the Assabet in that it has fewer impoundments and few point sources, and also has more flow to assimilate nutrients from point sources. It is anticipated, moreover, that ongoing WWTP improvements in the Assabet will confer benefits to the Concord River through lower instream phosphorus concentrations. After reviewing water quality data collected during the upcoming permit cycle, EPA will consider whether to lower winter phosphorus limits for Concord POTW permits at the next reissuance.

COMMENT C6:

The pH range limit for the Concord WWTP is the same as the limit in its current permit (6.0-8.3 su). This limit does not conform to the state water quality standard for a Class B waterway, which is 6.5-8.3 su. However the water quality regulations (314 CMR 4.03(2)) allow the Department to "recognize a limited area or volume of a waterbody as a mixing zone for the initial dilution of a discharge. Waters within a mixing zone may fail to meet specific water quality criteria provided the following conditions are met: (a) Mixing zones shall be limited to an area or volume as small as feasible. There shall be no lethality to organisms passing through the mixing zone as determined by the Department…" The Fact Sheet states the deviation from the "customary" limit has not resulted in any observed "adverse effects due to occasional low pH in the discharge." The Fact Sheet does not provide calculations showing the size of the mixing zone. We are concerned that this approach puts the burden of proof on some party to observe and prove an ill effect, when the research has already been done to set a protective standard. The Fact Sheet does not explain what the "operational considerations" are that should be

considered. If the town is interested in having this exceptional limit, then a good case should be made and backed up with data. It should be noted that WWTPs on the Assabet River WWTPs have the 6.5-8.3 su pH range in their permits.

RESPONSE C6:

The pH standard is for the receiving water and not necessarily the effluent, however, standard practice for POTW permits has been to require that the pH limit range match the pH range of the criteria in the receiving water classification. In some instances, EPA has allowed a different pH range where there is sufficient dilution, The allowable limit range is constrained by the EPA secondary treatment range for pH of 6.0 - 9.0 SU. See 40 C.F.R. §133.102.

After further examination of the upstream data collected during WET tests, it appears that the Concord River upstream of the Concord WWTP discharge does not always meet the 6.5 minimum pH specified in the Massachusetts Water Quality Standards (314 CMR 4.00). Also, the alkalinity of the receiving water is low (under 20 mg/L)[18] at times, meaning that the water has little buffering capacity against acidic inputs.

Table 3. Average Upstream pH and Alkalinity from Concord WWTP WET tests

Date	Alkalinity (mg/L)	pH
Sep-09	28	6.63
Dec-09	19.6	7.23
Mar-10	16.6	6.79
Jun-10	31.3	6.6
Sep-10	40.7	7.1
Dec-10	15	6.83
Mar-11	12.5	6.73
Jun-11	31	7
Sep-11	26.7	6.3
Dec-11	19.3	6.5
Mar-12	23.3	7.1

Because it is not clear that the Concord River has sufficient buffering capacity to assimilate low-pH discharges without a violation of water quality standards, EPA has decided to change the minimum pH limit to 6.5 until the Town can demonstrate to EPA that lower-pH effluent does not have the potential to cause a violation of water quality standards in the Concord River. Such a demonstration would need to include several samples and examine water quality impacts year-round.

[18] http://www.water-research.net/Watershed/alkalinity.htm

COMMENT C7:

Massachusetts Water Quality Standards require the use of the 7Q10 flow in pollutant loading calculations for determining dilution. The 7Q10 calculation is critical to the accurate determination of appropriate discharge limits. The 7Q10 calculation required several adjustments to ascertain the flow at the discharge point. The calculations of 7Q10 in the Fact Sheet are not clear and are difficult to interpret. We request that a clearer calculation of the 7Q10 be provided so that we may properly assess its accuracy.

RESPONSE C7:

Water quality-based limitations are established with a calculated available dilution. 314 CMR 4.03(3)(a) requires that effluent dilution be calculated based on the receiving water 7Q10. The 7Q10 is the lowest observed mean river flow for 7 consecutive days, recorded over a 10-year recurrence interval. The 7Q10 for the Concord River at the Concord WWTF has been calculated as 16.8 MGD (20.1 cfs) as described below.

The Concord treatment plant discharge is located between USGS gages in Maynard MA and Lowell MA. To obtain an estimate of a 7Q10 flow at a point between these two USGS gages, 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 Merrimack River, in which the SUASCO (Sudbury-Assabet-Concord) river basin is included. The streamflows were determined using DFlow 3.1b, a streamflow modeling computer program.

Lowell, MA USGS gage (01099500), 7Q10 for 4/1/1993 – 3/31/2012 (20 years): **28.0 cfs** (drainage area = 400 mi^2)

Maynard, MA USGS gage (01097000), 7Q10 for 4/1/1993 – 3/31/2012 (20 years): **11.1 cfs** (drainage area = 114 mi^2)

The first step in estimating the 7Q10 upstream of the discharge is to calculate the watershed flow factor. The flow factor is an estimate of the non wastewater flows generated by the watershed per unit area during 7Q10 periods. It has been calculated using the 7Q10s and drainage areas at the Lowell and Maynard gages, the dry weather flows from the POTWs between the gages, and the direct drinking water withdrawal by the Town of Billerica.

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

400 square miles -114 square miles = **286 mi^2**

1) Low flow attributable to this stretch of river:

28.0 cfs -11.1 cfs – 10.0 cfs* + 9.1 cfs** = **16.0 cfs**

2) Flow factor for this stretch of river:

16.0 cfs / 286 square miles = **0.056 cfs/sq. mile**

Using the flow factor, the watershed area between the Concord discharge and the Maynard gage and the other estimated flows, the 7Q10 at the Concord discharge is then estimated as follows:

Estimated 7Q10 flow at Concord WWTF: (drainage area at Concord WWTF = 345 mi^2)

11.1 cfs + 2.05 cfs*** + (345 mi^2 -114 mi^2) 0.056 = **26.1 cfs = 16.8 MGD**

Available Dilution

Dilution Factor = (Facility Flow + 7Q10)/Facility Flow
Dilution Factor = (1.2 MGD + 16.8 MGD)/1.2 MGD = **15**

*This is the sum of the average effluent flow from the four WWTPs between the Maynard gage and the Lowell gage for the period of June to Sept of 2010-2012, reflecting the low flow season over that period.

- Maynard WWTP: 1.7 cfs
- MCI Concord WPCF: 0.35 cfs
- Concord WWTF: 1.7 cfs
- Billerica WWTF: 6.2 cfs

**Since the Town of Billerica has a water withdrawal from the Concord River, the average daily withdrawal for the period of June to September for 2010 of 5.84 MGD (9.1 cfs) has been added to the flow factor.

***This is the sum of the average effluent flow from the two WWTPs below the Maynard gage and upstream of the Concord WWTF.

Note that the calculated 7Q10 is lower than that used in the draft permit, but the only change has been to the aluminum effluent limit. Also refer to Response C8 for a discussion of the updated reasonable potential calculation.

COMMENT C8:

Metals—The method of calculating Aluminum and Copper concentrations is flawed
The Fact Sheet shows that the calculations of metals and phosphorus did include a "background" level in the receiving water, which is an improvement over past permits. However, the dilution calculations were faulty because an annual median value for flow, rather than 7Q10 conditions, was used to calculate the background level of the pollutants in the receiving water. This is not appropriate, as the 7Q10 conditions are the critical conditions when flow from the Assabet River, in particular, can be highly effluent-

dominated. By using median background concentrations, EPA has failed to demonstrate that Concord's aluminum limit is low enough to meet water quality standards, *which apply under 7Q10 conditions.* The draft permit does not contain a copper limit, yet the EPA has failed to demonstrate that Concord does not need a copper limit. Since EPA used a median background concentration for copper to represent a 7Q10 condition, there *is* reasonable potential for Concord's discharge to violate acute and/or chronic criteria for copper. The permit thus fails to prove that there is no reasonable potential for the discharge to cause or contribute to violation of water quality criteria for metals. In addition, there is no evidence that correct calculations were done for the other priority pollutants. This should be done using the correct background and 7Q10 factors to ensure that there should not be limits included in the permit for these pollutants.

RESPONSE C8:

The NPDES Permit Writers Manual encourages the use of actual ambient data to estimate background concentrations of pollutants (see page 6-19). The manual also emphasizes that the data be "reliable" and also states, as an example, that the "permit writer might use the maximum measured background concentration or, perhaps, an average of measured concentrations as the critical condition."

In this case, the available upstream data is from receiving water analysis done in conjunction with Whole Effluent Toxicity tests. While EPA believes that this data is generally reliable, we recognize that it has not been historically collected using the best sampling and analysis techniques and is apt to include outliers (As an example from the Concord WWTF WET tests is the December 2010 background aluminum result, 565 µg/L, which is more than double the next highest measurement). Therefore, EPA chose to use the median background metals value, a representation of the central tendency of the data (similar to the average), a decision consistent with the Permit Writers Manual.

The commenter is correct that the fact sheet did not provide a reasonable potential analysis for most of the priority pollutants. Effluent analysis performed for the permit application revealed detectable amounts of aluminum, copper, DEHP, nickel and zinc. No other priority pollutants were detected in the effluent. Reasonable potential analyses for aluminum, copper, and DEHP were included in the fact sheet, and analyses for nickel and zinc are presented in Appendix A to this Response to Comments. No reasonable potential was found for the discharge of any of these metals to cause or contribute to a violation of water quality standards. These findings were also true using the revised 7Q10 (see Response to Comments Appendix A).

COMMENT C9:

Nitrogen—May need to be considered in light of new information
Nitrogen reporting has been eliminated from the draft permit. If nitrogen is found to pose a threat to designated uses in the Concord River, the Merrimack River, or where the Merrimack discharges into the Atlantic Ocean, this should be reassessed.

RESPONSE C9:

A monitoring requirement for total ammonia nitrogen was inadvertently omitted from the draft permit table. This requirement has been restored in the Final Permit.

The comment also seems to imply that total nitrogen monitoring was removed from the draft permit. The current permit contains no total nitrogen monitoring, therefore it was not "eliminated from the draft permit." EPA has no information that nitrogen is a concern where the Merrimack River meets the Atlantic Ocean,

COMMENT C10: CONCLUSIONS

The proposed draft permit has several good components and points the way to a much-needed integrated approach to water resources investments and management. However, it does not meet the requirements of the Clean Water Act due to calculations that 1) do not properly reflect the impounded nature of sections of the Concord River, or 2) are either incorrect or unclear relative to instream pollutant concentrations, mixing zones, and dilution flows, particularly during the critical low flow periods. In addition, the growing body of research on the effects of winter-time nutrient loading of sediment on growing season nutrient recycling should be utilized.

RESPONSE C10:

Responses to the issues raised in the conclusion can be found in the responses to the commenter's detailed comments. Specifically, see Response C5 for a discussion of upstream phosphorus concentrations used in calculating the effluent limit, the attainment of Gold Book criteria in downstream impoundments, and phosphorus winter limits; see Response C7 for a discussion of available dilution; and see Response C8 for a discussion of upstream metals concentrations used in calculating aluminum and copper limits.

COMMENTS FROM THE NATIONAL PARK SERVICE

OPENING COMMENT:

Thank you for the opportunity to comment on the recently issued draft NPDES permit MA0100668 for the Town of Concord Wastewater Treatment Plant. The National Park Service is especially interested in this draft permit because it applies to a facility that discharges directly into the part of the Concord River that has been designated as a Wild and Scenic River.

As you know, 29 miles of the Sudbury Assabet and Concord Rivers have been nationally designated as part of the Wild and Scenic River System. The National Park Service as the administering agency is responsible for long term protection and stewardship of the rivers' 'outstandingly remarkable resources' including scenic, historic, cultural, recreational and ecological values. One of the greatest threats to these resources is impaired water quality, especially due to high nutrient loads. Section 7 of the Wild and Scenic Rivers Act gives the National Park Service the responsibility to evaluate this

permit to ensure the proposed discharge will not adversely affect the resource values for which the river was designated.

Following are our comments.

RESPONSE TO OPENING COMMENT:

EPA acknowledges the comment. We are confident that the limits in the final permit will support the many functions and values that the Concord River provides.

COMMENT D1:

EPA and DEP have included some new and important requirements in this permit which reflect the state of our rivers and help to protect water quality as well as human health. This is the first time that the permit for Concord recognizes that Billerica, downstream, uses the Concord River as a public water supply. It is correct to identify this as part of a Class B Water Quality Standard, and the permit must be written accordingly. This is also the first time that a requirement to monitor phthalate has been included in Concord's permit, an important addition because of the potential health effects (both as a carcinogen and as an endocrine disrupter), especially to residents of Billerica who will drink Concord River water. Phthalate may also affect the resident aquatic fauna. Recognition of the integrated nature of our water resources, and the potential for new contaminants to be present are critical to protecting natural resources and human health.

We support the decision not to grant a flow increase to the Town of Concord at this time. Not only is the planning to justify an increase incomplete, but there is also some uncertainty surrounding the flow numbers presented in the Fact Sheet. Based on figures provided in the Fact Sheet, if septage and I/I are subtracted from the 1.06 MGD current average flow, the wastewater generated per capita is 131 gallons per person per day. This is a high number, considering that the per person target for water use is 65 gallons per person per day and may suggest that there is room for more conservation efforts before a flow increase is considered.

RESPONSE D1:

Thank you for the comment. Regarding per capita usage, Massachusetts water utilities report their per capita usage to MassDEP, and in 2011, Concord reported 63 residential gallons per capita per day (RGPCD), below the 65 gpd standard.

Wastewater flows are not an accurate reflection of residential water use in Concord. First, the sewer system serves only 35% of the town, while the water system serves 95% of the town[19]. Furthermore commercial and municipal users of the sewer system contribute disproportionately high flows to the sewer system compared to residential users. Table 1 shows the data used to calculate Concord's RGPCD.

[19] http://www.concordma.gov/Pages/ConcordMA_Water/index

Concord, MA Residential Water Use Data, 2011 (Data provided to MassDEP)

Residential gallons per person per day = annual residential water use / population served x 365 days

= 368,135,000 gallons / 15,935 people x 365 days

= 63 gallons per person per day

We agree that now is not the right time to grant Concord WWTF a flow increase. An increase in design flow at the facility may be reflected in the Town's permit only after their facility's CWMP has been approved, it has been shown that the Class B water quality standards can be achieved at the increased flow, and that the increased discharge can be authorized under the MassDEP antidegradation policy. None of these steps has yet occurred, and therefore the final permit does not include a flow increase.

COMMENT D2: Phosphorus

There is no TMDL for phosphorus in the Concord River, although the river is impaired by phosphorus and listed in Category 5 of the Impaired Waters List. When water quality standards are not being met, The Clean Water Act (Section 301(b)(1)(C)) states that instead of a technology based effluent limit, a more stringent water quality based limit should be applied in order to comply with standards. Because Massachusetts does not yet have numeric criteria for phosphorus, a water quality based limit must employ 'best professional judgment' and depend on other guidance and relevant studies to determine appropriate phosphorus limits for effluent discharges. The Fact Sheet only refers to the Gold Book, published in 1986, as guidance for establishing a numeric limit for phosphorus, although more recent work is more relevant. In 2000, EPA published Ecoregion Nutrient Criteria and suggested numeric phosphorus criteria for this ecoregion and this type of slow moving river system, ranging from 0.1mg/l to 0.02 mg/l. The most recent EPA funded analysis, done by Mitchell, Liebman, Ramseyer and Clark (2004) utilizing the most current data and having been subjected to quality assurance measures suggests the need for even more conservative concentrations (0.020 -0.022 mg/l). In light of this growing body of information, a total phosphorus limit of 0.2 mg/l as proposed in this permit is inadequate to meet standards, and in fact the target in-stream concentration should be 0.02 mg/l, an order of magnitude lower than the Gold Book value, to protect and restore water quality in the Concord River.

RESPONSE D2:

Please see Response C5.

COMMENT D3:

While behavior of phosphorus during the winter in the Concord River is not known, studies on the Assabet indicate that the phosphorus discharged in the winter does not

flush through the system, but may adhere to sediment to become available in the next growing season. Limited winter flushing is likely in the Concord River too, given its low energy due to a modest gradient and impoundment behind the Talbot Dam in Billerica. Because the river is designated as impaired, with phosphorus found to be one of the sources of its impaired status, a conservative stance should be taken on winter limits. The Wayland WWTP permit sets a precedent in rivers with excess phosphorus, and a limit of 0.1 mg/l should be applied in this case as well.

RESPONSE D3:

See Response C5.

Regarding the comparison to the Wayland limit, it has been established that "[p]ermits are issued on an individual basis, taking into account individual differences as appropriate." *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. Jo*e, 7 E.A.D. 275, 304 n.44 (EAB 1997). There are significant differences between this permit and the permit issued to the Town of Wayland for its publicly owned treatment works. Among these differences are that the discharges are to different receiving waters with different characteristics and that the Wayland discharge was a recommenced discharge, with questions related to antidegradation (specifically, whether a sufficient number of failing septic systems within the Town had been connected to the treatment plant to offset the pollutant loads authorized by the permit). In sum, these differences supported a more stringent effluent phosphorus limit in the Wayland permit than is necessary here.

COMMENT D4:

There are other concerns about the phosphorus limit's appropriateness. The Fact Sheet explains how the 'background' phosphorus concentration was determined using OARS data that was averaged over two years of monthly sampling. Using a median of annual flow data dampens the extremes, most importantly the low flows. In order to make a reasonable approximation of 7Q10 conditions, having highly diluted spring, early summer (and even autumn of some years) concentrations included appreciably underestimates the concentration in the Concord River prior to the town's discharge during 7Q10 flows. The OARS data for July and August, which comes closest to the 7Q10 flow though still above, suggests the 0.53 mg/l median annual flow, used in the calculations is an inaccurate representation of the conditions during the summer by 40-50%. If this calculation is too optimistic and there are actually higher concentrations in the receiving water, the river faces accelerated eutrophication, depressed dissolved oxygen, limited light penetration, a larger load of organic material and nutrients in the river sediments. The receiving water concentration should be recalculated using the phosphorus average from the low flow months only.

RESPONSE D4:

See Response C5.

COMMENT D5: Aluminum

The calculation for background levels of aluminum is flawed in the same way described above. Median flows do not approximate the low flow conditions of 7Q10 when the impact of the effluent is greatest.

If the Assabet WWTP facilities are using increased amounts of alum in their recent upgrades to reach enhanced P removal, historical concentrations of background aluminum may not reflect the recent conditions of a river system with far more advanced nutrient removal facilities discharging. We hope the background aluminum concentrations in the next few years can be tracked as the full complement of upstream wastewater dischargers institute advanced nutrient removal. Should there be an increase in background levels due to an increase from upstream discharges, the aluminum limit in this permit should be revisited.

RESPONSE D5:

See Response C8.

COMMENT D6: Copper

Elevated concentrations of copper can be highly toxic to an aquatic ecosystem. The calculation used to ascertain the probability of copper in the effluent being above chronic or acute limits contains the same flaws in the determination of background levels as found in the phosphorus and aluminum numbers. It is essential to use the in-stream value from low flow conditions--not a median of concentrations seen during a range of seasonal flows. The results of the dilution water analysis from the WET testing was not provided in the permit package to allow a comparison of the copper concentration used to assess the potential for a copper exceedance and the concentration found in dilution water from a September WET tests from a year with September flow close to the 7Q10 flow for this discharge. It is the background concentration during a low flow time that has the potential to better capture the probability of the discharge being above chronic or acute toxicity levels.

RESPONSE D6:

The dilution water copper data used in the draft permit is shown below. For the same reasons as with aluminum, EPA chose to use the median background copper result rather than the maximum result. As discussed in Response C8, this decision is consistent with the EPA Permit Writer's Manual.

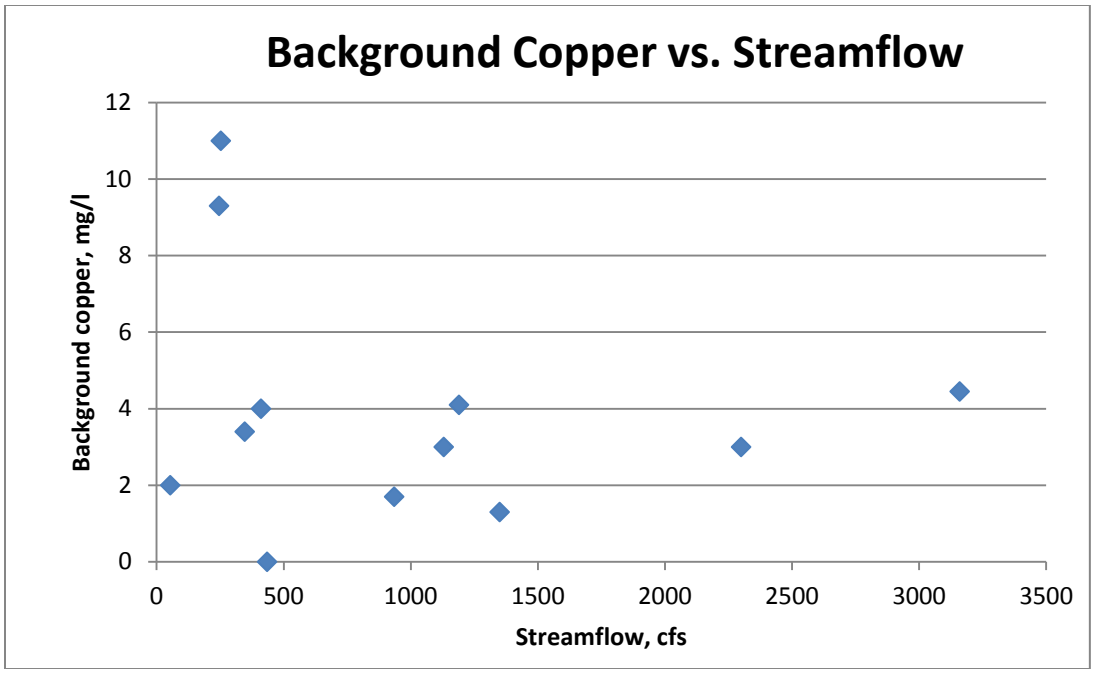

Table 3. Comparison of Background Copper Concentration and Streamflow

Date	Concentration, µg/L	Streamflow, cfs
3/10/2008	4.45	3160
6/18/2008	3.4	347
9/8/2008	4.1	1190
12/8/2008	1.7	935
3/18/2009	1.3	1350
6/10/2009	9.3	246
9/14/2009	<10	435
12/7/2009	3	1130
3/8/2010	3	2300
6/7/2010	4	411
9/13/2010	2	54
12/13/2010	11	253
Average	4.3	
Median	3.4	

EPA examined the relationship between background copper levels and streamflow to determine if the background level used to calculate the permit limit is representative of 7Q10 conditions. As the chart above shows, none of the data was collected at 7Q10 flow (28 cfs), and there is only a weak correlation between streamflow and background copper concentrations. At the lowest streamflow, 54 cubic feet per second (cfs), the background copper concentration was 2 µg/L, close to the value (3 µg/L) used in the reasonable potential analysis in the draft permit.

COMMENT D7: pH

The pH range for this wastewater treatment plant is a continuation of the limits in the existing permit. The range has a lower limit than the state water quality standard for a Class B waterway, though the Fact Sheet does not explain why this variance is necessary. There is variability in the pH found in the effluent, though the Fact Sheet does not provide insight into the root cause of this variability. All the other wastewater treatment plants in the watershed are required to meet the 6.5-8.3 SU Class B range in their permits, a compelling case to allow this inconsistency in the watershed should be explained.

RESPONSE D7:

See Response C6.

COMMENT D8: 7Q10

The low flow calculations are difficult to understand, at best. It appears that some of the numbers and/or what the numbers represent are transposed. A map would be helpful as well. More explanation would be really helpful.

RESPONSE D8:

See Response C7.

COMMENTS FROM THE SUDBURY, ASSABET, AND CONCORD WILD AND SCENIC RIVER STEWARDSHIP COUNCIL (RSC)

Thank you for the opportunity to comment on the recently issued draft NPDES permit MA0100668 for the Town of Concord Wastewater Treatment Plant. The Sudbury, Assabet and Concord Wild and Scenic River Stewardship Council (RSC) is especially interested in this draft permit because it applies to a discharge directly into that part of the Concord River that has been designated as a Wild and Scenic River.

In 1999, 29 miles of the Sudbury, Assabet and Concord Rivers were designated, and became a part of the federal wild and scenic river system. The RSC was created as part of the legislation to advise the National Park Service on long term protection and stewardship of the rivers and their outstanding resources including scenic, historical, cultural, recreational and ecological values. The RSC is comprised of the eight shoreline communities along the wild and scenic segment, Sudbury Valley Trustees, OARS for the Sudbury, Assabet and Concord Rivers, SUASCO Watershed Community Council, the Commonwealth and the federal government. The RSC provides a significant and important local perspective to the issues facing the rivers. One of the highest priorities for the RSC is the threat posed to the rivers from impaired water quality, and the consequent impacts to recreation, scenery and ecology of the rivers. It is in this light that the RSC offers the following comments.

COMMENT E1:

The Concord River is on the List of Impaired Waters in Massachusetts, in part due to high phosphorous levels and excessive plant growth. Although a TMDL has not been completed, there is data that supports that the river is not meeting Class B Water Quality Standards. The Clean Water Act Section 301 (b)(1)(C) requires water quality based effluent limits for wastewater treatment plants when water quality standards are not being met in the receiving water. A technology based limit of 0.2 mg/l, as proposed in the draft permit, is not appropriate and regulators must determine a more protective limit to bring waters into compliance with water quality standards.

Using EPA's own studies (Mitchell, Liebman, Ramseyer and Clark (2004)), a phosphorous limit of 0.02 mg/l, an order of magnitude below the proposed limit, should be imposed in order to protect and restore water quality. Concord has recently constructed a new treatment plant with state of the art technology that allows the plant to achieve very low phosphorus levels. Setting an appropriate limit should not require additional construction.

RESPONSE E1:

See Response C5.

COMMENT E2:

While behavior of phosphorus during the winter in the Concord River is not known, studies on the Assabet indicate that the phosphorus discharged in the winter does not flush through the system, but adheres to the sediment to become available during the next growing season. Limited winter flushing is likely in the Concord River too, due to its modest gradient and slow moving water. Because the river is designated as impaired by phosphorus, a conservative stance should be taken on winter limits. The Wayland WWTP permit sets a precedent in rivers with excess phosphorus, and a limit of 0.1 mg/L during the winter months should be applied in this case as well.

RESPONSE E2:

Regarding winter phosphorus limits, see Response C5. Regarding the comparison to the Wayland limit, see Response C3.

COMMENT E3:

Throughout the permit, estimation of low flow conditions and corresponding background contamination levels are flawed. The draft permit uses a median annual flow as a basis from which to determine background levels of aluminum, copper and phosphorus. Because median flows, which include high spring flows as well as high inflow and infiltration rates, may dampen true low flow conditions, these background level contaminants may be underestimated. The results of this error have been carried through

subsequent calculation to determine the appropriate level of these contaminants in the effluent. Because of this flawed calculation, limits may not be protective.

RESPONSE E3:

See Responses C7 and C8.

COMMENT E4:

The pH range for this plant is a continuation of the limits in the existing permit. The range has a lower limit than the state water quality standard for a Class B waterway although the Fact Sheet does not explain why this is necessary, except to state that there are operational considerations. This should be explained more fully. It seems a questionable precedent to allow discharges outside of water quality standards even if there is no apparent problem based on existing data.

RESPONSE E4:

See Response C6.

COMMENT E5:

The 7Q10 flow calculations are not straight forward and should be explained more clearly. A map which indicates gages and also other flow contributors would be helpful.

RESPONSE E5:

See Response C7.

COMMENT E6:

This permit takes a broader view of the integrated nature of our water resources, and EPA and DEP should be commended for this. Billerica, also a part of the Wild and Scenic River, utilizes the Concord River as a public drinking water supply. Recognizing this, and setting effluent limits and monitoring requirements accordingly, are good steps towards protecting human health as well as natural resources.

RESPONSE E6:

The comment is noted for the record.

APPENDIX A

7Q10

Water quality based limitations are established with a calculated available dilution. Title 314 CMR 4.03(3)(a) requires that effluent dilution be calculated based on the receiving water 7Q10. The 7Q10 is the lowest observed mean river flow for 7 consecutive days, recorded over a 10-year recurrence interval. The 7Q10 for the Concord River at the Concord WWTF has been calculated as 16.8 MGD (26.1 cfs) as described below.

The Concord treatment plant discharge is located between USGS gages in Maynard MA and Lowell MA. To obtain an estimate of a 7Q10 flow at a point between these two USGS gages, 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 Merrimack River, in which the SUASCO (Sudbury-Assabet-Concord) river basin is included. The streamflows were determined using DFlow 3.1b, a streamflow modeling computer program.

Lowell, MA USGS gage (01099500), 7Q10 for 4/1/1993 – 3/31/2012 (20 years): **28.0 cfs** (drainage area = 400 mi^2)

Maynard, MA USGS gage (01097000), 7Q10 for 4/1/1993 – 3/31/2012 (20 years): **11.1 cfs** (drainage area = 114 mi^2)

The first step in estimating the 7Q10 upstream of the discharge is to calculate the watershed flow factor. The flow factor is an estimate of the non wastewater flows generated by the watershed per unit area during 7Q10 periods. It has been calculated using the 7Q10s and drainage areas at the Lowell and Maynard gages, the dry weather flows from the POTWs between the gages, and the direct drinking water withdrawal by the Town of Billerica.

1) The watershed area between the two gages is:

Area at the Lowell gage – area at the Maynard gage

400 square miles -114 square miles = **286 mi^2**

2) Non wastewater 7Q10 flow between gages:

7Q10 at Lowell gage – 7Q10 at Maynard gage – wastewater flow from POTWs between the gages + water withdrawal by Billerica

28.0 cfs -11.1 cfs – 10.0 cfs* + 9.1 cfs** = **16.0 cfs**

*This is the sum of the average effluent flow from the four WWTPs between the Maynard gage and the Lowell gage for the period of June to Sept of 2010-2012, reflecting the low flow season over that period.

**Since the Town of Billerica has a water withdrawal from the Concord River, the average daily withdrawal for the period of June to September for 2010 of 5.84 MGD (9.1 cfs) has been added to the flow factor.

- Maynard WWTP: 1.7 cfs
- MCI Concord WPCF: 0.35 cfs
- Concord WWTF: 1.7 cfs
- Billerica WWTF: 6.2 cfs

3) Flow factor for this stretch of river:

Non wastewater 7Q10 between gages/watershed area between gages:

16.0 cfs / 286 square miles = **0.05594 cfs/sq. mile**

Using the flow factor, the watershed area between the Billerica discharge and the Maynard gage and the other estimated flows, the 7Q10 at the Billerica discharge is then estimated as follows:

4) Estimated 7Q10 flow at Concord WWTF: (watershed drainage area at Concord WWTF = 345 mi^2)

7Q10 at Maynard gage + wastewater flow from POTWs below the Maynard gage but upstream of Concord discharge + non wastewater flow generated by watershed

11.1 cfs + 2.05 cfs*** + (345 mi^2 -114 mi^2) 0.05594 = **26.1 cfs (16.8 MGD)**

***This is the sum of the average effluent flow from the three WWTPs below the Maynard gage and upstream of the Concord WWTF (Maynard and MCI Concord).

<u>The dilution factor can then be calculated using the discharge design flow and the receiving water 7Q10:</u>

Dilution Factor = (Facility Flow + 7Q10)/Facility Flow
Dilution Factor = (1.2 MGD + 16.8 MGD)/1.2 MGD = **15**

Total Phosphorus

The Massachusetts Surface Water Quality Standards at 314 CMR 4.00 (MA SWQS) do not contain numerical criteria for total phosphorus. The narrative criterion for nutrients is found at 314 CMR 4.05(5) (c), which states that, "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…"

The MA SWQS also require that "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,… to remove such nutrients to ensure protection of existing and designated uses." (314 CMR 4.05(5)(c)). The Massachusetts Department of Environmental Protection (MassDEP) has established that a monthly average total phosphorus limit of 0.2 mg/l (200 μg/l) represents highest and best practical treatment (HBPT) for Publicly Owned Treatment Works (POTWs).

The current permit contains the HBPT limit of 0.2 mg/l (200 μg/l) from April through October and a limit of 1 mg/l the rest of the year. From January 2009 through December 2010, there were no violations of the total phosphorus limit.

EPA calculated the downstream phosphorus concentration with the existing 0.2 mg/l permit limit for Concord WWTP to verify that the existing limit is sufficiently protective of designated uses. The upstream concentration, 45 μg/l, is the median phosphorus concentration reported for the Concord River at Lowell Street, Concord by the Organization for the Assabet River (OARS) in 2009 and 2010[1]. As the calculation below shows, the existing limit results in a downstream phosphorus concentration of 55 μg/l during 7Q10 conditions, lower than the Gold Book criteria of 100 μg/l.

[1] http://www.oars3rivers.org/sites/default/files/Data-2009-2010-Appendix-II.pdf

Downstream Phosphorus Concentration

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r	=	Concentration below outfall		
Q_d	=	Discharge flow	=	1.2 MGD
C_d	=	Discharge concentration	=	200 µg/l
Q_s	=	Upstream flow	=	16.8 MGD
C_s	=	Upstream concentration	=	45 µg/l
Q_r	=	Streamflow below outfall	=	18 MGD (effluent + upstream)

Therefore,

$$C_r = \frac{(1.2\ \text{MGD} \times 200\ \mu\text{g/l}) + (16.8\ \text{MGD} \times 45\ \mu\text{g/l})}{18\ \text{MGD}}$$

$$= \mathbf{55\ \mu g/l} < 100\ \mu\text{g/l (Gold Book criterion)}$$

The average monthly total phosphorus limit remains at 200 µg/l from April 1st through October 31st. From November 1st through March 31st, the average monthly limit remains at 1 mg/l. Sampling frequency will be once per month.

The final permit also requires Concord WWTP to report daily alum, magnetite, and polymer dosing levels with the DMR. The CoMag process allows for rapid changes in phosphorus removal by adjusting the dosing levels of the chemicals used in the process. The rationale for this requirement is that reporting of dosing level will provide verification that nutrient removal occurs throughout the month without more frequent effluent monitoring.

Aluminum

Aluminum, in the form of alum or other compounds, is a commonly used chemical additive in wastewater treatment to remove phosphorus. The release of metals such as aluminum into the environment can result in levels that are highly toxic to aquatic life. Therefore, it is necessary to evaluate the downstream effects of discharges of aluminum from wastewater treatment plants. Water quality-based effluent limitations are imposed on dischargers when it is determined that limitations more stringent than technology-based limitations are necessary to achieve or maintain the water quality standards in the receiving water (40 CFR § 122.44(d)(1)). Such determinations are made when EPA finds that there is reasonable potential for the discharge to cause or contribute to an instream

excursion above a water quality criterion contained within applicable state water quality standards (40 CFR § 122.44(d)(1)(i)).

In determining reasonable potential, EPA considers existing controls on point and nonpoint sources of pollution, pollutant concentration and variability in the effluent and receiving water as determined from the permittee's reissuance application, DMRs, state and federal water quality reports; and, where appropriate, the dilution of the effluent in the receiving water (see 40 CFR §122.44(d)(1)(ii)). If EPA concludes, after using the procedures found at 40 CFR § 122.44(d)(1)(ii), toxicity testing data, or other available information, that a discharge causes or has the reasonable potential to cause or contribute to an in-stream excursion above a numeric criterion within an applicable state water quality standard, effluent limitations must be included in NPDES discharge permits to ensure that water quality standards in the receiving water are met (40 CFR § 122.44(d)(1)(v)).

The MA SWQS include requirements for the regulation and control of toxic constituents and also require that EPA-recommended criteria established pursuant to Section 304(a) of the CWA be used unless site-specific criteria are established (314 CMR § 4.05(5)(e)). Massachusetts has not adopted site-specific criteria for aluminum. Therefore, the freshwater criteria for aluminum found in the *National Recommended Water Quality Criteria*: *2002* (US EPA 2002 [EPA-822-R-02-047]), which are an acute concentration of 750 µg/l and a chronic concentration of 87 µg/l, apply in Massachusetts.

The potential for discharges of aluminum from the Concord WWTP to cause or contribute to an excursion above water quality criteria was determined by statistically projecting the maximum concentration of the pollutant in the discharge assuming a lognormal distribution. A histogram of the effluent data verified this assumption. EPA projected the maximum effluent concentration as 4,411 µg/l (4.4 mg/l) by calculating the 99^{th} percentile measurement of the existing effluent data set from January 2009 through January 2011 (n=25). The 95^{th} percentile concentration, 2,720 µg/l (2.7 mg/l), was also calculated for comparison with the chronic WQC (see Fact Sheet Appendix C).

The projected pollutant level was then inserted into a steady-state mixing equation to determine if it could cause or contribute to an excursion from water quality standards under critical conditions. The median aluminum level reported in the 2008-2010 WET test dilution samples, 75 µg/l, was used in this analysis.

As shown in the boxes below, the projected maximum aluminum effluent of 4,411 µg/l results in a receiving water concentration of 364 µg/l during critical conditions, below the acute criterion of 750 µg/l. A concentration of 2,720 µg/l, the 95^{th} percentile concentration, results in a receiving water concentration of 25 µg/l, above the chronic criterion of 87 µg/l. Therefore, there is reasonable potential for the discharge to cause or contribute to an excursion of the chronic water quality standard for aluminum.

Reasonable Potential Analysis for Aluminum

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r	=	Concentration below outfall		
Q_d	=	Discharge flow	=	1.2 MGD
C_d	=	Discharge concentration	=	4,411 µg/l
Q_s	=	Upstream flow	=	16.8 MGD
C_s	=	Upstream concentration	=	75 µg/l
Q_r	=	Streamflow below outfall	=	18 MGD (effluent + upstream)

Therefore,

$$Cr = \frac{(1.2\ MGD \times 4{,}411\ \mu g/l) + (16.8\ MGD \times 75\ \mu g/l)}{18\ MGD}$$

= **364 µg/l** < 750 µg/l (acute criterion)

Therefore, there is **no reasonable potential** for the discharge to cause or contribute to an excursion from the acute water quality criterion for aluminum.

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r	=	Concentration below outfall		
Q_d	=	Discharge flow	=	1.2 MGD
C_d	=	Discharge concentration	=	2,720 µg/l
Q_s	=	Upstream flow	=	16.8 MGD
C_s	=	Upstream concentration	=	75 µg/l
Q_r	=	Streamflow below outfall	=	18 MGD (effluent + upstream)

Therefore,

$$C_r = \frac{(1.2\ MGD \times 2{,}720\ \mu g/l) + (16.8\ MGD \times 75\ \mu g/l)}{18\ MGD}$$

= **251 µg/l** > 87 µg/l (chronic criterion)

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

The effluent limits calculated below will result in attainment of water quality criteria downstream of the facility during critical conditions. The limit was calculated using the same steady state model that was used in determining reasonable potential, but setting the

downstream concentration equal to the applicable water quality criteria and solving for the effluent concentration.

Monthly Average Aluminum Limit

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

Where

C_d	=	Discharge concentration =	?	
C_r	=	Concentration below outfall	=	87 µg/l (chronic criterion)
Q_d	=	Discharge flow	=	1.2 MGD
Q_s	=	Upstream flow	=	16.8 MGD
C_s	=	Upstream concentration	=	75 µg/l
Q_r	=	Streamflow below outfall (effluent + upstream)	=	18 MGD

$$C_d = \frac{(18\ \text{MGD})(87\ \mu\text{g/l}) - (16.8\ \text{MGD})(75\ \mu\text{g/l})}{1.2\ \text{MGD}}$$

$$= \mathbf{255\ \mu g/l}$$

The draft permit therefore includes an average monthly limit of 255 µg/l and a requirement to report the maximum daily effluent concentration. The proposed monitoring frequency is once per month. If the facility monitors at this frequency, the single sample must be reported as both the monthly average and the daily maximum. If Concord WWTP chooses to sample more often than once per month, the average of the samples must be reported as the monthly average, and the highest sample of the month reported as the daily maximum.

Ammonia Nitrogen

High levels of ammonia in the water column can be toxic to fish by making it more difficult for fish to excrete this chemical via passive diffusion from gill tissues. Ammonia toxicity varies with pH and temperature. Ammonia can also lower dissolved oxygen levels by conversion to nitrate/nitrate, which consumes oxygen.

The current permit does not contain a limit for ammonia. DMR data show that effluent ammonia levels range from 0.49 mg/l to 2.81 mg/l (see Fact Sheet Appendix A).

EPA ammonia criteria recommend using the 30Q10 conditions (the lowest 30-day average daily flow with a 10-year expected recurrence interval) rather than the 7Q10 for setting ammonia limits. Interpolation of flow records for USGS Gages in Maynard and Lowell indicates that the 30Q10 is 23 cfs. The 30Q10 and dilution factor calculations are presented below.

Given the dilution factor of 21 during 30Q10 conditions, no reasonable potential for an exceedance of water quality standards exists (see calculations below). The draft permit carries forward the monitoring requirements of once per week from June 1- September 30 and twice per month from October 1 – May 31.

Summer (April 1st – October 31st) 30Q10 Calculations

Lowell, MA USGS gage (01099500), 30Q10 for 4/1/1993 – 3/31/2012 (20 years): **41.8 cfs** (drainage area = 400 mi^2)

Maynard, MA USGS gage (01097000), 30Q10 for 4/1/1993 – 3/31/2012 (20 years): **16.4 cfs** (drainage area = 114 mi^2)

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

400 square miles -114 square miles = 286 sq. mi. [(Lowell gage DA) - (Maynard gage DA) = (DA between Maynard and Lowell)]

Low flow attributable to this stretch of river:

41.8 cfs -16.4 cfs -10 cfs* + 9.1 cfs** = 24.5 cfs

Flow factor for this stretch of river:

24.5 cfs / 286 square miles = **0.086 cfs/sq. mile**

Estimated 30Q10 flow at Concord WWTF: (drainage area at Concord WWTF = 345 mi^2)

16.4 cfs + 2.05 cfs *** + (345 mi^2 - 114 mi^2) 0.086 = **38.3 cfs**

*This is the sum of the average effluent flow from the four WWTPs between the Maynard gage and the Lowell gage for the period of June to Sept of 2010-2012, reflecting the low flow season over that period.

- Maynard WWTP: 1.7 cfs
- MCI Concord WPCF: 0.35 cfs
- Concord WWTF: 1.7 cfs

- Billerica WWTF: 6.2 cfs

**Since the Town of Billerica has a water withdrawal from the Concord River, the average daily withdrawal for the period of June to September for 2010 of 5.84 MGD (9.1 cfs) has been added to the flow factor.

***This is the sum of the average effluent flow from the two WWTPs below the Maynard gage and upstream of the Concord WWTF.

Design Flow Dilution:

Design Flow = 1.2 MGD x 1.55[(c)] cfs/MGD = 1.9 cfs

$$\frac{\text{Design flow + 30Q10 flow}}{\text{Design flow}} = \frac{\text{1.9 cfs + 38.3 cfs}}{\text{1.9 cfs}} = \mathbf{21} = \text{Dilution Factor}$$

Reasonable Potential Analysis for Summer Ammonia Discharges

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

Q_d = effluent flow, i.e. facility design flow	=	1.2 MGD
C_d = effluent pollutant concentration	=	2.47 mg/l (projected highest data point)
Q_s = 30Q10 flow of receiving water	=	38.3 cfs = 24.7 MGD
C_s = upstream concentration	=	0 mg/l
Q_r = receiving water flow = $Q_s + Q_d$	=	1.2 MGD + 24.7 MGD = 25.9 MGD
C_r = receiving water concentration	=	?

$$C_r = \frac{(1.2 \text{ MGD} \times 2.47 \text{ mg/l}) + (24.7 \text{ MGD} \times 0 \text{ mg/l})}{25.9 \text{ MGD}}$$

C_r = 0.11 mg/l < 3.62 mg/l (summer chronic criterion)

There is no reasonable potential for the discharge to cause or contribute to an exceedance of the acute or chronic water quality criterion.

found in surface waters. Copper is a micronutrient at low concentrations and is essential to virtually all plants and animals. At higher concentrations copper can become toxic to aquatic life.

An examination of Concord WWTP's whole effluent toxicity (WET) testing data shows effluent copper concentrations ranging from non-detect to 16 µg/l (see Fact Sheet Appendix A).

The *National Recommended Water Quality Criteria*: *2002* (US EPA 2002 [EPA-822-R-02-047]) includes copper criteria for the protection of aquatic life. These criteria are hardness-based. The calculations below estimate hardness in the receiving water downstream of the facility, which is then used to establish the applicable copper criteria. The hardness data used in the calculations are from Concord WWTP's Whole Effluent Toxicity (WET) test reports from March 2008 through December 2010. The hardness values used in this calculation are the median hardness values measured in the treatment plant discharge and the upstream receiving water during this period. Hardness data used to calculate the criteria are included in Fact Sheet Appendix F.

Hardness Analysis

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r	=	Concentration below outfall		
Q_d	=	Discharge flow	=	1.2 MGD
C_d	=	Discharge concentration	=	86 mg/l
Q_s	=	Upstream flow	=	16.8 MGD
C_s	=	Upstream concentration	=	55 mg/l
Q_r	=	Streamflow below outfall (effluent + upstream)	=	18 MGD

Therefore,

$$C_r = \frac{(1.2\ \text{MGD} \times 87\ \text{mg/l}) + (16.8\ \text{MGD} \times 50\ \text{mg/l})}{18\ \text{MGD}}$$

$$= 57\ \text{mg/l}$$

1. Acute Criteria (Total Recoverable) = $\exp\{m_a [\ln(h)] + b_a\}$ = **8.24 µg/l**

Where:

m_a = Pollutant-specific coefficient = 0.9422
b_a = Pollutant-specific coefficient = -1.700
ln = Natural logarithm
h = hardness of the receiving water = 57 mg/l

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2. Chronic Criteria (Total Recoverable) = $\exp\{m_c [\ln(h)] + b_c\}$ = **5.77 µg/l**

Where:

m_c = Pollutant-specific coefficient = 0.8545

b_c = Pollutant-specific coefficient = -1.702
ln = Natural logarithm
h = hardness of the receiving water = 57 mg/l

EPA used information from the quarterly WET tests to perform a Reasonable Potential Analysis to determine the potential for discharges of copper from the Concord WWTP to cause or contribute to an excursion above water quality criteria. First, EPA projected the maximum effluent concentration as 46.40 µg/l by calculating the 99th percentile measurement the effluent data from March 2008 through December 2010. EPA then calculated the 95th percentile concentration, 27.82 µg/l, to characterize the maximum monthly average concentration (see Fact Sheet Appendix F).

Background conditions in the Concord River were determined from the median of the WET chemistry dilution water samples from March 2008 through December 2010. The projected pollutant levels were then inserted into a steady-state mixing equation to determine if the discharge could cause or contribute to an excursion from water quality criteria under critical conditions.

As shown in the box below, the projected maximum copper effluent concentration of 46.40 µg/l results in a downstream receiving water concentration of 5.89 µg/l, below the acute criteria of 8.24 µg/l. A concentration of 27.82 µg/l, the 95th percentile concentration, results in a receiving water concentration of 4.6 µg/l, below the chronic criterion of 5.77 µg/l. Therefore, there is no reasonable potential for the discharge to cause or contribute to an excursion of either the acute or chronic water quality standard for copper.

Reasonable Potential Analysis for Copper – Acute

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r	=	Concentration below outfall		
Q_d	=	Discharge flow	=	1.2 MGD
C_d	=	Discharge concentration	=	46.40 µg/l
Q_s	=	Upstream flow	=	16.8 MGD
C_s	=	Upstream concentration	=	3 µg/l
Q_r	=	Streamflow below outfall (effluent + upstream)	=	18 MGD

Therefore,

$$C_r = \frac{(1.2 \text{ MGD} \times 46.40 \text{ µg/l}) + (16.8 \text{ MGD} \times 3 \text{ µg/l})}{18 \text{ MGD}}$$

$$= \mathbf{5.89} < 8.24 \text{ µg/l (acute criterion)}$$

Therefore, there is **no reasonable potential** for the discharge to cause or contribute to an excursion from the acute water quality criterion for copper.

Reasonable Potential Analysis for Copper – Chronic

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r	=	Concentration below outfall		
Q_d	=	Discharge flow	=	1.2 MGD
C_d	=	Discharge concentration	=	27.82 µg/l
Q_s	=	Upstream flow	=	16.8 MGD
C_s	=	Upstream concentration	=	3 µg/l
Q_r	=	Streamflow below outfall (effluent + upstream)	=	18 MGD

Therefore,

$$C_r = \frac{(1.2 \text{ MGD} \times 27.82 \text{ µg/l}) + (16.8 \text{ MGD} \times 3 \text{ µg/l})}{18 \text{ MGD}}$$

= **4.6 µg/l** < 5.77 µg/l (chronic criterion)

Therefore, there is **no reasonable potential** for the discharge to cause or contribute to an excursion from the chronic water quality criterion for copper.

Because there is no reasonable potential for an excursion from water quality standards from copper discharges from Concord WWTP, the draft permit does not contain copper limits. The permittee will continue to monitor for copper as part of the quarterly whole effluent toxicity testing.

Nickel and Zinc

The facility's effluent concentrations (from Attachment B) were characterized assuming a lognormal distribution in order to determine the estimated 95th percentile of the daily maximum. For metals with hardness-based water quality criteria, the criteria were determined using the equations in 2002 Recommended Water Quality Criteria (see table below). The downstream hardness was calculated to be 57 mg/l as CaCO3, using a mass balance equation with the design flow, receiving water 7Q10, an upstream median hardness of 55 mg/l as CaCO3 and an effluent median hardness of 86 mg/l as CaCO3 (see Copper discussion, above). The following table presents the factors used to determine the acute and chronic total recoverable criteria for each metal:

Metal	Parameters				Total Recoverable Criteria	
	ma	ba	mc	bc	Acute Criteria (CMC) (ug/L)	Chronic Criteria (CCC) (ug/L)
Nickel	0.846	2.255	0.846	0.0584	287.28	31.94
Zinc	0.8473	0.884	0.8473	0.884	73.31	73.31

In order to determine whether the effluent has the reasonable potential to cause or contribute to an exceedance above the in-stream water quality criteria for each metal, the following mass balance is used to project in-stream metal concentrations downstream from the discharge.

$$Q_d C_d + Q_S C_S = Q_r C_r$$

rewritten as:

$$C_r = \frac{Q_d C_d + Q_S C_S}{Q_r}$$

where:

Qd = effluent flow (design flow = 1.2 mgd = 1.9 cfs)
Cd = effluent metals concentration in µg/L (95th percentile)
QS = stream flow upstream (7Q10 upstream = 26.1 cfs)
CS = background in-stream metals concentration in µg/L (median)
Qr = resultant in-stream flow, after discharge (QS + Qd = 35.9 cfs)
Cr = resultant in-stream concentration in µg/L

Reasonable potential is then determined by comparing this resultant in-stream concentration (for both acute and chronic conditions) with the criteria for each metal. In EPA's Technical Support Document for Water Quality Based Toxics Control, EPA/505/2-90-001, March 1991, commonly known as the "TSD", box 3-2 describes the statistical approach in determining if there is reasonable potential for an excursion above the maximum allowable concentration (criteria). If there is reasonable potential (for either acute or chronic conditions), the appropriate limit is then calculated by rearranging the above mass balance to solve for the effluent concentration (C_d) using the criterion as the resultant in-stream concentration (C_r). See the table below for the results of this

analysis with respect to nickel and zinc.

Metal	Qd	Cd[1] (95th Percentile)	Qs	Cs[2] (Median)	Qr = Qs + Qd	Cr = (QdCd+QsCs) /Q_R	Criteria		Reasonable Potential
	cfs	µg/L	cfs	µg/L	cfs	µg/L	Acute (µg/L)	Chronic (µg/L)	Cr > Criteria
Nickel	1.9	7.7	34	2.4	35.9	2.68	287.28	31.94	N
Zinc		52.68		12.4		14.5	73.31	73.31	N

[1] Values calculated using 12 quarterly toxicity measurements from the 2008-2010 WET tests.
[2] Median upstream data taken from Whole Effluent Toxicity (WET) testing on the Concord River just upstream of the Concord WWTP.

Di(2-ethylhexyl) Phthalate

Di(2-ethylhexyl) phthalate (also known as DEHP) is used in the production of polyvinyl chloride (PVC). It is commonly detected in the environment due to the widespread use of plastic products, though it is only slightly soluble in water and is broken down quickly in the presence of oxygen.

DEHP was detected in pollutant scans of Concord WWTP effluent conducted for the NPDES reissuance application.

Table 1. DEHP Levels in Concord WWTP Effluent

Date	Concentration
4/19/2010	<10 µg/l *
6/21/2010	11 µg/l
8/22/2010	19 µg/l
5/31/2011	6.6 µg/l

* not detected in laboratory analysis

The human health criteria for DEHP are 1.2 µg/L for consumption of water and organism, and 2.2 µg/L for organism only. The water and organism criterion applies when the water body is used for drinking water and animals from the water body are consumed. The organism-only criterion applies when animals from the water body are consumed. The drinking water MCL (Maximum Contaminant Level) for DEHP is 6 µg/L. The reason for the apparent discrepancy in these numbers is that cost and laboratory detection limits are considered in the determination of MCLs, while human health criteria do not account for either.

As of 2010 (the most recent report available online), the Town of Billerica, which uses the Concord River as a drinking water source, did not detect DEHP in its drinking water. Because the Concord River is a drinking water source for towns downstream, the water and organism criterion was used to determine whether an effluent limit would be needed under the MA SWQS and the Clean Water Act.

To determine whether an effluent limit is necessary, EPA conducted a Reasonable Potential Analysis to assess the likelihood that the effluent caused or contributed to an exceedance of water quality standards under harmonic mean flow. Critical conditions are considered to be 7Q10 streamflow with the facility operating at design capacity. EPA could not project the 99% or 95% percentile concentration, because at least ten samples are necessary to confirm that the data are lognormally distributed. Therefore, EPA used the highest observed effluent concentration. Finally, because DEHP breaks down quickly in the presence of oxygen, EPA assumes that the upstream concentration of DEHP is zero.

Because human health criteria apply over a 70-year period, the MA SWQS at say that, "[f]or rivers and streams and waters whose flows are regulated by dams or similar structures, human health based criteria may be applied at the harmonic mean flow." [314 CMR 4.03(3)(d)] The harmonic mean flow is defined at 314 CMR 4.02 as "[a] longterm flow value calculated by dividing the number of daily flows analyzed by the sum of the reciprocals of those daily flows." The harmonic mean flow at the Assabet River in Maynard gage (as calculated by DFlow 3.1b) is 82 cfs, and 271 cfs in Lowell. Because both of these flows are approximately 7 times the 7Q10 flow, it is doubtful that there is reasonable potential to exceed the human health criterion at harmonic mean flow.

Because we assume there is no DEHP upstream of the Concord WWTF, one can calculate what the dilution factor would need to be for there to be reasonable potential for DEHP.

Since

$$Q_sC_s + Q_dC_d = Q_rC_r$$

Where

C_r	=	Concentration below outfall		
Q_d	=	Discharge flow	=	1.2 MGD
C_d	=	Discharge concentration	=	19 µg/l

Q_s	=	Upstream flow	=	16.8 MGD
C_s	=	Upstream concentration	=	0 µg/l
Q_r	=	Streamflow below outfall	=	18 MGD (effluent + upstream)

Since $C_s = 0$, $Q_sC_s = 0$.

Then,

$$Q_dC_d = Q_rC_r$$

Because the dilution factor = $(Q_s + Q_d)/Q_d$ and $Q_s + Q_d = Q_r$,

the dilution factor = Q_r/Q_d

So, $C_d = Q_rC_r/Q_d = DF \times C_r$

$$C_d = DF \times C_r$$

And $DF = C_d/C_r$

Thus, when the upstream concentration is zero, the dilution factor must be lower than the ratio between the highest effluent concentration and the water quality criterion for there to be reasonable potential.

In this case,

C_d = 19 µg/L (highest effluent concentration)
C_r = 1.2 µg/L (water quality criterion)

C_d/C_r = 19 µg/L /1.2 µg/L = 15.8

Therefore, the harmonic mean flow dilution factor would need to be 15.8 or less for there to be reasonable potential for the Concord WWTF discharge to cause an exceedance of the human health water quality criterion for DEHP. Because the harmonic mean flows of both the Maynard and Lowell gages are at least 7 times that of the 7Q10 for each gage, reasonable potential does not exist.

Because there is not reasonable potential at this time for the effluent to cause or contribute to an exceedance of the human health criteria for DEHP, the draft permit does not include a limit for this pollutant. However, the permittee is required to monitor for and report DEHP concentrations in the effluent. Monitoring frequency will be once per calendar quarter. Because the detection level of DEHP can vary widely, if DEHP is not detected in the effluent, Concord WWTP must report the detection level of the analysis

with the DMR. This requirement will help EPA determine if water quality standards are being met and assist in future permit limit development, if needed.

Outfall 001 – Whole Effluent Toxicity

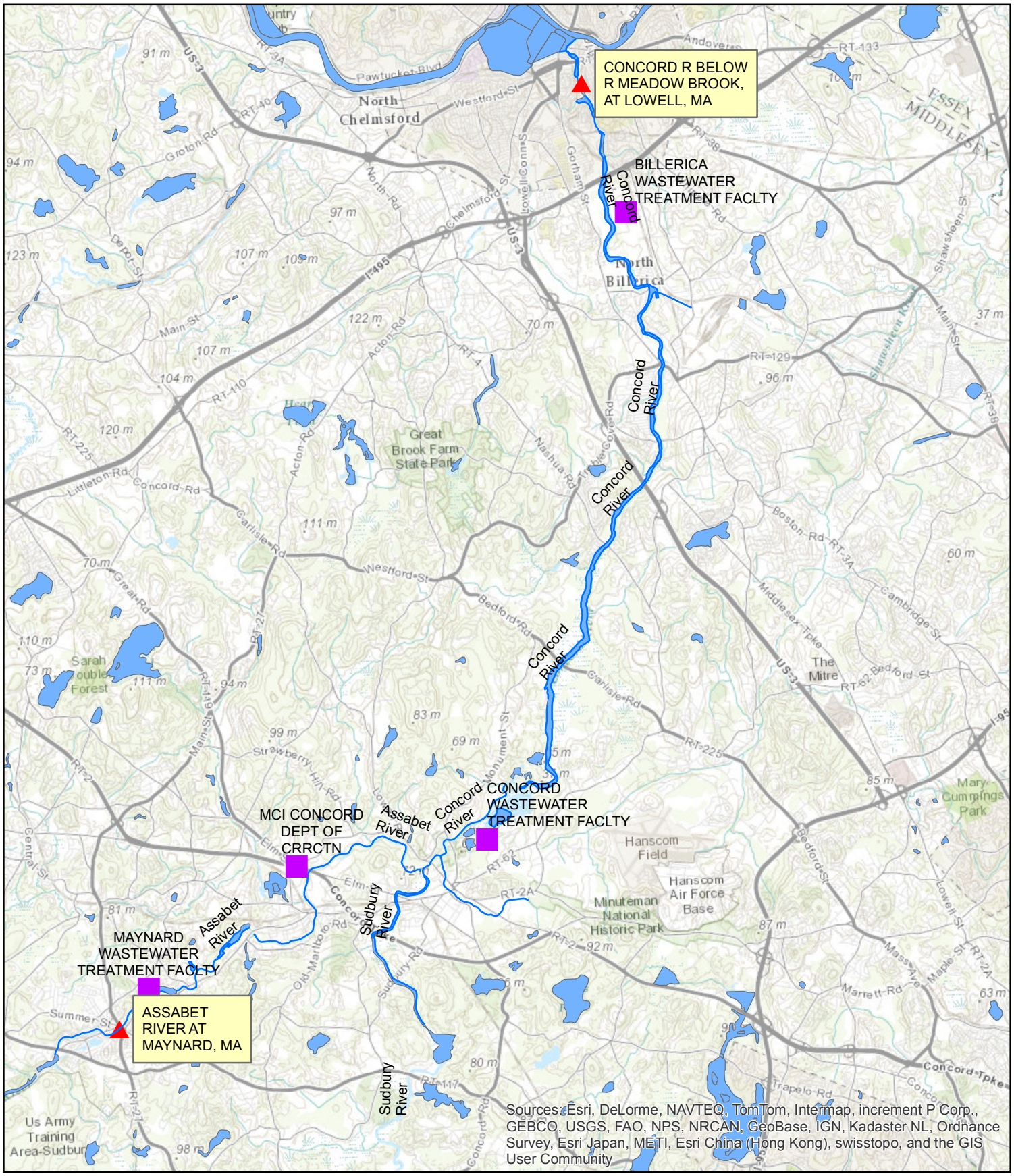
Under Section 301(b)(1)(C) of the CWA, discharges are subject to effluent limitations based on water quality standards. The MA SWQS require that EPA criteria established pursuant to Section 304(a)(1) of the CWA be used as guidance for interpretation of the following narrative criteria: All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife.

National studies conducted by the EPA have demonstrated that domestic sources contribute toxic constituents to POTWs. These constituents include metals, chlorinated solvents, aromatic hydrocarbons and others. Pursuant to EPA Region 1 and MassDEP policy, discharges having a dilution ratio between 10:1 and 20:1 require an acute toxicity limit of LC50 >100% and chronic toxicity testing four times per year. (See also "Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants", 49 Fed. Reg. 9016 March 9, 1984, and EPA's "Technical Support Document for Water Quality-Based Toxics Control", September, 1991.)

The current permit requires acute and chronic toxicity tests to be performed four times each year; in March, June, September, and December. The current permit also requires that the LC50 concentration exceed 100% effluent (i.e. 100% of effluent not cause mortality in more than 50% of test organisms), and that the Chronic C-NOEC (concentration of effluent that produces significant chronic effects in the test organism) be reported. From March 2008 through December 2010, there was one violation of the acute toxicity limit in June 2008, when the LC50 was 62% effluent.

The final permit reduces the frequency of whole effluent toxicity tests from quarterly to twice yearly. The permittee is required to conduct chronic and acute toxicity tests using the species *Ceriodaphnia dubia*, only. The acute toxicity endpoint, expressed as LC50, must equal or exceed 100% effluent. The reporting requirement for chronic toxicity is carried forward into the final permit. The tests must be performed in accordance with the test procedures and protocols specified in **Permit Attachment A**. The tests will be conducted twice per year, during the following months: March and September.

The final permit also requires reporting of certain metals in the 100% effluent sample. These are parameters that the permittee already measures and reports as part of the WET test. The requirement to report the parameters on the DMR will add these data to the compliance database and facilitate reasonable potential analyses for future permits.



Legend

Wastewater Treatment Facilities

USGS Streamgages

STATION_NM

ASSABET RIVER AT MAYNARD, MA

CONCORD R BELOW R MEADOW BROOK, AT LOWELL, MA

N

0 1 2 4 Miles

Figure 1
Concord WWTF
MA0100668 Response to Comments
7Q10 Map

EPA