City of Attleboro, Massachusetts Response To Comments

On August 16, 2006, the U.S. Environmental Protection Agency-Region 1 ("EPA") and the Massachusetts Department of Environmental Protection ("MassDEP") released for public comment a draft National Pollutant Discharge Elimination System ("NPDES") permit (No. MA0100595) for discharges of treated wastewater effluent from the City of Attleboro Water Pollution Control Facility ("WCPF") to the Ten Mile River in Massachusetts.

EPA received comments from the City of Attleboro ("City"), including from Anderson and Kreiger, LLP and Camp Dresser McKee ("CDM") on the City's behalf; the Rhode Island Department of Environmental Management ("RIDEM"); and the Massachusetts Riverways Program.

As a result of comments received from RIDEM, EPA proposed a revision to the draft permit's monthly average total phosphorus limit of 0.2 mg/l (effective April through October). EPA determined that a revision of the limit from 0.2 mg/l to 0.1 mg/l was necessary to assure that applicable water quality standards in Massachusetts and Rhode Island will be met. On August 1, 2007, EPA released a new draft permit reflecting this change for public notice and comment. EPA received additional comments on the modification from Anderson and Kreiger, CDM, NewStream LLC, and Riverways.

The following are responses to all comments received during the two public comment periods and descriptions of any changes made to the public-noticed permit and modification as a result of those comments.

MassDEP has issued a water quality certification pursuant to Section 401(a) of the Clean Water Act ("CWA"). While concluding that the conditions of the permit would achieve compliance with the CWA and the Massachusetts Clean Waters Act, the certification letter also included commentary on the technical, legal and policy rationales for draft permit's nutrients limits and specifically requested the inclusion of a compliance schedule to achieve the permit's total phosphorus limit of 0.1 mg/l. The issues raised by MassDEP in its certification letter are addressed at the end of this document under the heading "Section 401 Certification."

A copy of the final permit may be obtained by writing or calling David Pincumbe, United States Environmental Protection Agency, 1 Congress Street, Suite 1100 (CMP), Boston, Massachusetts 02114-2023; Telephone (617) 918-1695. Copies may also be obtained from the EPA Region 1 web site at http://www.epa.gov/region1/npdes/index.html.

The following comments were received from Anderson and Kreiger, on behalf of the City, in a letter dated September 14, 2006:

Comment #A.1: The Massachusetts Department of Environmental Protection (MassDEP) has not imposed the total nitrogen limit contained in the proposed permit. See Draft Permit, pp. 2, 4 and n. 9 ("This permit limit is a requirement of the U.S. Environmental Protection Agency (EPA) permit and is not a requirement of the Massachusetts Department of Environmental Protection (MassDEP) permit. . . ."). This permit is, as far as we know, the first instance where EPA has proposed stricter nitrogen limits upon a Massachusetts discharger than imposed by Massachusetts itself. This raises legal and policy issues arising from the interstate nature of the analysis.

The problem is exacerbated by the absence of total maximum daily load (TMDL) calculations or other reliable data supporting the downstream state's position here. EPA's draft permit ultimately rests upon an approach that the Clean Water Act (CWA) attempted to avoid, that Massachusetts regulators contest, and that science cannot justify. This raises additional legal, factual and policy issues under the CWA.

The City's first concern is that the total nitrogen limits are unwarranted as a scientific matter. To accept the Rhode Island Department of Environmental Management's (RIDEM) rationale in this case would establish an extremely unfortunate precedent for reliance upon unproven "science" and speculation.[1]

The CWA contemplated solid scientific support for imposing site-specific effluent limits upon publicly owned treatment works, with corresponding burdens upon ratepayers and taxpayers. Section 303(d) (33 U.S.C. § 1313(d)); 40 C.F.R. 130.7. Rhode Island was supposed to establish TMDLs for the receiving waters "at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality." *Id*.

RIDEM frankly acknowledges that it has been unable to develop a water quality model and a water quality restoration plan for the Providence and Seekonk Rivers. See "Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers", RIDEM, Office of Water Resources, December 2004 (Appendix, Tab 1) ("RIDEM 2004 Evaluation"):

[1] Requiring expenditures by Attleboro based upon this state of scientific knowledge is particularly ironic, where RIDEM has declined to devote resources needed to develop a water quality model and other predictive tools until a technical advisory committee recommends the most promising approach. RIDEM, Nutrient Permit Modifications – Response to Comments, pp. 16, 22, 29, included in Appendix, Tab 3. Meanwhile, municipalities including Attleboro are forced to expend resources in facilities upgrades without even knowing what the final requirements will look like and what cost savings might have been achieved if those final requirements had been known prior to committing those resources – precisely what RIDEM itself refuses to do.

> It has recently been determined that due to problems encountered when modeling the interaction between the deep channel and shallow flanks of these water bodies, the mass transport component of the model system cannot be successfully calibrated and validated . . . Because water doesn't mix in the model as it does in the rivers, we are unable to simulate the chemical and biological behavior of the system in the water quality phase of the modeling effort.
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> Our inability to adequately validate the mass transport model also prevents us from applying the Massachusetts approach to setting load allocations that uses ambient total nitrogen concentration as the indicator, which is described below.

Id., p. 1. See also RIDEM "2004 CWA § 303(d) List of Impaired Waters" [listing Ten Mile River as group 2: "(TMDL Planned)"; the target date is 2008]. Instead, RIDEM relies upon an experiment, conducted between May 1981 and September 1983 in a static laboratory system (consisting of nine tanks at the University of Rhode Island) by the Marine Ecosystems Research laboratory (MERL), which sampled chlorophyll-a, dissolved oxygen and – tellingly – DIN (dissolved inorganic nitrogen), rather than total nitrogen. *Id*. The problems with applying that experiment to the dynamic rivers and embayment systems at issue here go even beyond the obvious differences between a laboratory and a complex real-world system.[2]

CDM has identified many reasons why the RIDEM 2004 Evaluation fails to establish a scientific basis for imposing limits upon Attleboro that Massachusetts has not imposed. See CDM report, attached hereto as Exhibit A. It has also pointed out that there are many potential causes of low dissolved oxygen, beyond wastewater plant effluent.

MassDEP has also documented the uncertainties and inadequacies of the existing scientific knowledge, if used for permitting purposes. It did so in a letter dated February 11, 2004, and then in its February 8, 2005, review comments on RIDEM permits and supporting documents including the RIDEM 2004 Evaluation. See Appendix, Tab 2. Many of MassDEP's comments have gone unanswered. Its insistence upon solid science has not been effectively rebutted. It is probably no

[2] Even as it states the belief "that the MERL tank results provide an adequate representation of the relationship between nitrogen and oxygen levels in the Providence and Seekonk Rivers" the RIDEM 2004 Evaluation, p. 27, concedes that "some uncertainty remains regarding predicted water quality improvements and loading reductions necessary to meet water quality standards. As noted above, significantly lower mean DIN concentrations were observed in the Providence and Seekonk Rivers as compared to the MERL experiment for an equivalent loading rate, which may be the result of large differences between the field and experimental flushing times, uptake by macroalgae and denitrification in the bottom waters."

coincidence that MassDEP, which can apply water quality models, comes up with a different answer.

RIDEM was operating under a state legislative mandate to reduce nitrogen discharges by 50% by December 31, 2008. RIDEM, Nutrient Permit Modifications – Response to Comments, pp. 1, 3, citing RI Gen. Laws. § 46-12-2(f), Appendix, Tab 3. See also RIDEM "Plan for Managing Nutrient Loadings to Rhode Island Waters" (Feb. 1, 2005), Appendix, Tab 8. That mandate is a blanket reduction applicable to in-state facilities, not an applicable water quality standard, within the meaning of federal law. RIDEM has (understandably) acted upon this mandate (id.), which does not apply to Attleboro and can not be applied by EPA here. It would be error to require Attleboro to comply with RI Gen. Laws. § 64-12-2(f), but the draft permit would do just that (and more), because it derives from RIDEM's implementation of that statute. It is not a fair answer to assert (again without reliable scientific support) that "EPA has concluded that the amount of nitrogen reduction will be at least as great as required by the proposed permit level." See Fact Sheet, p. 11. EPA should not require public investment based upon uncertain science that easily may turn out to be superseded by the time the required construction is designed or even completed, requiring still more investment, a changed course of action and imposition of charges or taxes. Of course, if future science (or even the current facts cited by CDM) demonstrates that EPA has overstated the contribution of the Attleboro plant to low oxygen levels or other conditions, then the situation would be even worse.

Ultimately, RIDEM's selection of limits is not based upon science, let alone a TMDL. In its search for guidance from EPA, it has used the criteria that apply "if there are not adequate data and predictive tools to characterize and analyze the pollution problem ....". RIDEM 2004 Evaluation, Appendix, tab 1. This is essentially a correct admission about the lack of scientific support for RIDEM's approach – an approach that, as shown below, even RIDEM does not intend to implement for years, if ever. To be sure, the EPA guidance acknowledges that a "phased approach may be necessary", but RIDEM consciously delayed its modeling (see FN1, above) and then based its 2004 Evaluation upon implementation costs of certain approaches and the supposed water quality benefit that it presumes would result despite the lack of adequate data and predictive tools. On the supposed basis of cost-effectiveness, it selects 5 mg/l for four WWTPs and 8 mg/l for the others (including out-of-state plants), regardless of actual contribution to Rhode Island waters.[3] This is therefore **not a decision about relative contributions to problems within Rhode Island waters,** but,

[3] It rejected a suggestion to evaluate Massachusetts contributions after current upgrades are in place, but, in doing so, discussed only the Upper Blackstone facility – a red herring as far as Attleboro's ongoing upgrade is concerned. Moreover, by applying the same 8 mg/l limit to Rhode Island and Massachusetts facilities, it failed to account for the observation (RIDEM 2004 evaluation, p. 19) that "[i]n the Ten Mile river, the DIN discharge to the Seekonk River was found to be 61% of the concurrent load estimate from the Attleborough and North Attleborough WWTFs using 1995-1996 flows."

instead, is a crude means to postpone TMDLs and treat different discharges the same, regardless of location and attenuation before reaching affected waters.

Response #A.1: Section 301(a) of the CWA prohibits the discharge of any pollutant into a navigable body of water unless the point source has obtained an NPDES permit. Section 402 establishes the NPDES permitting regime, and describes two types of permitting systems: state permit programs that must satisfy federal requirements and be approved by the EPA, and a federal program administered by the EPA. As the Commonwealth of Massachusetts has never obtained authorization from EPA to administer the federal NPDES program, EPA is responsible for development and issuance of NPDES permits to point sources in Massachusetts. While the State of Rhode Island has sought and obtained such authority from EPA, Rhode Island's authority to issue NPDES permits pertains to discharges into navigable waters in its jurisdiction. *See* CWA § 402(b). In this matter, EPA, not Massachusetts or Rhode Island, is responsible for development and issuance of an NPDES permit that meets all applicable requirements of the CWA and EPA's regulations.

The Act and EPA's regulations require EPA to condition any permit to ensure compliance with applicable water quality standards of the state where the discharge originates *and* the standards of any downstream affected state. Pursuant to section 301(b)(1)(C) of the CWA, a permit must, among other things, contain limitations necessary to achieve water quality standards established by a state and approved by EPA pursuant to section 303 of the CWA. Limitations must control all pollutants and pollutant parameters that can be shown will cause, have the reasonable potential to cause, or will contribute to an excursion above numeric or narrative state water quality criteria. Section 401(a)(2) of the CWA and 40 C.F.R. § 122.44(d)(4) explicitly direct EPA to consider the views of a downstream state concerning whether a discharge would result in violations of the state's water quality standards. If EPA agrees a discharge would cause or contribute to such violations, EPA must condition the permit to ensure compliance with those standards.[4] *See also* 40 C.F.R. § 122.4(d) (prohibiting issuance of an NPDES permit "[w]hen the imposition of conditions cannot ensure compliance with applicable water quality requirements of all affected States").

Neither the CWA nor EPA regulations require that a TMDL be completed before a water quality-based limit may be included in an NPDES permit. Rather, water quality- based effluent limitations in NPDES permits must be "consistent with the assumptions and requirements of any *available* [emphasis added] wasteload

[4] Although EPA administers the NPDES program, Massachusetts maintains separate, independent water pollution control permitting authority under state law. *See* Mass. Gen. Laws Ann. Ch. 21, § 43. EPA and the Commonwealth typically coordinate their respective permitting efforts; when the Region issues an NPDES permit in Massachusetts, MassDEP typically issues a permit pursuant to state law. Although these permits are often identical, there is no legal requirement for them to be the same. Unlike an NPDES permit, a Massachusetts surface water discharge permit is not required to comply with the water quality standards of downstream states.

allocation." 40 C.F.R. § 122.44(d)(1)(vii)(B). Thus, an approved TMDL is not a precondition to the issuance of an NPDES permit for discharges to an impaired waterway. This interpretation is consistent with the preamble to 40 C.F.R. § 122.44(d)(1), which expressly outlines the relationship between subsections 122.44(d)(1)(vi) (*i.e.*, procedures for implementing narrative criteria), and (d)(1)(vii):

> The final point about paragraph (vi) is that in the majority of cases where paragraph (vi) applies waste load allocations and total maximum daily loads will not be available for the pollutant of concern. Nonetheless, any effluent limit derived under paragraph (vi) must satisfy the requirements of paragraph (vii). Paragraph (vii) requires that all water quality-based effluent limitations comply with "appropriate water quality standards," and be consistent with "available" waste load allocations. Thus for the purposes of complying with paragraph (vii), where a wasteload allocation is unavailable, effluent limits derived under paragraph (vi) must comply with narrative water quality criteria and other applicable water quality standards.

See 54 Fed. Reg. 23,868, 23,876 (June 2, 1989). If a TMDL is completed and approved by EPA, the effluent limitation in any subsequently issued NPDES permit must be consistent with the wasteload allocation assigned to the Attleboro facility. In the meantime, relevant regulations *require* that EPA include an effluent limit for any pollutants which EPA determines "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality." 40 C.F.R. § 122.44(d)(1)(i).

The nitrogen limit in this permit is based upon an application of the requirements of the federal CWA and has been imposed to meet Rhode Island's water quality standards.[5] Rhode Island, like most states, has not yet developed statewide numeric total nitrogen criteria or numeric response variable criteria, nor has

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[5] The Attleboro WPCF discharges to the Ten Mile River about 200 yards from the Rhode Island border. *See* Attachment 1. The nitrogen limit is not required to meet Massachusetts' water quality standards, because the portions of the Ten Mile River within Massachusetts that receive nitrogen effluent discharges from the Attleboro facility are comprised of freshwater. Phosphorus is the limiting nutrient for the purposes of cultural eutrophication in freshwater systems, while nitrogen plays that role in marine systems. Both the NPDES permit and the Massachusetts state permit contain identical phosphorus effluent limits to address cultural eutrophication in this stretch of the Ten Mile River. After crossing the Massachusetts/Rhode Island border at Pawtucket, the Ten Mile River continues through East Providence, and ultimately discharges to the Seekonk River about 8 miles downstream of the Attleboro discharge. The Seekonk River is a marine water, where nitrogen impacts pose the primary threat to water quality and are required to be controlled to ensure compliance with Rhode Island water quality standards. Rhode Island has listed the Seekonk River as impaired for nutrients, low dissolved oxygen and excess algal growth/chlorophyll *a*. The Seekonk River joins the Providence River, which ultimately discharges into Narragansett Bay.

Rhode Island developed site-specific numeric criteria for total nitrogen or response variables for Narragansett Bay. Until such numeric criteria values are available, EPA must base effluent limits on its interpretation of the narrative criteria in the currently approved water quality standards. *See* Rhode Island Water Quality Regulations, Rule 8(D)(1)(d) and Table 2, Rule 8(D)(3)(10). Water quality-based effluent limits imposed through NPDES permits must ensure that all components of water quality standards are achieved. *See* CWA § 301(b)(1)(C); 40 C.F.R. §§ 122.4(d), 122.44(d)(1).

EPA has determined that discharges of nitrogen from the Attleboro WPCF cause or contribute to violations of Rhode Island's water quality standard for nitrogen. The Seekonk River is listed on the Rhode Island's 2004 and 2006 CWA § 303(d) Lists of Impaired Waters as a water impaired due to excess nutrients, low dissolved oxygen, and excess algal growth/chlorophyll *a*. The need for nitrogen limits is based on an extensive amount of water quality/use impairment data and scientific knowledge regarding the environmental impacts of excessive nitrogen loadings on the receiving waters. For many years, it has been recognized that Rhode Island and Massachusetts municipal wastewater treatment facilities are a significant source of nutrients to the Seekonk River, Providence River and Upper Bay. *See, e.g., Plan for Managing Nutrient Loadings to Rhode Island Waters*, RIDEM, February 1, 2005; *Governor's Narragansett Bay and Watershed Planning Commission, Nutrient and Bacteria Pollution Panel, Initial Report*, March 2, 2004 at page 3 (summarizing studies). In addition, certain facilities (including Attleboro) discharge to the most impaired reaches at the head of Upper Narragansett Bay. *2005 RIDEM Report* at page 3.

In this case, neither a dynamic water quality model nor a TMDL was available to EPA, and neither is expected to be available in the foreseeable future. Since 1995, RIDEM has expended significant resources in an attempt to simulate this complex ecosystem through the use of mathematical models. Some of these efforts are summarized in the 2005 RIDEM Report. Several unsuccessful attempts at dynamically modeling this system have resulted in the conclusion that the system is too complicated to simulate with available mathematical models.

When imposing an effluent limit on a particular point source in order to implement a narrative water quality criterion, EPA is not required to have a TMDL, a dynamic water quality model, or comparable analysis that comprehensively allocates loads to all point and nonpoint pollutant sources that are contributing to an impairment. Instead, when calculating a numeric permit limit to achieve a narrative criterion, EPA is directed (in relevant part) to use one or more of the following methodologies:

> (A) Establish effluent limits using a calculated numeric water quality criterion for the pollutant which the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and will fully protect the designated use. Such a criterion may be derived

using a proposed State criterion, or an explicit State policy or regulation interpreting its narrative water quality criterion, supplemented with other relevant information which may include: EPA's Water Quality Standards Handbook, October 1983, risk assessment data, exposure data, information about the pollutant from the Food and Drug Administration, and current EPA criteria documents; or

(B) Establish effluent limits on a case-by-case basis, using EPA's water quality criteria, published under section 304(a) of the CWA, supplemented where necessary by other relevant information[.]

40 C.F.R. §§ 122.44(d)(1)(vi)(A), (B). EPA is clearly authorized, even in technically and scientifically complex cases, to base its permitting decision on a wide range of relevant material, including EPA technical guidance, state laws and policies applicable to the narrative water quality criterion, and site-specific studies. Nothing in the foregoing regulation, or its preamble, suggests that EPA is required to await the completion of approved TMDLs or dynamic water quality models as predicates to imposing a water quality-based effluent limit.[6]

In the absence of a dynamic model or TMDL, EPA relied on the best information reasonably available to it to establish the permit limit for nitrogen. The agency considered more than 15 years of water quality data, studies and reports evaluating nitrogen levels and response variables in Narragansett Bay. These materials included EPA's *Nutrient Criteria Technical Guidance Manual: Estuarine and Coastal Marine Waters* (EPA, October 2001) and a variety of site-specific reports commissioned by Rhode Island to address nitrogen loading and control the effects of cultural eutrophication in the receiving waters. *See, e.g., Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers* (December 2004); *Plan for Managing Nutrient Loadings to Rhode Island Waters* (RI-DEM, February 1, 2005); *Nutrient and Bacteria Pollution Panel – Initial Report* (Governor's Narragansett Bay and Watershed Planning Commission, March 3, 2004); and *Massachusetts Estuaries Project –*

[6] In keeping with the regulation, EPA does not believe that any one source of information should necessarily be given definitive weight, nor does it believe that the absence of a particular information source should necessarily preclude EPA from establishing an effluent limit. The approach of utilizing available guidance and materials generated by the EPA and States, as supplemented by other information reasonably available at the time of permit reissuance, makes sense in light of federal regulations requiring EPA to include requirements that will achieve state water quality standards when reissuing a permit and prohibiting issuance of a permit when the imposition of conditions cannot ensure compliance with the applicable state water quality requirements of all affected States. *See* 40 C.F.R. §§ 122.4(d), 122.44(d)(1). The alternative proposed by the commenter—to forego imposition of permit limits that would mitigate water quality impacts while awaiting complex TMDLs and dynamic mathematical models that may take years to complete, if competed at all—would forestall water quality improvements and would be inconsistent with EPA's regulatory obligations. Although the commenter regards this overall approach as flawed and argues that EPA should have waited to act until more definitive and comprehensive analyses became available, EPA disagrees and believes its reliance on the regulations and the best technical and scientific material reasonably available at the time of reissuance is reasonable.

Site-Specific Nitrogen Thresholds for Southeastern Massachusetts Embayments: Critical Indicators, July 21, 2003 as revised).

In addition, EPA relied on the results of a physical water quality model operated by the Marine Ecosystems Research Laboratory (MERL) at the University of Rhode Island that was designed to predict the relationship between nitrogen loading and several trophic response variables in the Narragansett Bay system. In establishing the nitrogen limit in this permit, and evaluating the MERL model, EPA also considered actual measurements of nitrogen loadings from point source discharges, including a 1995-96 study by RIDEM Water Resources.

The City criticizes EPA's reliance on a physical model in lieu of a mathematical model. EPA, however, determined that reliance on this model was reasonable. In light of the extreme technical difficulty of constructing an accurate fate and transport model that would allow EPA to predict with certainty the precise downstream impacts of nitrogen loading from the facility, EPA turned to the simplifying ground rules and assumptions reflected in the MERL model to guide and rationalize its decision making.[7] In addition, EPA's guidance document *Nutrient Criteria Technical Guidance Manual, Estuarine and Coastal Marine Waters* cites the MERL experiments as compelling evidence that nitrogen criteria are necessary to control enrichment of estuaries. Specifically, the guidance states:

> "Three case studies provide some of the strongest evidence available that water quality managers should focus on N for criteria development and environmental control (see NRC 2000 for details). One study involves work in large mesocosms by the University of Rhode Island (Marine Ecosystem Research Laboratory–MERL) on the shore of Narragansett Bay. Experiments showed that P addition was not stimulatory, but N or N+P caused large increases in the rate of net primary production and phytoplankton standing crops. (Oviatt et al. 1995)."

In arriving at its determination to rely on the MERL model, EPA also considered the need to expeditiously address the severe existing nitrogen-driven cultural eutrophication in the receiving waters. In the time that RIDEM has been attempting to develop a dynamic model, the Seekonk/Providence River system and waters downstream have continued to suffer from the effects of severe cultural eutrophication, so EPA could not justify further delaying the permitting process on the chance that a numerical model would be forthcoming.[8] Moreover, the tendency for nitrogen to not only exacerbate existing water quality impairments but to persist in the environment in a way that contributes to future water quality problems counsels in favor of imposing such a limit on Attleboro's discharge based on information currently available to EPA. Finally, EPA notes

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[7] RIDEM has also embraced the model as a basis to impose permit limits on Rhode Island facilities to control the effects of cultural eutrophication.

[8] These adverse affects have included fish kills (see www.dem.ri.gov/bart/fishkill.htm).

that the permit was last issued to the facility in 1999, has expired, and has been administratively continued for several years.

The MERL enrichment gradient experiment included a study of the impact of different loadings of nutrients on dissolved oxygen and chlorophyll *a*. *See Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers*, RIDEM, December 2004. The MERL enrichment gradient experiments were conducted from June 1981 through September 1983 and consisted of 9 tanks (mesocosms), each 5 meters deep and 1.83 meters in diameter. Three tanks were used as controls, and were designed to have regimes of temperature, mixing, turnover, and light similar to a relatively clean Northeast estuary with no major sewage inputs. The remaining six mesocosms had the same regimes, but were fed reagent grade inorganic nutrients (nitrogen, phosphorus and silica) in molar ratios found in Providence River sewage. The six mesocosms were fed nutrients in multiples of the estimated average sewage inorganic effluent nutrient loading to Narragansett Bay. For example the 1X mesocosm nitrogen loading was 2.88 mM N/m^2/day (40 mg/ m^2 /day) and the 2X was twice that and so on (4X, 8X, 16X) up to the a maximum load of 32X. During the study dissolved oxygen, chlorophyll, pH, and dissolved inorganic nutrients were measured in the water column and benthic respiration was also measured. From the collected data the investigators produced times series for oxygen, pH, temperature, nutrients, chlorophyll, and system metabolism (see *Patterns of productivity during eutrophication: a mesocosm experiment*, Oviatt, Keller, Sampou, Beatty).

Both the MERL tank experiments and the data from the Providence/Seekonk River system indicate a clear correlation between nitrogen loadings, dissolved oxygen impairment and chlorophyll *a* levels. Low dissolved oxygen levels, as well as supersaturated dissolved oxygen levels, are indicators of cultural eutrophication. Figures 1 through 3 in the *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers* show the dissolved oxygen measurements taken from MERL tank experiment and demonstrate that the range and variability of DO increases with increased nutrient loading. As described in the text of the report, and shown in Figure 13, the DO in the Seekonk River showed patterns of DO variability similar to that of the high enrichment tanks in the MERL experiments.

Phytoplankton, as measured by chlorophyll *a* levels, is an even stronger response indicator of cultural eutrophication than DO. Coastal areas without high nutrient loads are expected to have chlorophyll *a* levels in the 1 to 3 ug/l range (*Nutrient Criteria Technical Guidance Manual – Estuarine and Coastal Marine Waters*, USEPA, October 2001). Massachusetts has identified chlorophyll *a* levels of less than 3 ug/l as representing excellent water quality and chlorophyll *a* levels similar to the levels in the Providence/Seekonk River system as representing significantly impaired waters (*Massachusetts Estuaries Project – Site-Specific Nitrogen Thresholds for Southeastern Massachusetts Embayments: Critical*

Indicators, July 21, 2003 as revised). Peak chlorophyll *a* levels in the Providence/Seekonk River system have exceeded 200 ug/l (see June 29th data in Figure 15 of *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers*). The MERL tank experiments showed a correlation between nitrogen loading rates and chlorophyll *a* levels (see Figures 7, 8, and 9). These results were consistent with RIDEM data from 1995-96, which indicate that mean photoplankton chlorophyll *a* levels in the three Seekonk River monitoring stations ranged from 14 ug/l to 28 ug/l, with the highest levels in the upper reaches of the river and the lowest levels in the lower reaches of the river (see Table 3). These chlorophyll *a* levels correlate with total nitrogen levels and with the dissolved inorganic nitrogen levels shown in Figure 3.

The basic relationship demonstrated by the MERL tank experiments between the primary causal and response variables relative to eutrophication corresponds to what is actually occurring in the Providence/Seekonk River system.[9] EPA recognized, however, that the MERL tank experiments cannot completely simulate the response of chlorophyll *a* and dissolved oxygen to nitrogen loadings in a complex, natural setting such as the Providence/Seekonk River system, and thus does not yield a precise level of nitrogen control required to restore uses in the system. For example, dissolved oxygen in Narragansett Bay is influenced by stratification, which was not simulated in the MERL tank experiment, in which waters were routinely mixed. In a stratified system there is little vertical mixing of water, so sediment oxygen deficits are exacerbated due to the lack of mixing with higher DO waters above. In addition, the flushing rate used in the MERL tanks is not the same as seen in the Bay. The model's lack of stratification could result in it being significantly less conservative than the natural environment. On the other hand, the failure of the model to mirror the flushing rates in Narragansett Bay could render it overly conservative when compared to natural conditions, but to what degree is unclear. Because the physical model does not generate a definitive level of nitrogen control that can be applied to a real world discharge, but instead a range of loading scenarios which are subject to some scientific uncertainty, EPA was required to exercise its technical expertise and scientific judgment based on the available evidence when translating these laboratory results and establishing the permit limit.

Of the various loadings scenarios available to it, EPA determined that a concentration-based limit of 8 mg/l would be necessary to address the excessive loadings from the facility, which both EPA and Rhode Island have determined are contributing to ongoing water quality impairments in the Narragansett Bay system. An effluent limit of 8 mg/l corresponds to a loading scenario in the Seekonk River of approximately 6.5X at current facility flows and 10X at 90% design flows. *See* Evaluation of Nitrogen Target and WWTF Load Reductions for the Providence and Seekonk Rivers, RIDEM, December 2004 at 28. *See also*

[9] The correlation between nitrogen loadings, chlorophyll *a* levels, and dissolved oxygen impairment is well documented in the *Nutrient Criteria Technical Guidance Manual – Estuarine and Coastal Marine Waters*, USEPA, October 2001.

Attachment 12. Despite the severe nitrogen-related impairments in the receiving waters, EPA opted not to impose a limit based on more stringent loading scenarios at this time in order to account for uncertainties associated with the physical model. (Based on the MERL tank experiments, a nitrogen loading of between 2 times and 4 times the Bay wide loading may be necessary to achieve water quality standards). Even with the recognition of differences between the laboratory and natural environment, the fact that water quality responses to a 10X nitrogen mass loading scenario in the MERL tank experiments resulted in a significant level of impairment was an area of concern for EPA in light of its duty under section 301(b)(1)(C) to ensure compliance with water quality standards. However, when evaluating the adequacy of the limit, EPA was also aware that the particular approach it adopted possesses conservative elements which enhance the protectiveness of the permit beyond that of the 10X mass loading scenario. Specifically, the decision by EPA to impose concentration rather than mass limits will assure that effluent nitrogen concentrations are maintained at consistently low levels and, as a practical matter, will result in actual mass loadings that are kept significantly below the 10X loading scenario for the foreseeable future, as treatment plant flows remain well below the facility's design flow of 8.6 MGD.[10]

When establishing the limit and assessing its protectiveness, EPA took into account the fact that RIDEM has committed to ensuring adequate monitoring and assessment of water quality changes to determine if additional reductions will be necessary to meet water quality standards. RIDEM has, in partnership with several research and academic institutions in Rhode Island, established an extensive monitoring network in order to provide the data necessary to evaluate compliance with water quality standards upon implementation of the recommended nitrogen reductions (*see* RIDEM**,** February 1, 2005 report). This information will be available to check the Region's assumptions regarding the adequacy of the limit. If EPA has erred in navigating the scientific complexities and uncertainties associated with the MERL tank experiments, EPA will be able to further refine the limit in future permitting cycles.

When evaluating whether it had met its obligations under section 301(b)(1)(C) and 401(a)(2) to ensure compliance with applicable water quality standards, including those of affected states, EPA also accounted for the fact that Rhode Island, when assigning permit limits to facilities within its own borders in accordance with its own water quality standards, did not conclude more stringent limits would be necessary or appropriate at this time. Under Rhode Island's permitting approach, limits of 8 mg/l and 5 mg/l have been imposed on various Rhode Island POTWs whose discharges impact Narragansett Bay, and Rhode Island has recommended that similar limits be placed on certain Massachusetts facilities that are impacting the Bay. *See Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers*, RI DEM,

[10] Treatment facility flows have been generally stable in recent years. Annual average flow was 4.7 MGD for 1997, 5.0 MGD for 2000, 5.0 MGD for 2001, 5.0 MGD for 2002, 5.8 MGD for 2003, 4.6 MGD for 2004, 3.3 MGD for 2005, 3.4 MGD for 2006 and 4.2 MGD for 2007.

December 2004. In arriving at its decision to impose nitrogen effluent limit of 8 mg/l on the Attleboro WPCF, EPA regarded Rhode Island's position as additional evidence that the limit was reasonable and sufficiently stringent to comply with the CWA.

EPA in addition determined that no less stringent limit could be imposed that would still ensure compliance with water quality standards in light of the severe existing eutrophic conditions in the Providence/Seekonk River system, indicating that it is significantly overallocated for nitrogen. In so concluding, EPA also weighed the fact that RIDEM has indicated that nitrogen limits as low as the limits of technology (*i.e.*, 3 mg/l) may be necessary to achieve water quality standards, with the caveat that it too has acknowledged uncertainty in the model. *See Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers*, RIDEM, December 2004, at p. 27. [11]

Contrary to the commenter's suggestion, in establishing the nitrogen limit, EPA did take into account specifics regarding Attleboro's discharge, including the location of its discharge and its relative contribution to the Seekonk River system, in developing the limits. Both EPA and RIDEM have established or proposed nitrogen limits of 5.0 mg/l for facilities contributing the largest amount of nitrogen to the upper reaches of the Seekonk River system, where the greatest level of impairment has been documented. These include one facility in Massachusetts (Upper Blackstone Water Pollution Abatement District, currently proposed in draft) and two facilities in Rhode Island.[12] To show the relative contribution of POTW discharges to the Seekonk River, EPA calculated the total DIN load to the River using the effluent DIN limits recommended by RIDEM technical evaluation and EPA. The calculations were made using 90 percent of the POTWs' design flows and the suggested permit concentration limits. The resulting loads were then calculated under two scenarios, one assuming no attenuation and the other using the attenuation rates calculated by RIDEM (13 percent for Blackstone River dischargers and 40 percent for the Ten Mile River discharges). *See* Attachment 11. Under the no-attenuation scenario, Attleboro's load would be roughly equal to Woonsocket's, due to Attleboro's higher proposed

[11] In general, the Region adopts a reasonably conservative approach when permitting nutrient discharges. This protective approach is appropriate because, once begun, the cycle of eutrophication can be difficult to reverse given the tendency of nutrients to recycle through the ecosystem. This approach is in line with EPA regulations. The Region is required to impose a limit where the reasonable *potential* exists for violations of water quality standards. *See* 40 C.F.R. § 122.44(d)(1),(5). Moreover, such a limit must *ensure* compliance with water quality standards. This approach is also consistent with EPA nutrient guidance. For example, in the context of section 303(d) listing decisions, EPA's 2001 Nutrient Criteria Development Memorandum, recommends (at p. 19) that listing should "ideally occur prior to highly visible responses such as algal blooms to facilitate a more proactive approach to management[,]" and states should "consider excessive levels of nitrogen and phosphorus as a basis for listing regardless of the status of early response variables such as chlorophyll *a* or turbidity."

[12] All of the Rhode Island facilities receiving a limit of 8.0 mg/l discharge either into the Providence River, downstream of the Ten Mile confluence or in the lower Bay, where the flushing rate is higher and the impacts less severe.

limit, even though Woonsocket has a much higher design flow, with each discharge representing about 12 percent of the total loading POTW loading to the Seekonk River. Using attenuation, Attleboro's contribution to the total load falls to 9 percent with Woonsocket's increasing to 13 percent, given the different attenuation rates. As we have discussed previously, we expect the attenuation in the Ten Mile River to decrease as the phosphorus-driven algae growth decreases in the future.

While the Attleboro facility discharges into the area experiencing the greatest impairment (Seekonk River), it is a smaller facility than the three facilities with 5 mg/l limits referred to above, and therefore EPA has imposed a less stringent limit on it, which has resulted in having the same relative loading as the Woonsocket facility (before accounting for attenuation), which has a design flow about twice Attleboro's.

The City understandably expresses concern about the need to expend resources for facilities upgrades without knowing whether future permit limits will be different. This is in part a function of the NPDES permitting program, which requires EPA to reassess permit limits and water quality conditions based on information available at the time of permit reissuance. While the cost to implement treatment is not one of the factors set forth in the CWA or EPA's regulations related to the establishment of water quality-based effluent limits, EPA appreciates and acknowledges the City's concerns. The current limit of 8 mg/l is readily achievable with existing technology (see *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers*, RI DEM, December 2004 and Chesapeake Bay Program website (http://www.chesapeakebay.net/ecoanalyses.htm). It is EPA's judgment that future limits will not be less stringent than 8 mg/l total nitrogen. Should more stringent limits ultimately be needed after assessing the receiving water response to the proposed load reductions, additional nitrogen removal technologies can be added to the technology implemented to meet the limit in this permit. This should minimize any potential for the permittee to expend funds unnecessarily. In addition, EPA anticipates establishing a reasonable schedule in a separate administrative order for design and implementation of treatment necessary to meet the new permit limits. As is our usual practice, EPA will consult with the City in development of that schedule.

EPA did not base its permit limit on Chapter 46-12 of the RI General Laws. The City incorrectly suggests, however, that EPA should not in development of effluent limits for this permit consider water quality reports and studies generated by RIDEM in connection with that law related to restoring uses in the Narragansett Bay system. While EPA recognizes its independent obligation to establish protective permit limits, it is fully appropriate for EPA to consider the technical reports generated by RIDEM in development of the nitrogen limits for this permit. As noted above, the CWA explicitly directs EPA to consider the

views of a downstream state concerning whether a discharge would result in violations of the state's water quality requirements.

In its comment above, the City generally references comments prepared by its consultant, CDM, that relate to the 2004 RIDEM Evaluation. The City also appends to its comments a letter dated September 13, 2006, from CDM. Finally, the City indicates that CDM has pointed out many potential causes of low dissolved oxygen in addition to wastewater plant effluent. EPA addresses the comments offered by CDM and reflected in CDM's September 13, 2006 letter in section B below.

The City also references and appends comments from MassDEP submitted to RIDEM during the public notice period on four permits issued by RIDEM – Fields Point, Bucklin Point, Woonsocket and East Providence WWTFs. (It appears that MassDEP's letter was incorrectly dated February 11, 2004 instead of February 11, 2005. The "February 11, 2004" letter includes an attachment dated February 8, 2005.) The City also appends to its comments RIDEM's responses to MassDEP. The City generally notes that "[m]any of MassDEP's comments have gone unanswered" and that MassDEP "comes up with a different answer." The City does not, however, specify which comments it believes were incompletely addressed by RIDEM and how the failure to address these issues specifically relates to the Attleboro permit. EPA cannot therefore offer a meaningful response.

Comment #A.2: The interstate nature of the problem exacerbates the scientific, policy and legal difficulties. EPA contemplates the highly unusual step of promulgating a nitrogen limitation for a Massachusetts facility that MassDEP has declined to impose. There is no total nitrogen limits issue here under Section 401(a)(1) [33 U.S.C. § 1341(a)(1)] of the Clean Water Act, as Massachusetts has not required those limits to comply with the water quality standards of the state where Attleboro's discharge originates.

The total nitrogen limits therefore must be justified, if at all, under Section 401(a)(2) [33 U.S.C. § 1341(a)(2)] and 40 C.F.R. § 122.44(d), relating to conditions in NPDES permits that will ensure compliance with the "applicable water quality requirements" of a "downstream affected state", namely Rhode Island. By now, such standards should be reflected in TMDLs. As a downstream state, Rhode Island has no authority to regulate the Massachusetts waters where the Attleboro plant discharges; the only question concerns the effect of the Massachusetts discharge once it reaches affected Rhode Island waters. See Arkansas v. Oklahoma, 503 U.S. 91 (1992) (downstream state's water quality standards are not applicable where any pollutants in the upstream discharge are not detectable at and within the downstream state's borders). In this context, EPA must determine what state-law standards are "applicable." Id., 503 U.S. at 110. "[T]reating state standards in interstate controversies as federal law accords

with the Act's purpose of authorizing the EPA to create and manage a uniform system of interstate pollution regulation." Id.

Conversely, a non-TMDL system that imposes speculative burdens -- and does so disproportionately upon attenuated discharges originating out of state -- would be discriminatory and contrary to congressional mandate. Where, as argued below, the Attleboro draft permit limits are more stringent with regard to Rhode Island waters than the limits that RIDEM has applied in word and deed, the permit limits contravene the legislative purpose of uniformity.

Though in a different factual context, the Supreme Court has specifically cautioned against excessive application of the downstream state's regulations:

> If every discharge that had some theoretical impact on a downstream State were interpreted as 'degrading' the downstream waters, downstream States might wield an effective veto over upstream discharges.

Arkansas, 503 U.S. at 111. The parallel concern in this case is that, if Rhode Island can require greater dilution *within its waters* from out-of-state dischargers than from in-state ones, it can shift a disproportionate responsibility and expense of improving its water quality onto those who lack a political voice in Rhode Island's choices. As a matter of policy, fairness and law, EPA must not allow that to occur here and therefore must withdraw the total nitrogen permit limits proposed in the draft permit.

As argued extensively below, Attleboro's concern about even-handed treatment is heightened by the level of speculation and scientific uncertainty underlying Rhode Island's determinations and by Rhode Island's willingness to substitute higher interim nitrogen limits in place of its nominal discharge limits for Rhode Island facilities, for many years, until more is known.

Response #A.2: While we agree that this is a section 401(a)(2) issue, there is no basis for suggesting that a TMDL is necessary in order to issue an NPDES permit with a water quality-based limit for nitrogen, for the reasons discussed above.

In this case, the effluent limit for nitrogen is needed to meet Rhode Island's water quality standards but is not necessary to meet Massachusetts' water quality standards. (See Response #A.1 above). Rhode Island's Water Quality Standards (Regulation EVM 112-88.97-1, June 2000) establish designated uses of the State's waters, criteria to protect those uses, and an antidegradation provision to ensure that existing uses and high quality waters are protected and maintained. As is detailed in the Fact Sheet and Response #A.1, following the discharge from the Attleboro facility, the Ten Mile River discharges to the Seekonk River in Rhode Island. The Seekonk River is a marine water (seawater) designated as a Class SB1. Designated uses include primary and secondary contact recreational activities and fish and wildlife habitat. *See* Rhode Island Water quality

Standards Rule 8(B)(2)(c). Rhode Island has listed the Seekonk River on the State's 2004 and 2006 CWA 303(d) List of Impaired Waters as a water impaired due to excess nutrients, low dissolved oxygen, and excess algal growth/chlorophyll *a*.

Applicable water quality criteria include the following:

> At a minimum, all waters shall be free of pollutants in concentrations or combinations or from anthropogenic activities subject to these regulations that:
>
> i. Adversely affect the composition of fish and wildlife;
> ii. Adversely affect the physical, chemical, or biological integrity of the habitat;
> iii. Interfere with the propagation of fish and wildlife;
> iv. Adversely alter the life cycle functions, uses, processes and activities of fish and wildlife....

Rule 8(D)(1)(a) (General Criteria).

In addition, all waters shall be free from pollutants in concentrations or combinations that:

> i. Settle to form deposits that are unsightly, putrescent, or odorous to such a degree as to create a nuisance, or interfere with the existing or designated uses;
> ii. Float as debris, oil, grease, scum or other floating material attributable to wastes in amounts to such a degree as to create a nuisance or interfere with the existing or designated uses;
> iii. Produce odor or taste or change the color or physical, chemical or biological conditions to such a degree as to create a nuisance or interfere with the existing or designated uses….

Rule 8(D)(1)(b) (Aesthetics).

> The dissolved oxygen shall be "not less than 5 mg/l at any place or time, except as naturally occurs. Normal seasonal and diurnal variations which result in *insitu* concentrations above 5.0 mg/l not associated with cultural eutrophication will be maintained in accordance with the Antidegradation Implementation Policy."

Table 2, Rule 8(D)(3)(1).

> There shall be no nutrients "in such concentration that would impair any usages specifically assigned to said Class, or cause undesirable or nuisance aquatic species associated with cultural eutrophication." Nutrients "shall not exceed site-specific limits if deemed necessary by

> the Director to prevent or minimize accelerated or cultural eutrophication. Total phosphorus, nitrates and ammonia may be assigned site-specific permit limits based on reasonable Best Available Technologies."

Table 2, Rule 8(D)(3)10; see also Rule 8(D)(1)(d).

Additional relevant regulations include Rules 9(A) and 9(B), which prohibit discharges of pollutants which alone or in combination will likely result in violation of any water quality criterion or interfere with one or more existing or designated uses, and prohibit discharges that will further degrade waters which are already below the applicable water quality standards.

The United States Supreme Court's decision in *Arkansas v. Oklahoma*, 503 U.S. 91 (1992), supports EPA's permit issuance in this matter. Among other things, the Court described as "permissible and reasonable" EPA's view that, in issuing a permit to a source in one state, EPA must apply the water quality standards of a downstream affected state. *Id*. at 104. As the City notes, the factual context of that permit was different involving, among other things, construction of the downstream affected state's anti-degradation provision. Moreover, the impact on Rhode Island waters as a result of discharges from the Attleboro WPCF is far from theoretical or imperceptible. The Attleboro facility is about 200 yards from the Rhode Island border and from May through October 2007 discharged an average load of over 900 lbs per day of total nitrogen into the receiving waters.

We disagree that the permit limit imposed is speculative or that limits have been imposed disproportionately upon attenuated discharges from Massachusetts (see Response #A.1). Rhode Island facilities discharging to the same general area as the Attleboro discharge have been given nitrogen limits of 5.0 mg/l. Furthermore, attenuation rates that exist currently in the Ten Mile River are expected to be reduced in the future as the phosphorus-driven cultural eutrophication of the Ten Mile River is addressed. The primary mechanism for attenuation of nitrogen is uptake by aquatic plants (see RIDEM 2005 Response to Comments, p.11). The excessive aquatic plant growth in the Ten Mile River is driven by the high phosphorus loadings to this river. See Response #A.3.a for a further discussion of attenuation.

Comment #A.3: While EPA's draft permit purports to address Rhode Island's Water Quality standards, it duplicates RIDEM's choice in the RIDEM 2004 Evaluation, and relies entirely upon RIDEM's analysis, which is incomplete, contradictory and applied inconsistently, if at all, in practice. *Compare* EPA Fact Sheet, pp. 10-12 (citing RIDEM 2004 Evaluation, comments and RIDEM's response) with attached CDM letter, Exhibit A. The result is a proposed total nitrogen limit that is excessively and discriminatorily strict, compared to Rhode Island's actual water quality standards.

a. By the time effluent from the Attleboro WWTP reaches the Seekonk River in Rhode Island, the concentration of nitrogen has been attenuated. RIDEM used an attenuation factor of 40%. RIDEM 2004 Evaluation, pp. 19, 20, Appendix, Tab 1. As CDM notes, wastewater treatment effluent is only 70% of the total nitrogen load to the Ten Mile River. Therefore, the proposed 8 mg/l limit at the Attleboro plant would only discharge 3.4 mg/l to the Seekonk River (8 x 60% x 70%). Requiring an 8 mg/l concentration of nitrogen at the Attleboro WWTF outfall is excessive to achieve a 8 mg/l (or even a 5 mg/l) concentration of nitrogen from the plant in the Seekonk River, which is all that Rhode Island has nominally required of its in-state plants.

The following table shows the nominal limits contained in RIDEM's recent permits that, assertedly, reflect current application of Rhode Island water quality standards to facilities discharging in Rhode Island, compared to Attleboro's effective 3.4 mg/l discharge:

	May-Oct	**Nov-Mar**
NBC-Bucklin	5.0 mg/l	Operational[13]
E. Providence	8.0 mg/l	Operational
NBC-Fields Pt.	5.0 mg/l	Operational
Woonsocket	5.0 mg/l	Operational
Cranston	8.0 mg/l	Operational
Warwick	8.0 mg/l	Operational
West Warwick	8.0 mg/l	Operational
Attleboro to Seekonk River (and at the outfall)	3.4 mg/l effective (8.0 mg/l nominal)	Operational

Attleboro's discharge to the affected waters thus has stricter proposed limits than all direct dischargers to Rhode Island.

This is particularly hard to understand given the relatively small design flow for the Attleboro facility. As show in the RIDEM 2004 Evaluation, p. 20, Table 4, Attleboro's design flow and estimated May-October design flow ranked 8th out of 10, less than a third of, for instance, the NBC-Bucklin plant (which is allotted 8.0 mg/l in May-Oct.), about 1/6th or the Fields point plant, and behind East Providence and Woonsocket as well.

To be sure, the EPA Fact Sheet asserts that the 40% attenuation figure should be adjusted downward to an extent not specified in the Fact Sheet. Any such adjustment would be speculative, would be overwhelmed by taking account of the

[13] "Operational" means that the permit imposes no limit, but requires the permittee to "operate the treatment facility to reduce the discharge of total nitrogen, during the months of November through April [or March, for Attleboro], to the maximum extent possible using all available treatment equipment in place at the facility, except methanol addition."

fact that WWTP discharges are only 70% of the total nitrogen load, and should await real data as well as the achievement of the improvements upon which EPA's assertion rests. Moreover, as shown by CDM (Exhibit A), EPA's assumptions about reduction in attenuation are based upon erroneous analysis.

Response #A.3.a: EPA believes that the allocation of loads to the wastewater treatment plants discharging to the Seekonk River are equitable and necessary to achieve RI Water Quality Standards. The limitations for the Attleboro treatment plant are less stringent than those for the larger facilities (Upper Blackstone, Woonsocket and NBC-Bucklin Point are either subject to, or proposed to be subject to, final nitrogen effluent limits of 5 mg/l) and should be achievable at a lower cost than the more stringent limit. Also see Response #A.1 above relative to the equity of Massachusetts versus Rhode Island nitrogen limits.

The commenter's calculation of the concentration of total nitrogen discharged to the Seekonk River from the Attleboro facility is based on an incorrect calculation of attenuation as detailed in the response to CDM's comments below.

Additionally, the current assumed attenuation rate (40%) in the Ten Mile River is expected to significantly decrease in the future because nitrogen currently utilized in the phosphorus–driven eutrophication of the fresh water segments of the Ten Mile River and its impoundments is expected to diminish when Attleboro and North Attleborough achieve the more stringent phosphorus limits in their permits. EPA does not regard its position regarding future attenuation rate reductions as speculative. Rather, such a reduction stands to reason given EPA's imposition of a phosphorus effluent limitation, which is designed to control the effects of cultural eutrophication (i.e., excessive plant growth).

The technical evaluation of loads to the Seekonk River that EPA consulted in the course of establishing the permit limit for nitrogen accounts for attenuation (*i.e.*, the loads calculated for the Massachusetts facilities in DEM's calculations in Figure 21 of *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers* have been multiplied by the delivery factor). Obviously, a decrease in Attleboro's attenuation would result in an increase in Attleboro's loading to the Seekonk River. If monitoring shows that the overall load reduction to the Seekonk River is insufficient to achieve water quality standards even after the POTWs achieve their total nitrogen limits, further action will have to be taken and a lower limit imposed.

Comment #A.3.b. While RIDEM's nominal limits are excessively strict when applied to Attleboro's out-of-state discharge, its limits upon in-state plants are illusory. The proposed limits on Attleboro therefore are not required to meet the actual limits of the downstream state.

RIDEM knew that the in-state nitrogen limits would be appealed and settled before the limits would ever be applied:

> Upon issuance of the final modifications, it is anticipated that the permittees will appeal the permits and enter a consent agreement with DEM, which will include the December 2008 target date for completion of construction [set forth in RI Gen. Laws. § 46-12-2(f)].

RIDEM, Nutrient Permit Modifications – Response to Comments, p. 3, Appendix, Tab 3.

RIDEM correctly anticipated the appeals and settlements, but it did not live up to the promise regarding the December 2008 target date, as evidenced by at least two documents:

> Consent Agreement (final) between the Department of Environmental Management and Narragansett Bay Commission for the Fields Point Wastewater Treatment Facility, In Re: AAD No. 05-002/WRA, docket No. RIA-371, Appendix, Tab 6A ["Fields Settlement"].
>
> Consent Agreement (final) between the Department of Environmental Management and Narragansett Bay Commission for the Bucklin Point Wastewater Treatment Facility, In Re: AAD No. 05-001/WRA, docket No. RIA-372, Appendix, Tab 6B ["Bucklin Settlement"];

Both agreements provide NBC with a test period after commissioning of the initial construction to see if the plants can meet the 5 mg/l permit limits. The agreements allow NBC to argue against ever meeting the 5 mg/l limit, not only by their terms, but because the permits will expire and new permits may contain different limits (the anti-backsliding rules being inapplicable because both permits preserve NBC's challenges to the 2005 permits).

In the Fields Settlement (Attachment A of Appendix Tab 6A), RIDEM has actually agreed to a total nitrogen limit of 18.2 mg/l for the remaining term of the permit and beyond. It also sets forth a construction schedule for new facilities which extends as far as December 1, 2018 before construction must be complete. See Appendix, Tab 7 [CDM calculation of deadlines in Bucklin and Fields Point consent decrees]. In the meantime, as long as NBC complies with the Fields Settlement, the permit nitrogen limits are superseded. Yet, as Attleboro understands it, Fields Point is just finishing facilities planning based upon meeting somewhat higher concentration than 5 mg/l. Basically, NBC is to build the plant they have been planning, and then have time to see if it can make it meet 5 mg/l.

At Bucklin Point, NBC just commissioned an expensive upgrade that was designed to achieve 8 mg/l summer average. At that facility, the Bucklin

Agreement gives NBC until November 2007 to see if the plant can meet the 5 mg/l limit. If not, the Bucklin Agreement provides some time to plan, design and install further upgrades. By then a new permit will be in place. Under the terms of the agreement, completion of those upgrades can wait until July, 2013. See Appendix, Tab 7 [CDM calculation].

These settlements demonstrate two things. The nominally strict RIDEM limits are, in fact, not taking effect for some time, if ever, and are subject to evaluation of ongoing upgrades. They are, in fact, paper limits at this point. Attleboro does not believe that such limits, not applied in practice, are "requirements" of an affected state within the meaning of 40 C.F.R. § 122.4. They therefore should not and must not be applied to Attleboro (as, for instance, by requiring a limit that achieves approximately 3.4 mg/l at the relevant discharge point).

Second, the opportunities afforded to NBC for evaluating compliance after completion of existing projects would be denied to Attleboro under the draft permit proposed by EPA. Whether as a matter of law or policy, EPA should not take that approach.

There is yet another lesson in these consent agreements. It is extremely poor public policy to require an upgrade based upon requirements to meet one set of limits (such as the recently completed upgrade at Bucklin Point or the upgrade in progress in Attleboro), only to change the limits when the upgrade is done, or in progress. The waste of time, effort and money from doing so is obvious. To address that problem requires postponing the limits and possibly never imposing them, as in the consent decrees. Attleboro is in exactly the same position. During the planning for its recent upgrade, it asked about nitrogen limits and was told that such limits would come later. Now, it is faced with the potential of having to meet 8 mg/l, only to be told (Fact Sheet at 11) that it may have to meet stricter limits even if it commits resources to meet the 8 mg/l limit.

Response #A.3.b: EPA disagrees with the commenter's characterization of the consent agreements between the Field Point and Bucklin Point facilities and Rhode Island. The commenter's assertion that the nitrogen effluent limits that have been imposed by RIDEM on Rhode Island facilities are illusory, and that it would be unfair to impose actual limits on Massachusetts facilities, is inaccurate. In fact, the permit limits imposed on the Rhode Island facilities are fully enforceable legal obligations on the permittees. For example, the Bucklin Settlement states that the facility "agrees not to object to a Total Nitrogen monthly average permit limit of 5.0 mg/l for the months of May through October, so long as the schedule and interim limits outlined in [the settlement] remain in effect." The Field Point consent agreement is similarly structured. The fact that NBC (the entity responsible for the operation of Bucklin Point) reserved the right to argue the validity of future permits with limits more stringent than 5.0 mg/l has no bearing on the establishment of appropriate nitrogen limits for Attleboro. While permits reissued to NBC in the future, as well as all other discharges to the

Providence/Seekonk River system, could contain different nitrogen limits, they are unlikely to be less stringent given the available record. The Consent Agreements require that major upgrades be completed and operations optimized as soon as possible in order to achieve a nitrogen limit of 5.0 mg/l.[14]

The "requirements" of state law do not refer to the individual permit limits proposed by RIDEM for various facilities, but instead to the underlying laws and regulations on which those limits are based. EPA is imposing the nitrogen limit on Attleboro because it independently determined the limit was necessary under applicable water quality requirements in Rhode Island; EPA does not view the RIDEM nutrient permitting plan and recommendations as legally binding requirements for EPA-issued permits in Massachusetts in and of themselves, but consistent with the CWA, considered and accounted for this information when establishing the limit, as they reflected the views of Rhode Island regarding the impacts of upstream discharges on waters within its borders.

Where appropriate, Rhode Island and EPA establish compliance schedules for new permit limits that allow for a reasonable amount of time to complete necessary treatment upgrades while achieving compliance as soon as possible. Since Rhode Island Water Quality Standards do not allow for schedules in permits, schedules are incorporated in an Administrative Compliance Order or a Consent Agreement. Because the nitrogen limit in the Attleboro permit is based upon Rhode Island's standards, EPA cannot include a compliance schedule in the permit. Similar to the Rhode Island schedules for compliance with nitrogen limits, EPA anticipates establishing a schedule for Attleboro that must reasonably go substantially beyond December 2008. Like the consent agreements cited above, such a schedule will also for reasonable interim limits and will allow for some time after completion of the upgrades in order to fine tune operations before a final compliance date is required. However, it is important to note that the challenges facing large facilities with combined sewers, such as the NBC facilities, in meeting a nitrogen limit of 5.0 mg/l are much greater than the challenges facing a moderate sized facility with separate sewers in meeting a less stringent limit of 8.0 mg/l.

[14] EPA believes it is reasonable to assume that technically achievable reductions associated with the legally enforceable permits issued to Rhode Island dischargers will actually occur; the fact that these reductions are mandated by the Rhode Island legislature, as the commenter has previously pointed out, would seem to bolster this conclusion. To second guess the motives of the state and the discharger with respect to implementation and compliance with permit terms, as Attleboro invites EPA to do, would be mere speculation on EPA's part and would not amount to a reasonable or rational basis to assess Attleboro's permit limit for nitrogen. When accounting for existing controls on other point sources, EPA instead believes that it is reasonable to assume that validly issued permits will be complied with and pollutant reduction contemplated thereunder achieved. EPA will also be closely involved in overseeing limits in future permits for facilities in Rhode Island. In any event, regardless of Rhode Island's actions with respect to specific facilities, EPA has an independent duty under the CWA to impose effluent limits that will ensure compliance with applicable water quality standards.

The upgrades proposed for NBC Fields Point are based on achieving the 5.0 mg/l nitrogen limit. These upgrades are currently under design with a design completion date of November 2008. The NBC Bucklin Point facility is currently achieving nitrogen removal to <8 mg/l. Additional upgrades are necessary to achieve the final permit limit of 5.0 mg/l. Facilities planning for these upgrades is expected to be completed in early 2009 and at that time a design and construction schedule will be established. East Providence requires an upgrade in order to meet its final nitrogen limit and this upgrade is schedule to be completed by June 2013.

Provisions that allow for a longer period to achieve final compliance are intended to address the potential that the initial major upgrades of the NBC facilities will not result in achievement of the 5.0 mg/l limits. Facility upgrades in Massachusetts have been, and will continue to be, afforded the same considerations to the extent reasonable in the establishment and/or enforcement of compliance schedules.

It is not clear who told Attleboro that nitrogen limits would come after the current upgrade. For EPA's position relative to nitrogen limits and planned upgrades for Attleboro, see the June 9, 2003, letter from MassDEP reflecting the position of EPA and the MassDEP permitting program. Regarding nitrogen, the letters state that, "nitrogen controls are possible in the future as loading to Narragansett Bay (Ten Mile River is a tributary) needed to be reduced to reduce phytoplankton growth; this could result in a nitrogen limit being imposed on the Attleboro facility in the future," and "The agencies urge the City and their consultant to keep the possible future permit conditions in mind when planning, designing and constructing upgraded facilities at the WWTP in the near and far term. The City should factor into their financial planning the potential substantial expenses associated with the high level of nutrient controls likely to be required at the facility." In light of this communication, it is unclear why the City (unlike the Town of North Attleborough, which has also been given a 8 mg/l limit of nitrogen and whose permit is now effective) chose not to make any provision for future nitrogen limits in its planning for future upgrades. While EPA appreciates the difficulties created by having to comply with new limits which may not have been fully anticipated by the permittee when planning its upgrade, EPA is legally obligated, now and in the future, to reissue permits that are consistent with Section 301 and 402 of the Clean Water Act, which at this time requires the imposition of an effluent limitation for nitrogen, and which may in the future require additional refinements to such limit.

Comment #A.3.c. The RIDEM permits applying the new nitrogen limits were vulnerable to challenge by the permittees and, indeed have been challenged. For instance, attached as Tab 5A to the Appendix is the Request for Adjudicatory Hearing In Re: Woonsocket Wastewater Treatment Facility, RIPDES Permit No.: RI 0100111 and attachments. Attached as Tab 5B are the comments of NBC regarding its draft permits, which were restated in NBC's appeal of the permits.

The consent decrees between RIDEM and NBC also, of course, resulted from appeals based upon the illegality of RIDEM's total nitrogen limits; the consent decrees fully preserve these claims, if the planning and construction contemplated in those decrees [does] not resolve matters. Whether or not those challenges have been settled, the points raised by the papers submitted by those licensees challenging the stated rationales for the new nitrogen limits are valid and are incorporated herein by reference.

Without limitation, the defects in applying Rhode Island water quality standards by imposing an 8 mg/l total nitrogen limit on discharges in Rhode Island waters (and, *a fortiori* a 5 mg/l or an effective 3.4 mg/l limit) include:

- Failure to present a comprehensive or coherent analysis of the dissolved oxygen dynamics of the Providence and Seekonk Rivers;
- Inconsistency with prior studies;
- Ignoring the significantly different conditions in the rivers, the Narragansett Bay and the laboratory;
- Ignoring the significant nitrogen reduction programs in discharging communities and the substantial reductions in nitrogen already achieved by those communities;
- Failure to follow RIDEM's own regulatory requirements;
- Failure to complete a TMDL that would provide the necessary basis for establishing nitrogen discharge limits for the regulated plants;
- Failure to evaluate whether the mandated reduction will have any significant benefit in fact;
- Requiring significant additional public investments without scientific evidence or consensus about the effect of the mandated nitrogen reduction on the relevant waters.
- The failure to schedule review of the nitrogen limits at an appropriate time, such as the next permit reissuance date, when permitting agencies can apply the data and science that, hopefully, will be available at that time.

See, e.g. Request for Adjudicatory Hearing, <u>In Re: Woonsocket Wastewater Treatment Facility</u>.

Response #A.3.c:

EPA does not regard the commenter's attempted blanket incorporation by reference from a court filing in another proceeding not even involving EPA or the NPDES permitting program as appropriate. Comments must be presented in a manner that apprises EPA of the relevant issues so that it can provide a meaningful response. EPA is not required to guess at the specific relevance of the arguments made in a separate court proceeding to the facts at issue here.

Specific comments relating to perceived defects in applying Rhode Island water quality standards by imposing an 8 mg/l total nitrogen limit on discharges in Rhode Island waters have been received from CDM (appended as Attachment A to the City's comments) and are addressed below. These detailed comments appear to generally encompass the bulleted points above.

EPA fully reviews the technical and legal basis for all permit limits at the time of permit reissuance. It must do so in order to ensure that the limits comply with all applicable requirements of the CWA and to confirm that they continue to be necessary. NPDES permits have maximum five-year terms (upon expiration, the permit may be administratively continued assuming timely receipt of permit renewal application).

Comment #A.4: Even if nitrogen limits are imposed, the draft permit cannot reasonably base total nitrogen limits upon the MERL experiment, which dealt with dissolved inorganic nitrogen ("DIN"). As CDM explains:

RIDEM also errs when it uses the MERL values, which are based on dissolved inorganic nitrogen (DIN) loadings to compute total nitrogen (TN) limits in the permits. Effluents from wastewater treatment facilities often contain residual, refractory organic nitrogen that is not biologically available, as RIDEM has acknowledged in its response to comments on the Rhode Island Permits (See page 18 of 41). If one accepts the area loading approach, and it is based on data developed around DIN, then the permit values ought be presented either as DIN, or adjusted to available Total N, in much the same manner that metals limits are adjusted from the biologically available form to total metals for permitting purposes.

Response #A.4: The same comment was received from CDM and is addressed in Response B.2 below.

Comment #A.5: CDM has also demonstrated that the draft permit's limits on metals are excessive, due to a generally-applicable miscalculation (especially a failure to consider the appropriate hardness factor), several specific errors, inconsistency with other permits, and failure to accommodate plant operations that improve the overall effluent. CDM's comments are incorporated.

While EPA acknowledged the City's inability to comply immediately with nutrient limitations (Fact Sheet, p. 6), it has not done the same for metals. Yet, the situation is the same. The City has already devoted extensive resources to plant improvements and operations to treat metals. Further investment in plant upgrades for this purpose is not warranted. The City will need to require its generators to implement an industrial pretreatment program, which will take time. Imposition of the proposed metals limits therefore will require a phased implementation by both the plant and those who discharge into its system.

Response #A.5: Specific comments from CDM are addressed in the following section of this document.

EPA understands that the City may not be able to comply with all of the metals limits immediately. Any schedule developed relative to achieving compliance with nutrient limits can also address metals limits. We agree that the primary focus for reducing metals concentrations in the effluent should be on source controls, including enhanced pre-treatment requirements. EPA concurs that, if the required technical evaluation of local limits indicates the need to revise the local limits, additional time is warranted for establishing revised limits. Consistent with the North Attleborough permit, the final permit allows for 300 days to complete any necessary revisions.

The following comments were received from CDM, on behalf of the City of Attleboro, in a letter dated September 13, 2006:

Comment #B.1: EPA presents no substantive justification of its own for the conclusion that "the nitrogen limit proposed in this permit is necessary to meet Rhode Island Water Quality Standards". It merely indicates that it has reviewed the RIDEM reports, RIDEM's responses to Massachusetts DEP's comments on the draft permits and other unspecified documents, and declares that it has concluded the limits are necessary. While acknowledging both the complexity and uncertainty associated with the dynamics of upper Narragansett Bay and the application of the MERL experiments to this system, EPA presents no discussion of the factors that it evaluated in reaching conclusions exactly the same as RIDEM. In particular, various individuals provided significant technical commentary on RIDEM's analysis, some of which RIDEM attempted to answer, and others of which RIDEM did not answer at all. EPA appears not to have addressed these questions at all, even though they form the basis for the continuing appeals of some Rhode Island Permits.

Response #B.1: See responses above regarding the basis for the nitrogen limit.

Specific comments relating to perceived shortcomings in RIDEM's responses to technical commentary provided on the nitrogen analysis are addressed below.

Comment #B.2: In December of 2004 RIDEM issued a study entitled *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers* ("The 2004 Evaluation"). The study attempts to provide the substantiation of the permit limits for Total Nitrogen proposed by RIDEM for the treatment plants discharging into the Providence and Seekonk River systems. It uses research conducted by the Marine Ecosystems Research Laboratory (MERL) at the University of Rhode Island in the early 1980's on nutrient enrichment of Narragansett Bay, and data collected in 1995 and 1996 to support its conclusions. The study was developed by RIDEM when its initial efforts to construct a more

formal total maximum daily load (TMDL) analysis using a numerical model to simulate the Providence/Seekonk River systems were unsuccessful.

Based on our review as described further below, the central problems with this analysis are that:

> It does not present a cohesive analysis of the dissolved oxygen dynamics of the Providence and Seekonk Rivers. The analysis ignores fundamental and critically important factors, including local sources of oxygen demanding substances and the impacts of physical processes such as elevated temperature and stratification on the oxygen dynamics of the Providence and Seekonk Rivers.
>
> In extrapolating the results of the MERL experiments it generally ignores the significant differences between the conditions in Narragansett Bay that the MERL simulates, and the Providence and Seekonk River system.
>
> In applying the MERL experimental results, RIDEM makes significant conceptual errors which lead to flaws in its arguments.

Our concerns are more fully discussed below.

a. The analysis fails to properly analyze the oxygen deficits in the Providence River system.

The oxygen dynamics of an urban river/estuary system that receives discharges of oxygen demanding pollutants from multiple sources are very complicated. Any analysis of the conditions should take into account all potential sources of oxygen demanding substances, including the close-by discharges of two large wastewater treatment plants discharging significant quantities of oxygen demanding substances and the impacts of sediment oxygen demand reflecting the highly urbanized nature of adjacent watersheds. It should also include the impacts of physical conditions such as stratification, temperature, tidal stage, wind induced mixing and re-aeration, as well as the potential impacts of algae on the oxygen conditions. The complexity of these interactions is presumably the reason that RIDEM originally undertook to establish a model of the Seekonk and Providence River systems to develop a TMDL.

Having failed in its initial attempt to develop a numerical model of the system, RIDEM has then turned to an overly simplistic adaptation of local research. RIDEM'S analysis is based entirely on an extrapolation of the concept that excess nitrogen leads to algal growth, which can lead to diminished dissolved oxygen. The work is based solely on the nitrogen flux into the Providence river system, and draws from the system loading response in the MERL studies conducted at URI in the 1980's. The analysis completely ignores any other pollutant sources that impact the local oxygen conditions, and fails to consider major differences

between the physical characteristics of the Providence and Seekonk River systems, and that of Narragansett Bay which the MERL experiments were built to simulate.

While the literature is quite clear that nutrient over-enrichment can lead to low dissolved oxygen, this is not the only reason for oxygen depletion, and it is imperative that one fully understands the reasons for low dissolved oxygen before one launches a nitrogen reduction program based on the dissolved oxygen in the Providence River. Careful attention must be given to these other dissolved oxygen sinks that may be as important as or more important than the nitrogen flux in order to avoid the inappropriate expenditure of limited public funds.

Response #B.2.a: It is not necessary that there be a complete understanding of all factors that influence one response variable (dissolved oxygen) before cultural eutrophication can be addressed; EPA must make permitting decisions based on the best information reasonably available to it. This is especially true where the water quality impairment—cultural eutrophication—is severe and where the cause of such impairment—excessive nitrogen loading—is known, as evidenced by numerous studies. *See, .e.g., Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers*, RI DEM, December 2004).

The data collected in the Seekonk and Providence Rivers offers compelling evidence of excessive nutrient enrichment. Total nitrogen and chlorophyll *a* concentrations are well above, for example, the MassDEP guidelines for TN and environmental health, and the supersaturated levels of dissolved oxygen measured in the Seekonk and Providence Rivers can only result from photosynthesis or an outside physical aeration mechanism. To the extent that sediment oxygen demand (SOD) plays a role in the low dissolved oxygen levels, the decay of nitrogen-driven vegetation that has accumulated in the sediments would contribute to the SOD levels (see Response #B.2.c below), so EPA does not believe it is appropriate to completely decouple this nonpoint source of impairment from the initial point source nitrogen loading into the system.

Physical conditions such as stratification, temperature, tidal stage, wind induced mixing and re-aeration do have an effect on dissolved oxygen levels. Water quality data (11 sampling events during 1995 and 1996) were collected under a variety of conditions in order to reflect the dynamic physical conditions of the system, and show that the common thread through the observed dissolved oxygen problems is nutrient enrichment. EPA therefore believes that this nitrogen is the dominant source of impairment in the system.

Biochemical Oxygen Demand (BOD) from direct discharges to Upper Narragansett Bay has been shown to have minimal impact on dissolved oxygen levels (see D.R. Kester et al. / Marine Chemistry 53 (1996) 131-145, *Modeling, measurements, and satellite remote sensing of biologically active constituents in coastal waters.*)

EPA had more than sufficient basis to consider the MERL experiments when imposing a permit limit for nitrogen. The comment above does not specifically identify the relevance of any of the physical differences between the Providence/Seekonk River system and Narragansett Bay on the applicability of the model and how such differences impact the reasonableness of EPA's reliance on it. The physical differences between the respective water bodies as a whole do not negate or undermine the basic relevance of the MERL tank experiments to this permit proceeding, as the experiments were fundamentally designed to examine the relationship between nitrogen loading and eutrophic response variables. Indeed, EPA's guidance document *Nutrient Criteria Technical Guidance Manual, Estuarine and Coastal Marine Waters* cites the MERL experiments as compelling evidence that nitrogen criteria are necessary to control enrichment of estuaries. Specifically, the guidance states. "Three case studies provide some of the strongest evidence available that water quality managers should focus on N for criteria development and environmental control (see NRC 2000 for details). One study involves work in large mesocosms by the University of Rhode Island (Marine Ecosystem Research Laboratory–MERL) on the shore of Narragansett Bay. Experiments showed that P addition was not stimulatory, but N or N+P caused large increases in the rate of net primary production and phytoplankton standing crops. (Oviatt et al. 1995)."

Comment #B.2.b. Inaccuracies with respect to watershed sources of nitrogen.

RIDEM's analysis incorrectly assigns all the nitrogen discharged from the Ten Mile River to two wastewater treatment plants (WWTP) and makes conceptual and computational errors in estimating the delivery of these loads to the Seekonk River. These errors and inaccuracies magnify the potential impacts of the City's discharge on the Seekonk and Providence River System.

RIDEM attributes essentially all the nitrogen discharged at the mouth of the Ten Mile River to the Attleboro and North Attleboro discharges. See page 20 of The 2004 Evaluation, where RIDEM asserts that compared to these discharges "other watershed sources [of nitrogen] are assumed to be negligible". Although the discussion is with respect to the Blackstone River, RIDEM apparently applies the same logic to the Ten Mile River and the Attleboro discharge. This assertion apparently serves to justify the analysis presented on page 18 of The 2004 Evaluation that expresses the level of discharge of Nitrogen from the Ten Mile into the Seekonk River as a function of the level of discharge from the treatment plants.

This analysis is correct only to the extent that there are no other sources of nitrogen in the tributary River systems. However, virtually all studies done on the tributaries suggest that the two treatment plants contribute on the order of 60 % to 70 % of the nitrogen discharged into tributaries of the Providence and Seekonk Rivers.

> The Governor's Panel on Nutrient and Bacteria Pollution recognized the importance of other sources when it says …"Other analyses show general agreement regarding total loading but decompose the "river/stream" component to provide more insight into sources by recognizing that it is, in large part, due to wastewater treatment facilities (WWTFs) and atmospheric deposition. Alexander et al. (2001) estimated that 62% of the total came from point sources, 19% from non-agricultural nonpoint sources, 6% from fertilizer and 3% from livestock in addition to the 10% from atmospheric deposition. Castro et al. (2001) estimated 73% of their total loading figure came from human sewage (through WWTFs and Individual Sewage Disposal Systems (ISDSs)), 13% from atmospheric deposition, 10.5% from agricultural runoff, and 3% from urban nonpoint sources. The analysis reported by Roman et al. (2000) estimated that wastewater treatment facilities contributed 73% of the nitrogen load, atmospheric deposition 23%, and agriculture 4%. RIDEM (2000)5 estimated that WWTFs contributed 66% of the total nitrogen to Upper Narragansett Bay; rivers and runoff (not including WWTFs) 30%, and direct atmospheric deposition 4%. Moore et al. (in press), using a similar but higher resolution technique than Alexander et al. (2001), estimated that total nitrogen load from the Providence /Seekonk River was 68% municipal wastewater, 15% atmospheric deposition, 14% runoff from developed lands, and 3% runoff from agricultural lands. All these analyses agree that wastewater treatment plants are the major source of nitrogen to the Bay. (See http://www.ci.uri.edu/GovComm/Documents/Phase1Rpt/Docs/Nutrient-Bacteria.pdf, page 2)
>
> Also, studies conducted by the USGS indicate that for the Providence River system, approximately 68% of the total nitrogen load is from municipal wastewater treatment plants, with the remainder attributed to nonpoint sources. (see http://water.usgs.gov/pubs/sir/2004/5012/SIR2004-5012_report.pdf, page 23).

The erroneous assumptions adopted by RIDEM significantly impact their analysis, and overstates the impacts of the tributary treatment plants on the receiving waters. It can be shown by simple algebra that if the WWTP discharge is 70% of the total nitrogen load, and that the amount discharged from the Ten Mile to the Seekonk River is 60% of the amount discharged by the WWTP's, then the River Delivery Factor is more on the order of 42%, rather than the 60% used by RIDEM. This issue is important because it indicates that a discharge of 8 mg/l into the Ten Mile River is more like a discharge of 3.4 mg/l directly into the Providence and Seekonk Rivers simply because of natural attenuation of the nitrogen load.

Response #B.2.b: The estimates of the relative nitrogen loading cited by the commenter are based on annual average loading and underestimate the relative contribution of the Attleboro facility under summer conditions. The RIDEM data used to estimate the Ten Mile River attenuation rate was collected only during May – October, a period of relatively low nonpoint source loadings. In 1995 and 1996, the flow in the Ten Mile River during May - October represented only 31% and 29% respectively of the annual river flow. Using the average summer flows from the POTWs, the average DIN discharged from the facilities during the summer of 2007 (TN – 2 mg/l), the average summer background DIN calculated using summer average flow at the East Providence gage (minus the POTW flow) and the estimate of background DIN of 0.3 mg/l (from the estimate provided on page 20 of the RIDEM *Evaluation of Nitrogen Targets Report*), it can be estimated that the POTWs contribute over 90 percent of the DIN load during the May-October period, making the Rhode Island estimates more reasonable than those proposed by the commenter. As can be seen, Attleboro represents about 84% of the total POTW loading due to its high effluent nitrogen concentration. (The Atttleboro average TN concentration was 24.5 mg/l and the North Attleborough concentration was 7 mg/l). *See* Attachment 2 for flows used to make the estimates and Attachment 3 for calculated loads. Coupling the 90% loading with the 60% delivery factor yields an overall delivery of 54% (rather than 42% estimated by the City), which is closer to the Rhode Island estimate of 60%. In any event, as described previously, the attenuation rate in the Ten Mile River is expected to decrease with decreasing phosphorus levels (see Response #A.2 above and RIDEM Total Nitrogen Permit Modifications Response to Comments, June 27, 2005, p. 11 of 41 (addressing relationship of nitrogen attenuation through algae uptake in the Blackstone River).

Comment #B.2.c. Contradictory data are presented in the analysis.

In support of its arguments RIDEM presents a variety of plots and data from the MERL experiments as well as from a cruise in the summers of 1995 and 1996. The MERL data are synthesized in figures 1 through 11 of The 2004 Evaluation, and information for the 1995 and 1996 cruises are presented in figures 13 through 18 of The 2004 Evaluation. The MERL data show that high levels of chlorophyll result in increasing <u>average</u> dissolved oxygen, but lower instantaneous oxygen concentrations, owing to diurnal swings in oxygen production and consumption by phytoplankton. The plots presented by DEM appear to indicate that low values for dissolved oxygen (associated with the 8x, 16x and 32x loading conditions) occur <u>simultaneously</u> with the high chlorophyll values (See figures 3 and 9 of The 2004 Evaluation).

In contrast, the data from 1995 and 1996 show that the occurrence of low dissolved oxygen and high chlorophyll in the Providence and Seekonk river systems are not occurring simultaneously. On pages 13 through 16 of The 2004 Evaluation, RIDEM presents plots of oxygen and chlorophyll *a* concentrations at depth along a transect from the upper reaches of the Seekonk River, down to the Upper portions of Narragansett Bay. The plots show that the year with the worst

dissolved oxygen problem (1996) has far less chlorophyll *a* than 1995. The extent of hypoxia, both vertically in the water column and longitudinally along the length of the Rivers, is far greater in 1996 than in 1995, whereas the 1995 chlorophyll data show far greater algal abundance. As discussed by RIDEM, there is a 10 fold difference in chlorophyll a from 1995 to 1996. This contradiction is further highlighted by the charts on page 17 of The 2004 Evaluation that show the higher the chlorophyll *a*, the higher the dissolved oxygen. These points are highly inconsistent with the underlying hypothesis of RIDEM and points out the importance of thoroughly understanding all the dissolved oxygen demands before establishing a dissolved oxygen restoration plan.

We should note that our preliminary investigations of the climatic conditions of the summers of 1995 and 1996 indicate that they were so radically different that they may not be simply averaged in the way that RIDEM has done without great caution. The summer of 1995 was among the driest recorded for 132 years of record at a location in the Blackstone watershed (34^{th} driest), while the summer of 1996 was amongst the wettest (9^{th} wettest). The difference could markedly impact the fate of pollutants in such a way as to make simple averaging of data across the two years inappropriate.

These extreme differences in climatic conditions is contrary to the claim made by RIDEM that its samples were taken during "typical summer season flows" (page 10 of The 2004 Evaluation), which would lead one to believe that the summers sampled reflected average or normal conditions. But it is consistent with the arguments made by RIDEM to explain the difference between 1996 and 1995 chlorophyll levels (page 11), where the difference in flushing times owing to higher river flows – which was a result of greater rainfall – is used to explain the year on year differences in chlorophyll a concentrations.

Response #B.2.c: Base on its review, EPA believes the commenter's conclusions above are based on a mischaracterization of the data. The MERL tank results referenced in the comment do not indicate that low dissolved oxygen levels occur simultaneously with high chlorophyll *a* levels for any of the high treatments (*i.e.*, high loading conditions), except the highest treatment level (32x), and even that treatment level shows simultaneous high chlorophyll and low DO only part of the time (compare chlorophyll measurements in Figure 9 to DO measurements in Figure 3).

EPA agrees that the plots of the 1995 and 1996 data show that high chlorophyll *a* and low DO do not necessarily occur simultaneously. Low DO in the lower water column would not necessarily be tied to the simultaneous phytoplankton activity in the upper water column but would be a function of many factors, including water temperature, stratification, and benthic oxygen demand. Low dissolved oxygen levels are not just driven by phytoplankton respiration (as measured by chlorophyll *a*) but also by phytoplankton that has settled to the bottom and exerts

a dissolved oxygen demand as it undergoes the decay process (see Response #B.2.a). In the upper water column high chlorophyll *a* concentrations generally occur simultaneously with high DO, as would be expected given the effects of photosynthesis (average dissolved oxygen increased due to the effects of photosynthesis induced supersaturation during the day), and this effect is shown on Figures 17 and 18. Both the MERL tank experiments and the data from the Providence/Seekonk River system indicate a clear correlation between nitrogen loadings, chlorophyll *a* levels, and dissolved oxygen impairment. The correlation between nitrogen loadings, chlorophyll *a* levels, and dissolved oxygen impairment is well documented in the *Nutrient Criteria Technical Guidance Manual – Estuarine and Coastal Marine Waters*. EPA understands (and does the commenter) that the MERL tank experiments cannot *completely* simulate all of the complexities of how chlorophyll *a* and dissolved oxygen respond to nitrogen loadings, including the timing of the response, in a natural system.

EPA also notes that even in the absence of DO violations the presence of nuisance algae is a violation of water quality standards.

The 1995 and 1996 data reflect different climatic conditions, and water quality standards must be met under both conditions. The data from both years indicate a system with excessive nitrogen concentrations and clear evidence (in the form of DO and chlorophyll *a* levels) of cultural eutrophication. RIDEM did present aggregate averages of water chemistry from the two surveys, but its analysis was clearly not limited to simply averaging the results from the two different years. Instead, the report clearly demonstrates that Rhode Island assessed the specific conditions observed in each of the two years.

Comment B.2.d. Unsubstantiated extrapolation of the MERL experiments to the Providence/Seekonk River system.

The use of the MERL data to analyze the Seekonk and Providence River system is questionable in that there are several critical and important differences between the conditions in the Bay and in the Providence and Seekonk River systems.

As RIDEM points out, on page 12 of The 2004 Evaluation, the MERL experiments were conducted under simulated flushing conditions that are almost 7.8 times lower than the conditions in the Providence River (27 day flushing time in the Bay versus 3.5 day flushing time in the River). The higher flushing rates of the Providence River would lead to lower nutrient loadings (expressed as mass per unit volume) and therefore much less algal activity. Indeed, RIDEM uses exactly this logic to explain why the observed chlorophyll a values in 1996 are an order of magnitude lower than observed in 1995. While RIDEM suggests that for some pollutants the hydraulic residence time might overstate the transport of the pollutant out of the river segment, no explanation, data or other information is presented as to how this would operate in the Providence and Seekonk River systems.

As a first approximation, the relationship between the standing concentration and flushing rates out varies inversely with respect to each other. Thus, an increase in flushing rate by a factor of 7.8 would result in a decrease in concentration of by a factor of 7.8. Stated another way, a loading rate of 32x in the Providence River will have the impact of a loading rate of 4x in the bay at large system.

The effect is even more dramatic for the Seekonk River. The 1991 studies cited by RIDEM indicate that the average flushing time of the Seekonk River is 1.2 days (See Asselin, S. and Spaulding M.L., Flushing Times for the Providence River Based on Tracer Experiments, Estuaries, Vol 16, No. 4, p 830-839, December 1993, page 838). Thus, for the Seekonk river system, the flushing rate is 22 times greater than the value used in the MERL experiments.

RIDEM also errs when it uses the MERL values, which are based on dissolved inorganic nitrogen (DIN) loadings to compute total nitrogen (TN) limits in the permits. Effluents from wastewater treatment facilities often contain residual, refractory organic nitrogen that is not biologically available, as RIDEM has acknowledged in its response to comments on the Rhode Island Permits (See page 18 of 41). If one accepts the area loading approach, and it is based on data developed around DIN, then the permit values ought be presented either as DIN, or adjusted to available Total N, in much the same manner that metals limits are adjusted from the biologically available form to total metals for permitting purposes.

Response #B.2.d: The average estimated flushing time in the Providence River during the May – October periods of 1995 and 1996 was about 3.5 days, much faster than the rate of 27 days used in the MERL experiments. However, the flushing rate during the critical period of high temperatures and low tributary flow rates during dry summer conditions, such as occurred in 1995, would be slower than 3.5 days. The indicators of cultural eutrophication were significantly greater in 1995 then they were in 1996. As indicated in Response #B.2.c, water quality standards must be met during both dry and wet years.

Differences in flushing rates between the MERL tank experiments and the 1995-1996 ambient data from the Providence/Seekonk River system is one of the key factors in our decision not to impose more stringent nitrogen load reductions at this time. It is therefore incorrect to suggest that EPA has not accounted for this difference. After implementation of the required nitrogen reductions at all POTWs, the permitted nitrogen loading rate to the Seekonk River will still reflect the 10x loading rate (see *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers*, RIDEM, December 2004). Water quality responses to a 10x nitrogen loading rate in the MERL tank experiments resulted in a significant level of impairment. In extrapolating these laboratory results to the natural environment, EPA determined that a 10x loading limit was reasonable to account for this uncertainty. See Response #A.1 above.

The 2004 loading study was done on data based on DIN, and the recommended loadings from the POTWs were developed using DIN. However, in establishing effluent limitations for POTWs the recommended DIN limits were adjusted to TN by increasing the recommended limits by 2 mg/l (see page 20). A check of effluent data from the Bucklin Point facility for 2007 confirms that the difference between TN and DIN averaged about 1.4 mg/l with a maximum of 2 mg/l, confirming that the RIDEM estimates are valid. (The DMR data for Attleboro could not be used because all of the components of DIN are not required to be reported).

Comment #B.2.e. Errors in the calculations of nitrogen loadings to the Providence and Seekonk Rivers.

RIDEM calculates the nitrogen loading on four different river segments by dividing the upstream nitrogen load by the area of the segment. As their analysis moves downstream, they add area and loads. This analysis ignores the fact that for half the day, because of tidal effects, the Seekonk River is "downstream" from the discharges of the NBC at Fields Point, East Providence, Cranston, Warwick and West Warwick and nutrients discharged by these point sources clearly influence the Seekonk River. Thus the loads expressed on an area basis on the Providence and Seekonk River system are significantly greater than calculated by RIDEM.

This is important because even without this consideration, RIDEM has difficulty reconciling the observed and implied concentrations of nitrogen in the upper reaches of the Seekonk River. See page 12 of 32 of RIDEM's Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers, where RIDEM compares the measured nitrogen concentration to the concentrations implied by the area loading rates of the MERL experiments. RIDEM observes that the actual measured concentrations are far lower than the MERL values for comparable area loading rates, with the observed values being one-fourth the value predicted by the MERL data. Had RIDEM properly included some fraction of the Fields Point, East Providence, Cranston, Warwick and West Warwick loadings to the Seekonk River in this calculation, the MERL predicted values should be even more than four times higher than the observed concentrations. This clearly points out the fallacy of extrapolating the results of the MERL experimental area loading rates to the Seekonk and Providence Rivers.

Response #B.2.e: Dye studies conducted for the Narragansett Bay Commission (NBC) on the Fields Point Wastewater Treatment Facility discharge in August 1989, indicate that there is minimal upstream transport of wastewater effluent. See *Preliminary Report - Summer Survey Dye Dilution Studies Field's Point Wastewater Treatment Facility Providence, Rhode Island.*

EPA recognizes that there are differences between the Providence/Seekonk River system and the MERL tank experiments (*see, e.g.*, Response #A.1, B.2.a, B.2.c, and B.2.d). The fact that nitrogen levels in the MERL tank experiments were

higher than measured levels in the Providence and Seekonk Rivers for the same loading per unit area is not unexpected given that the MERL tank cannot exactly replicate the complex dynamics of the Providence and Seekonk Rivers. In addition to differences in flushing rates, other factors contributing to the differences in nitrogen concentration between MERL tank experiments and the Providence/Seekonk River data include uptake by macroalgae and denitrification in the bottom waters. The dissolved oxygen response, however, was worse in the 1995 -1996 field data than in the MERL tank experiments for a given nitrogen loading rate. The contents of the tanks in the MERL experiments were routinely mixed and so do not represent the stratified conditions such as occurs in the Providence and Seekonk Rivers. Stratification exacerbates the dissolved oxygen response to nitrogen driven eutrophication.

Comment #B.2.f. RIDEM fails to incorporate all available information into its analysis.

RIDEM uses data from the 1995/1996 time frame to analyze the condition of the Providence and Seekonk River systems. They appeared to have ignored other readily available sources of information concerning the dynamics of dissolved oxygen in the Providence and Seekonk rivers that could serve to validate their analyses. In particular, RIDEM participated in an EMPACT program that deployed continuous recording sensors (salinity, temperature, dissolved oxygen, amongst other parameters) at various locations in the Providence and Seekonk River systems for upwards of two years. That information is available on the worldwide web at http://www.narrabay.com/empact/. Combined with concurrent discharge monitoring reports from the various wastewater treatment plants and flow data gathered from USGS gages, this would result in an extensive data set that could serve to validate RIDEM's conclusions. The lack of analysis of this information in the December 2004 report is surprising.

Response #B.2.f: It is not clear how the commenter believes that EPA should specifically use the referenced EMPACT data in development of nitrogen limits for this permit. Data for the critical summer periods are available from only two sites. The data include dissolved oxygen and chlorophyll *a* levels but not nitrogen levels. There are also no tributary nitrogen loading rates concurrent with the dissolved oxygen and chlorophyll *a* data.

The data do, however, provide additional documentation of the severity of the eutrophication. For example, a review of the data for the Phillipsdale station, located in the Seekonk River just upstream of the confluence with the Ten Mile River, shows that on July 16, 2007, minimum surface and bottom DO were less than 4 mg/l, maximum surface DO reached almost 20 mg/l (250 percent of saturation), and surface chlorophyll concentrations were over 80 ug/l. These data indicate that there are frequent periods during the summer months when dissolved oxygen levels and chlorophyll *a* levels reflect significantly impaired water quality.

Comment #B.2.g. EPA improperly speculates on the effects of the current permit.

In discussing its findings, EPA speculates that the 40% nitrogen attenuation ascribed by RIDEM to the Attleboro discharge [] will lower in the future because the phosphorus limits in the draft permit will reduce phosphorus driven eutrophication. This is true only in the special case that phosphorus from the treatment plants was the only limiting factor that controlled algal growth in the period reviewed by RIDEM. However, other factors – temperature, light penetration, cloud cover, and residence time all impact algal growth. EPA has provided no evidence to show that these factors were not limiting algal growth, and accordingly their speculation is inappropriate. In order to reach the conclusion that EPA has adopted, it would be appropriate for the Agency to develop a detailed TMDL that considers all factors influencing algal growth.

Response #B.2.g: Consistent with national guidance (Nutrient Criteria Technical Guidance Manual – Rivers and Streams, USEPA, July 2000), limiting phosphorus inputs is the key to controlling cultural eutrophication in fresh water systems. The permits being issued to North Attleborough and Attleboro will result in a substantial reduction in permitted loadings of phosphorus. Such phosphorus reductions will reduce (or eliminate) cultural eutrophication in the Ten Mile river system, and therefore there will be less plant life to uptake nitrogen, resulting in a lowering of the nitrogen attenuation rate (see Response B.2.b above). While the physical factors cited in CDM's comment (temperature, light penetration, cloud cover and residence time) can impact algal growth in the fresh water system, the only one of the cited factors that may significantly change in the future is light penetration, as surface plant growth decreases. While this may promote a change in the plant community, EPA believes that a net reduction in attenuation is inevitable. See responses above regarding the imposition of a water quality-based limit in the absence of a TMDL.

Comment #B.3: The permit calculates effluent metals limits based on 100 mg/l of hardness, which reflects the hardness of the upstream receiving water. However, the Wastewater Treatment Plant discharges effluent with a significantly higher hardness, approximately 250 mg/l, and thus the downstream receiving water, under 1.4:1 dilution conditions can be expected to have a hardness of approximately 207 mg/l. Under this condition, the permit limits ought to be as follows:

Constituent	*Monthly Limit*	*Daily limit*
Cadmium	0.6	6.3
Copper	24.3	38.9
Zinc	310.7	310.7
Lead	11.2	288.6
Nickel	135.1	1215.6
Silver		18.5

This approach has been used several times in recent Massachusetts permits, including Southbridge, Upton, and Northbridge.

Response #B.3: While effluent hardness is at times as high as 250 mg/l, at other times it is much lower. In determining appropriate hardness levels for permit limit development, EPA focuses on low flow conditions in order to approximate hardness level during the critical conditions. Effluent hardness data from the August quarterly toxicity tests for 2003 and 2004 indicate very different results. In 2003, the effluent hardness average was 177 mg/l, but in 2004, the effluent hardness average was only 97 mg/l. Using an in-stream hardness value of 100 mg/l ensures that criteria will be met under all effluent and receiving water conditions. Therefore, EPA has opted to use the lower hardness value when calculating the permit limits. This approach is appropriate given the toxicity of metals to aquatic life in the receiving water.

Comment #B.4: This permit eliminates a permit limit for chromium, based on the fact that the data shows no reasonable potential to exceed water quality criteria in the receiving water. The same conclusion can be reached for zinc, and the zinc limit should be eliminated from the permit. As with chromium, testing will be conducted periodically as part of the WET testing, thus providing EPA with continuing assurance that the plant is discharging low levels of zinc.

Response #B.4: We concur and have eliminated the zinc limit from the permit. The maximum monthly average zinc level in the effluent was 60 ug/l (see Fact Sheet), which is significantly less than the Massachusetts criterion or the Rhode Island criterion (see RIDEM comment below).

Comment #B.5: Aluminum is a component of several highly effective coagulants commonly used in wastewater treatment to provide control of metals and phosphorus and to improve overall process performance. The Attleboro plant has successfully used Polyaluminum chloride (PAC) over the past two years, resulting in overall enhancement of plant effluent, especially with respect to phosphorus levels in the discharge as compared to previous use of alum. Changing out this coagulant would likely cause operational difficulty for the plant.

The water quality criteria for aluminum indicates that the chronic criteria for aluminum may be overly restrictive. It says:

> There are three major reasons why the use of Water-Effect Ratios might be appropriate. (1) The value of 87 g/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 in "Aluminum Water-Effect Ratio for the 3M Plant Effluent Discharge, Middleway, West Virginia" (May 1994) indicate that aluminum is substantially less toxic at higher pH and hardness, but the effects of pH

and hardness are not well quantified at this time. (2) In tests with the brook trout at low pH and hardness, effects increased with increasing concentrations of total aluminum even though the concentration of dissolved aluminum was constant, indicating that total recoverable is a more appropriate measurement than dissolved, at least when particulate aluminum is primarily aluminum hydroxide particles. In surface waters, however, the total recoverable procedure might measure aluminum associated with clay particles, which might be less toxic than aluminum associated with aluminum hydroxide. (3) EPA is aware of field data indicating that many high quality waters in the U.S. contain more than 87 g aluminum/L, when either total recoverable or dissolved is measured.

See http://www.epa.gov/waterscience/criteria/wqcriteria.html#L2, footnote L.

Recognizing:

The importance of aluminum in the wastewater industry,

The fact that the toxic effects that drove the development of the chronic criterion were for ambient environmental conditions far different (hardness of 10 versus hardness of 207) from that of Attleboro,

Attleboro's demonstrated ability to consistently meet its chronic WET limit, which shows the nontoxic nature of Attleboro's effluent

The limit on aluminum should be struck from the permit.

Response #B.5: The acute and chronic criteria used to calculate the aluminum limits are those adopted by MassDEP into its water quality standards, and so must be used as the basis for the effluent limitations. EPA must limit pollutants which have the reasonable potential to cause or contribute to exceedances of water quality standards. EPA has determined in this case that the discharge of aluminum from the facility has such a potential.

We are aware that there are concerns regarding the aluminum criteria, specifically that the chronic criteria may be overly conservative for some waters. If MassDEP were to propose, and EPA approve less stringent criteria, these would be the basis for future limits.

Whole effluent toxicity tests are designed to determine if there are any additive or synergistic toxic effects of the various pollutants in the effluent using a specific organism, and WET limits are not substitutes for chemical- specific limits. They are not designed to assess the toxicity of individual pollutants.

On September 12, 2006, the following comments were received from the Rhode Island Department of Environmental Protection:

Comment #C.1: The Rhode Island Department of Environmental Management (DEM) has reviewed the permit limits contained in the draft permits referenced above and determined that many of these limits will result in violations of Rhode Island Water Quality Standards in RI waters. The Environmental Protection Agency (EPA) established all water quality-based permit limits using background concentration of zero and by allocating 100% of the criteria. As a result, the limits for the Attleboro facility were based on the assumption that the entire pollutant load from the North Attleborough facility was eliminated from the water column before reaching the Attleboro facility. This assumption is not reflective of actual conditions and when coupled with allocation of the entire criteria, results in permit limits that cause violations of RI Water Quality Standards. In addition, EPA has utilized an in-stream hardness value of 100 mg/l to compute the water quality criteria for metals. This value is significantly higher than values typically observed in RI waters and results in higher water quality criteria than DEM would anticipate. Please provide information to support the use of this hardness value.

The table below, compares the in-stream concentrations at the MA/RI state line that result from the draft permit limits, to the RI Water Quality Standards (please note that for the sake of this analysis the hardness of 100 mg/l was utilized based on the assumption that EPA will provide justification for using this value). The concentrations that will result at the state line were computed from a mass balance using a 7Q10 flow at the state line of 14.4 cfs (or 2.71 cfs, based on flow data collected from USGS gauge # 01109403 after subtracting out historical WWTF flows), the WWTF flows and pollutant concentration limits contained in the draft permits and are artificially low as the EPA assumption of pollution concentrations of zero upstream of the North Attleborough WWTF was also used. Attached is a spreadsheet that contains the details of this analysis.

	Ten Mile River Concentration at the RI Border[1]	RI Water Quality Standard	% Exceedance of RI Water Quality Standards
Phosphorus	0.177 mg/l	0.025 mg/l[2]	606 %
Copper	10.5 ug/l	9.3 ug/l	12.9%
Lead	3.6 ug/l	3.2 ug/l	14.3%
Aluminum	98.5 ug/l	87 ug/l	13.2%
Zinc	135.5 ug/l	120 ug/l	13.1%
Cadmium	0.32 ug/l	0.27 ug/l	19.0%
Cyanide	5.2 ug/l	5.2 ug/l	0%

[1]As noted above predicted concentrations are artificially low since the EPA assumption of pollutant concentrations of zero upstream of the North Attleborough WWTF was utilized.

[2]Rule 8.D.(2) of the Rhode Island Water Quality Regulations establishes the following criteria for Nutrients:

> "*Average Total Phosphorus shall not exceed 0.025 mg/l in any lake, pond, kettlehole or reservoir, and average Total P in tributaries at the point where they enter such bodies of water shall not cause exceedance of this phosphorus criteria, except as naturally occurs, unless the Director determines, on a site-specific basis, that a different value for phosphorus is necessary to prevent cultural eutrophication*."

Determination of whether the water quality criterion of 25 ug/l is applicable to the Ten Mile River requires an evaluation of whether it flows into a lake, pond or reservoir (including whether run of the river impoundments constitute a lake, pond or reservoir). For the development of nutrient criteria, the EPA document titled *Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs: First Edition* has defined lakes as natural and artificial impoundments if they have a surface area greater than 10 acres and a minimum mean water residence time of 14 days. The Turner Reservoir on the Ten Mile Rivers meets both criteria and receives most of its flow from the Ten Mile River; therefore, the criterion of 25 ug/l must be met in the Ten Mile River at the point where it enters Turner Reservoir.

The table below is excerpt from the Final 2004 and the draft 2006 Rhode Island List of Impaired Waters ("303(d) list") and lists several waterbody segments that are impaired due to excessive metals and Phosphorus concentrations. As noted above the limits proposed by EPA would result in continued violation of many of these criteria even under the assumption that no other pollutant sources are present.

Waterbody ID	Waterbody Name	Cause
TEN MILE RIVER BASIN		
RI0004009L-01A	Turner Reservoir	LOW DO, Phosphorus, Lead (Pb), Copper (Cu)
		PATHOGENS
RI0004009L-01B	Turner Reservoir	LOW DO, Phosphorus, Lead (Pb), Copper (Cu)
		PATHOGENS
RI0004009L-02	Slater Park Pond	EXCESS ALGAL GROWTH/CHL-A, Phosphorus, PATHOGENS
RI0004009L-03	Omega Pond	Phosphorus, Lead (Pb), Copper (Cu)
RI0004009R-01A	Ten Mile River	Lead (Pb), Copper (Cu), Cadmium (Cd)
RI0004009R-01B	Ten Mile River	BIODIVERSITY IMPACTS, Copper (Cu), Lead (Pb)

As you know, pursuant to the NPDES regulations at 40 C.F.R. 122.44(d) and 33 USC Sec.1341(a)(2), NPDES limits must achieve compliance with water quality standards and limits must be included in permits where pollutants will cause, have

reasonable potential to cause, or contribute to an exceedance of the State's water quality. As noted above the limits contained in the draft permit will result in violations of RI water quality standards and therefore, the limits must be revised using a Waste Load Allocation (WLA) strategy that includes an appropriate margin of safety to account for any lack of knowledge concerning the relationship between effluent limits and water quality, ensures an equitable distribution of pollutant loads and that at a minimum meets all Rhode Island water quality criteria at the state line.

Response #C.1: Hardness data from Attleboro's quarterly toxicity tests conducted during the summer low flow period indicate that the average in-stream hardness above the North Attleborough discharge (Attleboro takes its dilution water from the Ten Mile River above the North Attleborough discharge) was 162 mg/l for 2002 – 2004 with a range of 100 mg/l – 253 mg/l. Using 100 mg/l for calculating the numeric criteria ensures that the criteria will be protective of in-stream uses (see also Response #B.3 above).

EPA notes that Rhode Island's analysis does not account for the dilutive impact of the Sevenmile River, which joins the Ten Mile River immediately below the state line, and also assumes that in-stream metals concentrations are 100% conservative in the water column, which is not necessarily the case. EPA believes these two factors are sufficient to offset the relatively small margin that Rhode Island's analysis shows water quality criteria to be exceeded.[15].

We concur with the comment that the phosphorus limit is not adequate to ensure that Rhode Island's water quality standards will be met in Turner Reservoir. Accordingly, EPA reopened the comment period to take comments on a proposed change in the phosphorus limit from 0.2 mg/l to 0.1 mg/l in order to ensure that the Rhode Island's nutrient criteria will be met, as well as to ensure compliance with the Massachusetts narrative water quality for nutrients. Please see below for responses to comments received during the reopened comment period.

On September 12, 2006, the following comments were received from the Massachusetts Riverways Program:

Comment #D.1: Staff at the Riverways Programs, MA Department of Fish and Game, have reviewed the draft NPDES permit for the Attleborough Water Pollution Control Facility discharging into the Ten Mile River. We appreciate the opportunity to review and comment on the draft NPDES permit. Protecting the health of the state's rivers, near coastal waters and estuaries is the driving force behind the Riverways Programs' work. The potential for point source pollution discharges to negatively impact our waterways heightens the role of NPDES permits in resource protection efforts.

[15] Moreover, it also worth noting that to the extent that the City further enhances nutrient removal this will likely also result in reduced metals concentrations in the effluent.

The Fact Sheet in this draft permit packet presents an informative picture of water quality issues in the Ten Mile River and other waterways downstream of this discharge and the probable or potential impact the effluent poses to interstate waters and important resource areas. We are pleased to see permit limits instituting limitations below secondary treatment standards and are especially pleased to see daily maximum limits for several of the pollutants. It is clear water quality based limits are needed if the Ten Mile River is to ever achieve water quality standards and the permit limits in this draft permit are a needed step.

Response #D.1: The comments are noted for the record.

Comment #D.2: Stricter limits on nutrients are especially welcome. With the modest dilution available for this discharge and the known water quality issues, reductions in nutrient loads can not come quickly enough. The proposed limits are a positive step forward in reducing water quality impacts and we note the facility has been doing an admirable job at nutrient removal regularly achieving concentrations below existing limits. This sound performance raises a question about the necessity of the caveat contained in footnote # 13 of the draft permit requiring the facility to, "comply with the 1.0 mg/l monthly average total phosphorus limit within one year of the issuance date of the permit". Since the facility is already able to meet 1.0 mg/l limit throughout the summer, (data provided in attachment A) is it necessary to have this grace period for the winter limits?

Response #D.2: Since the winter phosphorus limit is a new requirement, and treatment operations under cold weather conditions are different than treatment operations at other times of the year, it is reasonable to allow a one year schedule to make the necessary adjustments to the chemical dosing system. A multi-year schedule, however, is not justified since significant capital improvements are not necessary to achieve this limit.

Comment #D.3: Given the severe water quality issues in the Ten Mile River, including areas with excessive algal growth, and the downstream rivers and impoundments we wonder if consideration has been given to assigning load limits for total phosphorus or at least requiring the permittee to report total phosphorus loads during each of the summer months? A load limitation would provide further protection to a receiving water with documented eutrophication and knowing nutrient loads will help with management decisions and future modeling and assessment. This would also be true of total nitrogen. Knowing the loads through the year of this nutrient would be helpful to Rhode Island in its efforts to refine total maximum daily loads entering into Providence River and Narragansett Bay.

Response #D.3: We have included a monthly average reporting requirement for phosphorus and nitrogen effluent loads, because these data will inform future management, assessment and modeling efforts relative to nutrients carried out by

EPA, Rhode Island and other parties. Load limits could be included in future permits if determined to be necessary to ensure attainment of water quality standards.

Comment #D.4: We agree with EPA's assessment that nitrogen loads from point sources are a significant contributor to the nitrogen loading in Narraganset Bay. The ammonia and total nitrogen limitations in the draft permit are necessary to help curb these loadings and work toward meeting water quality standards. We fully support maintaining the existing ammonia limitations and the total nitrogen limit.

Response #D.4: The comments are noted for the record.

Comment #D.5: The summary of the discharge monitoring data shows there has been a significant exceedance of total residual chlorine. Is year round chlorination required because of concerns about shellfish beds in downstream waters or could there be some consideration given to seasonal disinfection? Seasonal disinfection would reduce the potential for impacts from this highly toxic substance in the receiving water. If year round disinfection is necessary, the requirement for alarms on the chlorination and dechlorination systems adds additional protection against malfunctions that could lead to excessively or inadequately chlorinated effluent from entering the river. Ideally continuous monitoring would be added to this facility to add an even greater level of protection.

Response #D.5: Year round disinfection is required to achieve Rhode Island water quality standards, which require that bacteria criteria be achieved year-round. A well-operated disinfection system with the required alarms should minimize the potential for a toxic impact associated with chlorine. Continuous chlorine monitoring is something EPA is evaluating and, as stated in the Fact Sheet, continuous chlorine monitoring may be required in a future permit.

Comment #D.6: The Ten Mile River is a severely impaired waterway. One of the water quality problems contributing to impairment is associated with low dissolved oxygen. The draft permit requires daily sampling of the effluent and a minimum concentration of 6.0 mg/l. Given the existing conditions in the river, this is a vital measure of the effluent quality. The permit does not provide guidance on when the dissolved oxygen daily grab sample should be taken. Should the dissolved oxygen concentration in the effluent naturally fluctuate, sampling during depressed dissolved oxygen times or matching the monitoring of the effluent with the typical low dissolved oxygen periods in the receiving water, (early morning) might provide more information on how the effluent could impact, either enhance or exacerbate, oxygen levels in the Ten Mile River. If the concentrations are quite static than explicit requirements on the timing of the sampling is not necessary.

Response #D.6: In order to more accurately characterize the effluent and water quality data, we concur that the dissolved oxygen effluent sampling should be conducted in the early morning when levels will be at the daily minimum and have included this requirement in the final permit.

On September 14, 2006, the following comments were received from the City of Attleboro:

Comment #E.1: The City of Attleboro is very proactive in its endeavors to achieve the limits of the NPDES permit for the wastewater treatment plant. We have worked very hard to meet current NPDES imposed treatment limits. At present, the City is working on a Comprehensive Wastewater Management Plan and our $30 million dollar upgrade now under construction.

Response #E.1: The comments are noted for the record.

Comment #E.2: With regard to metals we feel the Attleboro facility has maximized its ability to remove metals. Any further removal would have to be achieved at the point source industries. Further, we feel that the stringent limits proposed are not warranted. Positive bioassay testing from 2003 to present have had no toxicity failures, which proves that the impacts of metals discharged from the Attleboro facility are consistently not compromising the integrity of the Ten Mile River. (A copy is enclosed as Attachment A of the results of our bioassay testing for the past 3 years).

The City of Attleboro's Industrial Pretreatment Program was established in September 1984. We have a full time Industrial Pretreatment Coordinator overseeing 29 permitted industries. We are required to sample each industry on a semi annual basis along with requiring each industry to submit quarterly sample results to insure compliance. The City also conducts an annual total toxic organics sampling, as well as, inspections of all permitted industries once a year. Further, the City takes additional samples when inconsistencies are detected. The City continues to work with the Industries to provide assistance to improve the quality of their wastewater discharges to the municipal wastewater treatment plant.

Attachment A

September 14, 2006

The following is a list of all quarterly Bioassays conducted at the City of Attleboro' s Wastewater Facility dating back to November 2003 . All tests were successful except for February 2005. There were two invalid tests because the diluent did not meet the passing criteria using the freshwater species C. Dubia. The EPA was asked and granted permission to use a synthetic, soft reconstituted water to culture freshwater test organisms. All Bioassays since February 2005

have been successful. The City requests permission for continued use of synthetic dilution water.

November 2003 - Passed
February 2004 - Passed
May 2004 - Passed
August 2004 - Passed
November 2004 - Passed
February 2005 - Failed due to diluent, retested and passed.
May 2005 - Passed
August 2005 - Passed
November 2005 - Passed
February 2006 - Passed
May 2006 - Passed

Response #E.2: We concur that the primary focus of further metals removal should be at the industries that discharge to the collection system. The permit requires an evaluation of whether the current local limits for point source industries are sufficient to achieve the new permit limits and requires the development and implementation of revised local limits if the current limits are not sufficient.

As is discussed in Response #B.5, whole effluent toxicity tests are designed to determine if there is any additive or synergistic toxicity affects of the various pollutants in the effluent, and are not designed to assess the toxicity of individual pollutants. Individual metals criteria are established at a level that will be protective of a range of the most sensitive aquatic species. Whole effluent toxicity tests for Attleboro are conducted with only one species.

While authorization was previously granted for the use of synthetic laboratory water as the diluent for whole effluent toxicity testing, this permit requires that the upstream receiving water sample be collected at a different location and that it be used as the diluent. The new location is upstream of the Attleboro discharge but downstream of the North Attleborough discharge. Previous receiving water samples were collected upstream of the North Attleborough discharge. The change is necessary in order to account for any potential additive toxicity effects of the two discharges. If the use of receiving water as the diluent results in invalid tests, the permit includes an automated procedure for switching to synthetic laboratory water as the diluent.

Comment #E.3: Approximately a year and a half ago, the City and our Consultants, CDM, met with the DEP regarding our concern that total nitrogen limit might be implemented in this proposed permit. We were seeking direction from DEP and EPA at that time as the City began the first months of our plant upgrade. The City tried to obtain firm and long-term limits for phosphorus and nitrogen. The official response to the City was to monitor nitrogen until a TMDL

is completed on the Ten Mile River and then the discharge limits for the WWTP would be established and permitted. In effect, the City would not see a total nitrogen limit in this new permit, which would allow at least 5 more years of monitoring and careful assessment. This mutually agreed to approach provided direction to the City's wastewater budget, facility planning and the ongoing upgrade construction.

Response #E.3: As discussed in Response A.4(b), EPA's position relative to nitrogen limits and planned upgrades for Attleboro was outlined in a June 9, 2003, letter from MassDEP reflecting the position of both EPA and the MassDEP permitting program. In the letter, the City was informed that a nitrogen limit could be included in the reissued permit and that this should be considered in any facilities planning conducted by the City.

Comment #E.4: Throughout the years, the City of Attleboro has strived to meet and has complied with its NPDES limitations set by the DEP/EPA for all parameters. Over the past several years the following procedures have been implemented to our process and operations to achieve compliance. In the early 1980's a primary pH of 9.3 to 9.5 was established and maintained using lime addition at the headworks to enhance copper removal. In addition, three primary clarifiers, as opposed to two, were put into service to increase detention time and remove the copper into the sludge. Also, our first stage clarifiers were brought into service to serve as back up primaries to further remove copper into the sludge. In addition, a depressed pH due to the effect of the metal salts was neutralized by the addition of lime to our aeration system to keep the pH above a 7.0, which kept the copper from going back into solution, and substantially enhanced our copper removal. We also limited our septage pumping to nighttime hours during lower flow periods at a slower pumping rate over a longer duration of time. Following our Phosphorus Optimization Study, several different chemical combinations were tried as an alternate to alum. Ultimately we chose ferric chloride and poly aluminum chloride. This enabled us to meet the present phosphorus limit of 0.2.

Response #E.4: We commend the City on its efforts to comply with existing permit limits. However, it does not preclude the need to ensure that the reissued permit is consistent with Massachusetts standards as well as Rhode Island standards.

Comment #E.5: Under Footnote #10 the boxed area denoting "Chronic Limit C-NOEC" says > 94%. The "Effluent Limitations and Monitoring Requirements" in the draft permit indicates our limit as being > 71%.

Response #E.5: The C-NOEC chronic limit should be 71%. The typographical error in Footnote #10 has been corrected.

Comment #E.6: Fact Sheet - page 4 Section C mentions sulfur dioxide dechlorination. Our new chemical is sodium bisulfate.

Response #E.6: The correction is noted for the record.

Comment #E.7: Cyanide - Fact Sheet page 13, our existing ML is 20 ug/l for cyanide and if below report as zero. Is the new ML of 10 ug/l going to be reported as zero or is the limit that is specified in "Effluent Limitations and Monitoring Requirements" in the draft permit our limit?

Response #E.7: The limits for cyanide are 6.3 ug/l monthly average and 30.8 ug/l daily maximum. Any monitoring result of less then 10 ug/l should be reported as zero.

Comment #E.8: With regard to fecal coliform, favorable TRC data was forwarded to Mr. Brian Pitt to support our request to relax our fecal coliform frequency of sampling from 3 times per week back to once per week. We were told that the data submitted warranted a change in frequency but it would take place at the time of the renewal of our permit. We request to see this changed now.

Response #E.8: The final permit reduces the frequency of fecal coliform monitoring to twice per week. The vast majority of POTW permits in Massachusetts that authorize discharges into fresh water systems that afford little dilution require bacteria monitoring of 2 - 3 times per week. The potential for impacts to human health and downstream shellfish beds warrant more frequent monitoring than once per week to ensure that the limit is being met consistently.

Comment #E.9: Another step taken toward permit compliance included the design and implementation of a dechlorination system to meet lower chlorine residual requirements. Under the ongoing facility upgrade we replaced liquid chlorine gas with liquid sodium hypochlorite and sulfur dioxide was replaced with sodium bisulfite.

Response #E.9: The comments are noted for the record.

Comment #E.10: We take exception to several limits as proposed in the current draft permit. We believe that the basis or derivation of the new limits for total nitrogen is not sufficiently substantiated. Further, if imposed, the facility would be subject to yet another structural modification costing millions of dollars and will cause hardship to the taxpayers and ratepayers of the City of Attleboro.

Response #E.10: It is not clear what specific issues the commenter has with the basis or derivation of the total nitrogen limit other than those submitted by its attorney and its consultants. Please see responses above relative to the basis for the total nitrogen limit.

While structural modifications necessary to meet the total nitrogen limit will not be inexpensive, EPA's compliance schedule will account for affordability concerns to the extent reasonable.

Please see Response F#9 relative to the role of cost considerations in the establishment of water quality-based limits.

Comment #E.11: As demonstrated from the above, the Attleboro Wastewater Treatment Facility has successfully met all of the limits imposed in prior NPDES permits and is committed to meeting all reasonable future limits. However, we feel the total nitrogen limit along with the metals proposed in this draft permit are based on inconclusive information due to the fact that a TMDL has not been performed on the Ten Mile River (or any other rivers mentioned by EPA) nor is there any evidence based on the results of our bioassay's that our effluent has a negative toxic impact on our receiving waters, the Ten Mile River.

Response #E.11: See Response #A.1, A.2, B.1, and E.2, as well as the Fact Sheet discussion on metals criteria.

Comment #E.12: We trust that the proposed permit limits and schedule are negotiable and we request to meet with you to establish mutually acceptable terms. Please contact me to set a meeting date.

Response #E.12: EPA has determined that the proposed limits are necessary to ensure compliance with water quality standards. However, a reasonable compliance schedule for meeting any new limits that cannot be met upon the effective date of the permit will be established and the City will be consulted in establishing that schedule.

The following comments were received on the proposed revision to the draft permit from Doug Wilkins of Anderson & Krieger (with attached comments from John Gall of Camp Dresser and McKee), on behalf of the City of Attleboro, in a letter dated August 30, 2007:

Comment #F.1: In its Fact Sheet accompanying the original draft permit (at p. 8), proposing a limit of 0.2 mg/l phosphorus, EPA stated:

> A monthly average total phosphorus limit of 0.2 mg/l has been established based on the "highest and best" practical treatment as defined by the MAWQS. . . . If MassDEP adopts numeric nutrient criteria, a TMDL is completed, or additional water quality information shows that phosphorus limits are not stringent enough to meet water quality standards, more stringent limits may be imposed.

All of these facts and considerations still apply. MassDEP has not adopted numeric criteria; there is no TMDL; and no additional water quality information

appears in the record. EPA points to nothing that has changed, other than comments from RIDEM, which contained no new data and no new analysis. It would be arbitrary and capricious to change course with no change in circumstances and no data to back up the decision.

This is particularly true in light of the justification given in the new Fact Sheet for the draft Attleboro Permit revision (Fact Sheet). Neither EPA nor the States tolerate the practice of imposing limits upon WWTPs based upon the fact that some downstream waters may be "stressed," without specific inquiry, data and analysis showing the facility's actual contribution (or lack thereof) to an alleged water quality violation, and an assessment of the total load and the Pond's capacity, from which the WWTP's contribution may be allocated. *See Arkansas v. Oklahoma*, 503 U.S. 91 (1992); *Friends & Fishers of the Edgartown Great Pond, Inc. v. Department of Environmental Protection*, 446 Mass. 830, 840-844, (2006); RIDEM Rule 7. The Fact Sheet departs from this practice and offers two rationales that do not meet legal requirements.

CDM's comments further note the presence of several golf courses adjacent to the Turner Reservoir that could significantly impact the phosphorus loading and the fact that Rhode Island has indicated they intend to complete a TMDL for Turner Reservoir in 2012.

Response #F.1: Rhode Island Water Quality Regulations establish numeric criteria of 0.025 mg/L (25 ug/L) for any lake, pond, kettlehole or reservoir. RIDEM's comments on the draft permit argued that EPA had not adequately considered impacts of the Attleboro WPCF discharge on attainment of Rhode Island water quality standards for phosphorus, particularly attainment of numeric criteria for total phosphorus in lakes (see Comment # C.1). RIDEM provided an analysis of total phosphorus concentration at the Massachusetts/Rhode Island state line based on the 0.2 mg/l limit in the original draft. EPA was persuaded by this analysis and, based on RIDEM comments and its own subsequent analysis, concluded that the 0.2 mg/l limit proposed in the original draft permit was not sufficiently stringent to ensure that water quality standards would be met in the downstream Rhode Island lake. EPA's decision to rectify its error and re-notice a draft permit for public comment was not arbitrary and capricious; rather, it flowed logically from the public comment period, the purpose of which is to alert the permit issuer to potential problems with a draft permit and to ensure that the permit issuer has an opportunity to address the problems before the permit becomes final.

In addition, EPA concluded that its earlier decision to rely on the "highest and best" practical treatment requirement in Massachusetts WQS to impose a phosphorus effluent limit of 0.2 mg/l could not be adequately supported based on the record before EPA and would not be sufficiently protective of the Massachusetts portions of the river. Applicable nutrient-related EPA guidance and available peer-reviewed scientific literature indicate that a more stringent water quality-based effluent limitation would be required to control the effects of

eutrophication in the receiving water and ensure compliance with applicable water quality standards.

The commenter's suggestion that EPA imposed the phosphorus effluent limit merely on the grounds that the downstream waters are "stressed" and without reference to the actual impact of the facility's discharge on water quality is incorrect. Consistent with the CWA and implementing NPDES regulations, EPA determined a phosphorus effluent limit was necessary only after concluding that Attleboro's discharge had the reasonable potential to cause or contribute to the demonstrated impairments of the receiving waters. Upon so concluding, EPA imposed a limit that would ensure compliance with Massachusetts water quality standards, as it is obligated by law to do. *See* CWA § 301(b)(1)(C).

In determining the need for the limit, EPA also took into account the applicable water quality standards of the downstream affected state, Rhode Island, again as required by law. *See* CWA § 401(a)(2); 40 C.F.R. §§ 122.4(d), 122.44(d)(1)(vii)(4). *See also*, *Arkansas v. Oklahoma*, 503 U.S. 91 (1992) (EPA has authority to apply water quality standards of downstream state in issuing permit to point source in upstream state).

As outlined in the Fact Sheet and as described below, phosphorus effluent discharges from the Attleboro facility are contributing to violations of water quality standards in both Massachusetts and Rhode Island.

Cultural Eutrophication

Under undisturbed natural conditions, phosphorus concentrations are very low in most aquatic ecosystems. Excessive nutrient levels can result in increases in algae and other primary producers, which may prevent streams from meeting their designated uses. Typically, elevated levels of nutrients such as phosphorus will cause excessive algal and/or plant growth. Phosphorous and other nutrients (*i.e.*, nitrogen) promote the growth of nuisance levels of algae, such as phytoplankton (free floating algae) and periphyton (attached algae), filamentous algae such as moss and pond scum, and rooted aquatic plants, referred to generally as macrophytes.

Noxious aquatic plant growth degrades aesthetic and recreational uses in a variety of ways. Unsightly algal growth is unappealing to swimmers and other stream users and reduces water clarity. Heavy growths of algae on rocks can make streambeds slippery and difficult or dangerous to walk on. Algae and macrophytes can interfere with angling by fouling fishing lures and equipment. Boat propellers and oars may also get tangled by aquatic vegetation.

Excessive plant growth can also result in a loss of diversity and other changes in the aquatic plant, invertebrate, and fish community structure and habitat.

Through respiration, and the decomposition of dead plant matter, excessive algae and plant growth can reduce in-stream dissolved oxygen concentrations to levels that could negatively impact aquatic life. During the day, primary producers (*e.g.*, algae, plants) provide oxygen to the water as a by-product of photosynthesis. At night, however, when photosynthesis ceases but respiration continues, dissolved oxygen concentrations decline. Furthermore, as primary producers die, they are decomposed by bacteria that consume oxygen, and large populations of decomposers can consume large amounts of dissolved oxygen. Many aquatic insects, fish, and other organisms become stressed and may even die when dissolved oxygen levels drop below a particular threshold level.

Decomposing plant matter also produces unpleasant sights and strong odors, again negatively impacting recreational and aesthetic uses. Nutrient-laden plant detritus can also settle to bottom of a stream bed. In addition to physically altering the benthic environment and aquatic habitat, organic materials in the sediments can become available for future uptake, further perpetuating and potentially intensifying the eutrophic cycle.

Due to the tendency of phosphorus to be retained in the water column and/or transported downstream, EPA nutrient guidance emphasizes that when establishing phosphorus effluent limits, a permit issuer must taken into account downstream impacts of the pollutant. *See, e.g.*, Gold Book at 241; Nutrient Technical Guidance Manual at 3 ("In flowing systems, nutrients may be rapidly transported downstream and the effects of nutrient inputs may be uncoupled from the nutrient source[.]").

See generally, Effects of Eutrophication on Stream Ecosystems, Lei Zheng and Michael J. Paul, PhD (Tetra Tech, Inc.); *A Literature Review for Use in Nutrient Criteria Development for Freshwater Streams and Rivers in Virginia* (Virginia Polytechnic Institute and State University, 2006) at pp. 1-11.

Applicable Water Quality Standards

As a Class B water, the Ten Mile River has been designated by Massachusetts as a habitat for fish, other aquatic life and wildlife and for primary (e.g. swimming) and secondary (e.g. fishing and boating) contact recreation. *See* 314 C.M.R. §§ 4.06 (Table 12) and 4.05(3)(b). Such waters must have consistently good aesthetic value and, where designated, must be suitable as a source of public water supply with appropriate treatment, as well as for irrigation and other agricultural uses. *See* 314 C.M.R. § 4.05(3)(b).

Class B waters must also be free of floating, suspended or settleable solids that are aesthetically objectionable or could impair uses. *Id*. at § 4.05(3)(b)(5). Changes to color or turbidity of the waters that are aesthetically objectionable or use-impairing are also prohibited. *Id*. at § 4.05(3)(b)(6).

Numeric criteria for Class B waters include limits on dissolved oxygen (not less than 5.0 mg/l) and pH (6.5-8.3 s.u. and not more than 0.5 units outside the background range). *Id*. at §§ 4.05(3)(b)(1) and (3).

In addition to criteria specific to Class B waters, Massachusetts imposes minimum narrative criteria applicable to all surface waters, including aesthetics ("free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life"), bottom pollutants and alterations ("free from pollutants in concentrations or combinations or from alterations that adversely affect the physical or chemical nature of the bottom, interfere with the propagation of fish or shellfish, or adversely affect populations of non-mobile or sessile benthic organisms."), and nutrients. *See* 314 C.M.R. § 4.05(5)(a),(b) and (c).

Pursuant to C.M.R. § 4.05(5)(c), Massachusetts water quality standards require 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…" Massachusetts standards do not include a numeric criterion for total phosphorus.[16]

Rhode Island has designated the Ten Mile River as a Class B1 water from the Massachusetts border to the Newman Avenue Dam in East Providence, and as a Class B water from the Newman Avenue Dam to the discharge into the Seekonk River.

Rhode Island Class B designated waters are suitable for, *inter alia*, fish and wildlife habitat and for primary and secondary recreational uses. RI Water Quality Regulations, Rule 8(B)(l)(c).

Class B1 waters have the same classifications, except for the notation that although all criteria must be met, primary contact recreational uses may be impacted by pathogens from approved wastewater discharges. Rule 8(B)(l)(d).

The receiving waters are subject to a variety of class-specific criteria, as well as generally applicable minimum criteria. *See* Table 1, Rule 8(D)(3); Rule 8(D)(1) (General Criteria).

With respect to nutrients, Rhode Island water quality standards include the following numeric and narrative criteria:

> "a. Average Total Phosphorus shall not exceed 0.025 mg/l in any lake, pond, kettlehole or reservoir, and average Total P in tributaries at the point where they enter such bodies of water shall not cause exceedance of this

[16] Massachusetts has established site-specific criteria for numerous lakes and ponds pursuant to TMDLs. The criteria range from 0.0051 mg/l to 0.0455mg/l (see 314 C.M.R. 4.06, Table 28).

phosphorus criteria, except as naturally occurs, unless the Director determines, on a site-specific basis, that a different value for phosphorus is necessary to prevent cultural eutrophication.

b. None in such concentration that would impair any usages specifically assigned to said Class, or cause undesirable or nuisance aquatic species associated with cultural eutrophication, nor cause exceedance of the criterion of 10(a) above in a downstream lake, pond, or reservoir. New discharges of wastes containing phosphates will not be permitted into or immediately upstream of lakes or ponds. Phosphates shall be removed from existing discharges to the extent that such removal is or may become technically and reasonably feasible."

Rule 8(D)(2)(10). *See also* Rule 8(D)(1)(d) (General Criteria; Nutrients).

Water Quality Standard Violations

As outlined in the Fact Sheet and as demonstrated below, the segment of the Ten Mile River into which Attleboro discharges, as well as waters downstream of the discharge, are currently suffering from severe phosphorus-driven impairment and are clearly violating applicable water quality criteria in both Massachusetts and Rhode Island.

From the North Attleborough treatment plant to the Massachusetts/Rhode Island border, the Ten Mile River is listed on the Massachusetts 303(d) list as impaired for unknown toxicity, metals, nutrients, organic enrichment/low DO, pathogens, and noxious aquatic plants. Central Pond[17] and James V. Turner Reservoir, parts of which are in Massachusetts, are also on the Massachusetts 303(d) list as impaired due to nutrients and noxious aquatic plants (see *Massachusetts 2006 Integrated List of Waters*).

In Rhode Island, the free flowing segment of the river from the Massachusetts/Rhode Island border to the inlet of Turner Reservoir North, excluding Slater Park Pond, is listed for cadmium, copper, and lead, and the free flowing segment from Turner Reservoir South to the Omega Pond Inlet is listed for biodiversity impacts, copper and lead. Turner Reservoir, both north and south of the Newman Avenue Dam, are listed for copper, lead, low DO, and phosphorus. Omega Pond is listed for copper, lead, and phosphorus. *See State of Rhode Island 2006 303(d) List of Impaired Waters.*

The *Massachusetts Ten Mile River Basin 1997 Water Quality Assessment Report* describes the trophic state of both Central Pond and the Turner Reservoir as

[17] Central Pond is called Turner Reservoir North by RIDEM in its 303(d) report. In this document EPA has used the names used by Massachusetts DEP, i.e., the body of water north of Newman Avenue is called Central Pond and the body of water south of Newman Avenue is called the Turner Reservoir

hypereutrophic. The *Massachusetts Ten Mile River Basin 2002 Water Quality Assessment Report* noted that 90 percent of Central Pond was covered in duckweed, and that a very dense subsurface cover of *Elodea sp.* (a type of macrophyte) and filamentous algae were observed. The survey of the James Turner Reservoir noted moderate to dense macrophyte cover, a dense filamentous green algal mat covering 50 percent of the northern portion of the reservoir, and dense duckweed in the cove areas.

In 1999, the U.S Army Corps of Engineers investigated the Turner Reservoir to determine its potential as a recreational area and a back-up water supply for the City of East Providence and found it to be eutrophic. Data collected by the Corps showed elevated levels of phosphorus of 0.16 mg/l at the inflow to the Reservoir and describe large amounts of duckweed in Turner Reservoir and Central Pond, which caused offensive odors when the plant material died and decomposed along the shore. The Corps study also noted that its sampling showed an increase in phosphorus concentration from the inlet to the discharge, and offered the possible explanation that the cause of the increase was "that there is so much phosphorus in the sediments that sediment releases to the overlying water exceed plant uptake. *See Turner Reservoir Study, East Providence Rhode Island* (page 9) and Attachment 4 for pictures from report..

The MassDEP *Ten Mile River Watershed, 2002 Water Quality Assessment Report* includes extensive sampling conducted during the spring and summer of 2002 that documents water quality conditions in the main stem of the river, its significant tributaries and its impoundments. The data show that the phosphorus concentration in the Ten Mile River upstream of the facility exceeds the Gold Book guidance value, the Ecoregion criteria, and the other recommended values (discussed below), during every sampling event. Downstream of the Attleboro discharge, below the confluence with the Sevenmile River, the Ten Mile also consistently exceeds the cited water quality criteria. *See* Attachments 5 and 6

As can be seen in the data, the phosphorus concentration of the Ten Mile River entering Central Pond exceeded 0.1 mg/l on each of the sampling events, and the total phosphorus concentration within the Pond and Reservoir far exceeded the Rhode Island numeric criterion of 0.025 mg/l. The impact of the high phosphorus concentration on water quality can be seen by the supersaturated DO, indicating excessive algal growth, and the extremely high chlorophyll *a* values in both ponds on August 28, 2002.

A severe bloom of Microcystis algae (which is potentially toxic to humans and animals) in September 2007 resulted in RIDEM issuing a temporary advisory on September 13th that people avoid recreational activities in the Ten Mile River, including Turner Reservoir and Omega Pond. The advisory noted, "During a recent sampling event, DEM observed a dense algae bloom turning the waters of Turner Reservoir a bright green color. Laboratory results from tests have found high levels of the naturally occurring algal toxin, Microcystin. These levels,

exceeding 25,000 micrograms per liter, are significantly above the guideline of 40 micrograms per liter from the World Health Organization." The advisory was not lifted until December 19, 2007.

Reasonable Potential to Contribute to Water Quality Standard Violations

In the absence of a numeric criterion for phosphorus, EPA looks to a wide-range of materials, including nationally recommended criteria, supplemented by other relevant materials, such as EPA technical guidance and information published under Section 304(a) of the CWA, peer-reviewed scientific literature and site-specific surveys and data. *See* 40 C.F.R. § 122.44(d)(1)(vi)(B). EPA also relies on 40 C.F.R. § 122.44(d)(1)(vi)(A) when interpreting a state narrative criterion and deriving a limit that will achieve uses. EPA does not afford definitive weight to any one value or source, but rather assesses the total mix of technical, science and policy information available when determining an appropriate and protective limit.

EPA has produced several guidance documents which set forth total ambient phosphorus concentrations that are sufficiently stringent to control cultural eutrophication and other adverse nutrient-related impacts. These guidance documents present protective in-stream phosphorus concentrations based on two different analytical approaches. An 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.

Alternatively, reference-based values are statistically derived from a comparison within a population of rivers in the same eco-region class. They are a quantitative set of river characteristics (physical, chemical and biological) that represent conditions in waters in that ecoregion that are minimally impacted by human activities (*i.e.*, reference conditions), and thus by definition representative of water without cultural eutrophication. While reference conditions, which reflect minimally disturbed conditions, will meet the requirements necessary to support designated uses, they may also exceed the water quality necessary to support such requirements.

The 1986 Quality Criteria of Water ("Gold Book") follows an effects-based approach. It sets forth maximum threshold concentrations that are designed to prevent or control adverse nutrient-related impacts from occurring. Specifically, the Gold Book recommends in-stream phosphorus concentrations of no greater than 0.05 mg/l in any stream entering a lake or reservoir, 0.1 mg/l for any stream not discharging directly to lakes or impoundments, and 0.025 mg/l within the lake or reservoir. A more recent technical guidance manual, the Nutrient Criteria Technical Guidance Manual: Rivers and Streams (EPA 2000) ("Nutrient Criteria Technical Guidance Manual"), cites to a range of ambient concentrations drawn

from the peer-reviewed scientific literature that are sufficiently stringent to control periphyton and plankton (two types of aquatic plant growth commonly associated with eutrophication). This guidance indicates in-stream phosphorus concentrations between 0.01 mg/l and 0.09 mg/l will be sufficient to control periphyton growth and concentrations between 0.035 mg/l and 0.070 mg/l will be sufficient to control plankton (Table 1 shows the range of literature values cited in the Nutrient Criteria Technical Manual, and Table 2 shows a range of phosphorus criteria established by various states)

Table 1

Nutrient (ug/l) and algal biomass criteria limits recommended to prevent nuisance conditions and water quality degradation in streams based either on nutrient-chlorophyll *a* relationships or preventing risks to stream impairment as indicated.

PERIPHYTON Maximum in mg/m^3

TN	TP	DIN	SRP	Chlorophyll *a*	Impairment Risk	Source
				100 – 200	nuisance growth	Welch et al. 1988, 1989
275 – 650	38 – 90			100 – 200	nuisance growth	Dodds et al. 1997
1500	75			200	eutrophy	Dodds et al. 1998
300	20			150	nuisance growth	Clark Fork River Tri-State Council, MT
	20				*Cladophora* nuisance growth	Chetelat et al. 1999
	10 – 20				*Cladophora* nuisance growth	Stevenson unpubl. data
		430	60		eutrophy	UK Environ. Agency 1988
		100[1]	10[1]	200	nuisance growth	Biggs 2000
		25	3	100	reduced invertebrate diversity	Nordin 1985
			15	100	nuisance growth	Quinn 1991
		1000	10[2]	~ 100	eutrophy	Sosiak pers. comm.

PLANKTON Mean in ug/l

TN	TP	DIN	SRP	Chlorophyll *a*	Impairment Risk	Source
300[3]	42			8	eutrophy	Van Nieuwenhuyse and Jones 1996
	70			15	chlorophyll action level	OAR 2000
250[3]	35			8	eutrophy	OECD 1992 (for lakes)

1 30-day biomass accrual time
2 Total Dissolved P
3 Based on Redfield ratio of 7.2N:1P (Smith et al. 1997)

Source: *Nutrient Criteria Technical Guidance Manual – Rivers and Streams.* EPA-822-B-00-002. U.S.EPA. July, 2000.

Table 2		
Examples of Numeric Criteria and Guidelines for Total Phosphorus in the U.S.		
State and Waters	**Phosphorus Criteria Values**	**Reference**
Arizona River Specific	Annual Mean 0.05 – 0.20 mg/l 90 Percentile: 0.10 – 0.33 mg/l Single Sample Maximum: 0.20 - 1.0 mg/l	AAC R18-11-109
Arkansas All Waters	Maximum limit: 0.100 mg/l (guideline)	2 AAC 2.509
Hawaii Inland Streams	Geometric Mean, not to exceed 0.05 mg/l – Wet Season (Nov.1 – Apr.30) 0.030 mg/l – Dry Season (May 1 – Oct. 31)	HAR 11-54-5.2
Illinois Streams at entrance to reservoir or lake with surface area of 8.1 hectares or more	Maximum limit: 0.05 mg/l	35 IAC 302.205
Nevada[*] River Specific	Monthly, average: 0.1 mg/l	NAC 445A
New Jersey Streams	Maximum limit: 0.1 mg/l, unless demonstrate TP is not a limiting nutrient and will not render the waters unsuitable for designated uses.	NJAC 7:9B-1.14(c)
New Mexico Perennial reaches of specific waters in Rio Grande, Pecos River, and San Juan River basins	Maximum limit (single sample): 0.1 mg/l	20 NMAC 6.4.109 20 NMAC 6.4.208 20 NMAC 6.4.404 20 NMAC 6.4.407
North Dakota Class I, IA, II and III streams	Maximum limit: 0.1 mg/l (interim guideline limit)	NDAC 33-16-02-09
Oregon Yamhill River and its tributaries	Monthly median: 0.070 mg/l as measured during summer low flow	OAR 340-041-0350
Utah Streams and rivers to protect aquatic life; 3B, 3C waters	Maximum limit: 0.05 mg/l (used as pollution indicator; when exceeded, further investigations are conducted)	UAC R317-2 (Table 2.14.2)
Vermont Upland streams (> 2,500 ft.)	Maximum limit: 0.010 mg/l at low median monthly flow	VWQS 3-01-B2
Washington Spokane River (river mile 34 – 58)	Average euphotic zone: 0.025 mg/l (during June 1 to October 1)	WAC 173-201A-130
[*] Different requirements may exist to maintain existing higher quality streams.		

Source: *A Literature Review for use in Nutrient Criteria Development for Freshwater Streams and Rivers in Virginia*. Virginia Polytechnic Institute and State University – Virginia Water Resources Research Center. 2006.

Based on these materials, EPA determined that an ambient phosphorus concentration of 0.1 mg/l would be necessary to control the effects of cultural eutrophication and to ensure compliance with applicable narrative and numeric nutrient criteria in both Massachusetts and Rhode Island.

EPA has concluded that the available data clearly shows that the discharge of total phosphorus from the Attleboro treatment plant has the reasonable potential to cause or contribute to exceedances of Massachusetts and Rhode Island narrative water quality standards.

At its current total phosphorus limit of 1 mg/l and its design flow of 8.6 MGD (13.3 cfs), the Attleboro discharge would, under 7Q10 conditions with an estimated dilution factor of 1.4, cause an in-stream concentration immediately downstream, of 0.7 mg/l (1/1.4), which far exceeds any recommended water quality criterion. This value assumes a background concentration of zero, meaning that the Attleboro discharge on its own would cause this in-stream concentration in the absence of any other sources. At an effluent limit of 0.2 mg/l, the limit proposed in the original draft permit, the treatment plant would result in a downstream phosphorus concentration of about 0.14 mg/l (0.2/1.4), again assuming 7Q10 conditions and zero background of phosphorus. Thus, even when zero background is assumed, which does not reflect actual in-stream conditions, this value also far exceeds any of the recommended criteria.

Regarding the contribution of phosphorus from golf courses to the observed eutrophication of Turner Reservoir, EPA cannot quantify such contributions based on available data. However, given that the primary contribution from the golf courses would be in the form of stormwater runoff, EPA would not expect a significant contribution during dry weather.

The commenter also suggests that a TMDL (analysis of total load, assimilative capacity of Turner Reservoir, and point source allocations) must be completed before the limit can be imposed. The commenter is mistaken. Although TMDLs must eventually be prepared for section 303(d) listed waters, a completed TMDL is not required in order for EPA to establish water quality-based limits. As required by 40 C.F.R. § 122.44(d)(1), reissued permits must include limits necessary to ensure compliance with water quality standards, including narrative criteria. EPA has an obligation under the Clean Water Act to establish permit limits necessary to meet water quality standards and is required to use available information to establish water quality limits when issuing a permit for a discharge which is shown to have a reasonable potential to cause or contribute to a violation of state water quality standards. *See* 40 C.F.R. § 122.44(d)(1)(i). Where a TMDL has been established, EPA is required to ensure that the effluent limits are "consistent with the assumptions and requirements of any available waste load allocation" applicable to the discharger. 40 C.F.R. §122.44 (d)(1)(vii)(B). Where

a TMDL does not exist, EPA cannot fail to include effluent limits necessary to achieve water quality standards and protect existing and designated uses of the receiving water using the best information reasonably available to it. In this case, it is clearly reasonable to proceed with imposition of the phosphorus limit given the level of existing impairment due to phosphorus-driven cultural eutrophication and given that the facility contributes a substantial amount of the phosphorus loading to the river.

Friends & Fishers of the Edgartown Great Pond, Inc. v. Department of Environmental Protection, 446 Mass. 830 (2006) involved the appeal of a permit for an increased groundwater discharge that had been issued pursuant to the Massachusetts Clean Waters Act and the state's ground water discharge regulations. MassDEP concluded that the permit's nitrogen limitation would ensure compliance with applicable state water quality regulations, and that the permit could therefore issue, based on a study which assessed Edgartown Great Pond's assimilative loading capacity for nitrogen. The court in *Friends and Fishers* merely held that it was reasonable for MassDEP to interpret its regulations to allow issuance of a permit for a groundwater discharge impacting a stressed water body by allocating a portion of the Pond's site-specific nitrogen limitation to the treatment plant based on the loading study. The import of the study was that it allowed MassDEP to conclude that its groundwater discharge permit *was stringent enough* to ensure compliance with water quality regulations. The commenter wrongly suggests that, in the absence of an allocation study of the type in *Friends and Fishers*, it would be impermissible for EPA to include a nitrogen limit in a permit for discharges to nitrogen-impaired waters even if EPA concluded that nitrogen reductions were necessary to ensure compliance with water quality standards. This misreading turns *Friends and Fishers* on its head. In any event, this state case does not establish any requirement, standard or procedure for apportioning pollutant loads that would be applicable (or relevant) to EPA when it issues a federal NPDES permit under the Clean Water Act for the surface water discharge at issue here.

Comment #F.2: The Fact Sheet (p. 3) quotes EPA's "Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria Lakes and Reservoirs in Nutrient Ecoregion XIV." That document, like the other EPA documents cited in the Fact Sheet, does not support the proposed limit. Nor does EPA present data that would permit applying that document in a scientifically defensible way.

As noted in the accompanying analysis by CDM, the document that EPA cites specifically states:

> EPA does not recommend identifying nutrient concentrations that must be met at all times; rather a seasonal or annual averaging period . . . is considered appropriate.

Far from supporting EPA's approach, this refutes the Fact Sheet's practice of basing calculations based upon 7Q10 flows. These flows are certainly not seasonal or annual averages. The Fact Sheet even considers times when the Attleboro WWTP's discharge (and that of the North Attleborough WWTP) account for all of the river's flow. Yet these flows are in fact the sole basis for setting a 0.1 mg/l limit (apart from the Rhode Island regulations, discussed below):

> **Given the lack of effective dilution under 7Q10 flow conditions**, a monthly average phosphorus effluent limit of 0.1 mg/l has been established to ensure that the Gold Book recommended value of 0.1 mg/l [sic] will not be exceeded in the Massachusetts reaches of the river below the discharge. [emphasis added]

Fact Sheet, p. 4, citing also the Nutrient Criteria Technical Guidance manual.

Under this reasoning, the plant's limit is the same as the limit for the river itself – which can only be true if one assumes that there is no dilution or attenuation at all. But EPA has acknowledged that "phosphorus" is "not completely retained in the water column" (Fact sheet, p. 5) and has acknowledged that the Attleboro WWTP discharges experience some dilution before reaching the Rhode Island border. See EPA Response #17 to North Attleborough Permit Comments, p. 16, attached as Exhibit 2 to this letter[18] See also USGS, Map attached as Exhibit 4.

On that basis, it initially proposed to reject RIDEM's argument for the 0.1 mg/l phosphorus limit. Id. Scientific studies show a substantial attenuation rate for phosphorus in streams. See excerpts from USGS "Sparrow" report entitled "Estimation of Total Nitrogen and Phosphorus in New England Streams Using Spatially Referenced Regression Models," excerpts attached as Exhibit F.[19] See also CDM Comments. The present change in position is, surprisingly, not supported with any rationale for ignoring or downplaying this attenuation factor.

Moreover, in referring to the Nutrient Criteria Technical Guidance Manual, EPA's Fact Sheet provides nothing to support its cryptic reference to "adjustments" that may have been "made to account for the differing flow assumptions used to determine those values (i.e. 7Q10 versus 2 or 3-month summer seasonal flows)." The cited literature does, indeed confirm that use of the 7Q10 values are not recommended. Yet, EPA relies upon such values anyway. Why it then refers to adjustments (presumably judgmental) to the 7Q10 values to produce seasonal numbers – which it apparently should have used in the first place – is a mystery, but it is not appropriate or scientifically justified. As such, it is speculative, arbitrary and capricious and contrary to law.

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[18] The RIDEM 2004 evaluation, p. 19 (previously submitted), states that "[]n the Ten Mile river, the DIN discharge to the Seekonk River was found to be 61% of the concurrent load estimate from the Attleborough and North Attleborough WWTFs using 1995-1996 flows.

[19] By reference, these comments also incorporate the entire Sparrow Report, at the URL reflected in Exhibit F.

Response #F.2: In developing the proposed effluent limitations for total phosphorus, dilution and background were considered, but calculations were not shown in the revised fact sheet. Because the dilution factor under 7Q10 conditions is low (1.4) and the background concentration is expected to be high (the average summer background concentration is approximately 100 ug/l based on the data collected at Station TM13 for the 2002 MA Water Quality Assessment), EPA determined that for purposes of the revised draft permit it was reasonable to assume that these factors offset each other and the limit should be equal to the criteria. The calculation of the limit is shown below:

$Cd = (CrQr-CsQs)/Qd$

Where Cd = concentration of the discharge (i.e. effluent limitation)

Cr = downstream concentration-100 ug/l

Qr= downstream flow - Qd +QS = 5.53 cfs + 13.3 cfs = 18.83 cfs

Qs = flow upstream of the discharge- 7Q10 = 5.53 cfs

Cs = background concentration = 100 ug/l

Qd = discharge flow = 13.3 cfs

$Cd = [(100 ug/l)(18.83 cfs)-(100ug/l)(5.53)]/13.3 cfs$

$Cd = 100 ug/l$

This equation is used to calculate the effluent limit necessary to achieve a desired in-stream concentration, which is in part dependent on assumptions regarding background concentrations and flow. For example, if the background concentration were assumed to be zero and the desired in-stream concentration were 100 ug/l, the effluent limit would be 142 ug/l. EPA believes that the proposed limit of 100 ug/l is appropriate given EPA's knowledge of currently prevailing background conditions, the uncertainty of accurately projecting the extent of reduced background concentrations in the near term future, and the existing cultural eutrophication in the receiving waters. The Ten Mile River and its impoundments are already highly laden with phosphorus due to the past discharges from the North Attleborough WWTF, Attleboro WPCF and other sources. EPA believes that it is prudent to adopt a reasonably conservative approach in aquatic systems where the cycle of cultural eutrophication is already underway, as is the case in the Ten Mile River. In order for the river to be restored to health, the eutrophic cycle must be broken by limiting the amount of excessive phosphorus available for uptake by aquatic plants and to allow whatever existing phosphorus has accumulated in the sediments in the past to gradually flush out of the system over time.

EPA does not believe a 0.1 mg/l that is calculated using seasonal average flows would be sufficiently protective to ensure compliance with applicable water quality standards. Massachusetts and Rhode Island water quality standards are required to be met under 7Q10 conditions, and EPA therefore used this dilution flow for the purposes of deriving the limit. During the growing season, when light and temperature are optimal for plant growth and the receiving water is subject to elevated nutrients concentrations, aquatic plant biomass growth can proliferate in relatively short periods of time. A permit limit of 0.1 mg/l calculated using seasonal flows would have the potential to allow periods of excessive loading of nutrients during and around critical low flow conditions while still meeting the overall limit. The resulting biomass from any plant growth would violate water quality standards and have the potential to settle into the sediments and contribute to future water quality violations. It is imperative, therefore, to ensure that phosphorus effluent discharges from the Attleboro WWTF and the resulting ambient phosphorus concentrations are maintained at consistently low levels. A phosphorus effluent limit that assumes worst case hydrological conditions will accomplish the objective of maintaining consistently low phosphorus in-stream concentrations.

In terms of compliance, EPA imposes the limit as a monthly average. Not only is imposition of a 30-day average limit consistent with federal regulations governing the NPDES programs, [20] such an averaging period will again reasonably minimize (when compared to a seasonal average limit) the amount of time that phosphorus effluent concentrations from the facility can exceed 0.1 mg/l and still comply with the limit. This approach maintains consistently low phosphorus effluent concentrations, as well as minimizes overall phosphorus loading, into the system, which is important in impaired waters, like the Ten Mile River, which are already suffering from severe existing cultural eutrophication and where there may be some potential for the existing sediment phosphorus deposits to recycle in the water column. As mentioned above, a relatively conservative approach is warranted in order for the eutrophic cycle to be brought to a halt, which is achieved by consistently maintaining low phosphorus concentrations and loads into the system. EPA believes a conservative approach is appropriate consistent with its obligation to ensure compliance with water quality standards.

It should be noted that EPA does not foreclose the imposition of seasonally-based limits in all instances so long as such limits are *sufficiently low* to ensure compliance with water quality standards. Based on EPA's review of seasonally-based ambient phosphorus values that were available in EPA's nutrient technical guidance and the peer-reviewed literature, it is clear that 0.1 mg/l imposed on a seasonal average basis would not be sufficiently stringent to meet this test. On

[20] *See* 40 C.F.R. § 122.45(d)(2) ("For continuous discharges all permit effluent limitations, standards and prohibitions, including those necessary to achieve water quality standards, shall unless impracticable be stated as average weekly and average monthly discharge limitations for POTWs.").

the other hand, the 0.1 mg/l limit as expressed in the permit falls within the range of the seasonally-based ambient phosphorus values in the record.

Specifically, EPA has conducted analysis, shown on Attachments 7A through 7C, in which we estimate the concentration of total phosphorus immediately downstream of the Attleboro discharge under various summer flow scenarios to address whether a 0.1 mg/l limit based on 7Q10 conditions will also meet the recommended ecoregional phosphorus criterion and values contained in Nutrient Criteria Technical Guidance Manual and the peer-reviewed literature, which were expressed as seasonal averages. Analyses were done using the design flow of the Attleboro treatment plant of 8.6 MGD, which is the condition required by NPDES permit regulations and also at actual flows to determine what water quality results might be achieved if neither Attleboro nor North Attleborough significantly increase their discharge flows. Under design flow conditions, the calculated in-stream concentrations are greater, since the dilution factors are reduced.

Although the background concentration of total phosphorus upstream of Attleboro averaged about 0.1 mg/l in the 2002 DEP data, this value was not used for the analysis since the resulting in-stream concentration, calculated using the proposed effluent limitation of 0.1 mg/l would always be 0.1 mg/l, and we expect there will be an improvement in background concentration over the longer term after North Attleborough has achieved its 0.1 mg/l total phosphorus limit and the upstream waterbodies become less euthrophic. We have used 0.03 mg/l as the background concentration because this was the average concentration measured in the Sevenmile River during the 2002 sampling (see Attachment 8), which was the lowest average measured concentration of any of the major tributaries monitored in 2002, and indicative of a concentration possibly achievable in the future.

The resulting calculations show that under 7Q10 conditions, with background at 0.03 mg/l and Attleboro discharging a total phosphorus concentration of 0.1 mg/l at current flow, the in-stream concentration just downstream of the Attleboro discharge would be about 0.059 mg/l, the low summer month average would be about 0.047 mg/l and the average summer concentration would be 0.043 mg/l. These values fall within the range of criteria recommended in the Nutrient Criteria Technical Guidance Manual (see Table 1 above) and begin to approach the ecoregion-recommended value of 24 ug/l. Under design flow conditions the corresponding in-stream concentrations would be about 0.070 mg/l under 7Q10 conditions, 0.057 mg/l under low summer average flow conditions and 0.052 mg/l under average summer conditions. These projected values fall higher in the range of guidance and literatures values cited above.

EPA disagrees with the commenter's view that downstream dilution justifies a less stringent limit. The Sevenmile River joins the Ten Mile River downstream of the Attleboro discharge. Data collected by MassDEP in 2002 show that the Sevenmile (the source of Attleboro's drinking water) has a much lower phosphorus concentration than the Ten Mile (see Attachment 5), and could theoretically serve to dilute the phosphorus concentrations in the Ten Mile.

However, as can be seen by the data, the phosphorus concentration at TM14, which is downstream of both the confluence with the Sevenmile River and the Attleboro discharge, shows approximately the same concentration as TM 13, the station above Attleboro. This indicates an increase in the phosphorus load due to the Attleboro WPCF discharge that offsets any dilutive effect from the Sevenmile River flow. The observed concentrations of total phosphorus at TM14, which range from 0.11 mg/l to 0.2 mg/l, far exceed the recommended phosphorus criteria and values which have been previously cited for free flowing streams and the numeric criteria for the downstream lakes.

EPA is also not persuaded that attenuation would justify removal of the phosphorus limit. In general, much of the phosphorus removed by in-stream physical and biological processes is not permanently removed from the environment, but rather settles to the bottom where it is available for further biological growth, or is subsequently transported to downstream impoundments during high flow events. This is problematic given the severe degradation being experienced in downstream river segments and impoundments under existing conditions. In other words, EPA does not believe that attenuation by itself counsels in favor of removing or imposing less stringent limits. Instead, an appraisal of downstream conditions is necessary before deciding such a change is appropriate and consistent with EPA's duty to ensure compliance with all applicable water quality standards.

As to the amount of attenuation that is actually occurring, the 2002 monitoring data indicate that loads from the North Attleborough and Attleboro treatment plants are reduced as they flow downstream. Attachment 9 shows calculations of total phosphorus loads using the 2002 MassDEP sampling data for in-stream phosphorus concentrations, treatment plant data from discharge monitoring reports for total phosphorus concentrations and daily flow, and estimated stream flows using the daily flow data from the East Providence gage, adjusted for treatment plant flow and apportioned by watershed area. These admittedly rough estimates show that during low flow conditions, the sum of the loads from upstream of the Attleboro facility, plus the Attleboro WPCF load, plus the Sevenmile load, exceed the loading estimated at the downstream sampling station, sometimes by a significant amount. *See* calculations on bottom row of Attachment 9. However, when the spring sampling event is included, there is only about 10 percent attenuation of the phosphorus load. Because phosphorus loading from the City will not be attenuated by in-stream eutrophic processes under future conditions to the same extent they are today as the cultural eutrophication process is addressed through the imposition of more stringent phosphorus controls on discharges to the Ten Mile River, EPA does not believe it is appropriate or reasonable to assume the continuation of existing summer attenuation rates when calculating a permit limit. Even if there is a small attenuation of phosphorus downstream of the discharge under future conditions, this will serve to help attain water quality criteria in Turner Reservoir, rather than justify an increased discharge from Attleboro

The commenter has referenced the Spatially Referenced Regression on Watershed Attributes (SPARROW) model that was developed by USGS in cooperation with USEPA and NEIWPCC as a tool to assist the regional TMDL and nutrient-criteria activities in New England. While EPA is familiar with the SPARROW model and recognizes its utility under certain circumstances, it prefers to rely on actual water quality data where it available (as it is here) in favor of a generic modeling tool. Still, SPARROW is unlikely to lead EPA to a different conclusion regarding attenuation and Attleboro's permit limit. The model uses regression equations to relate total nitrogen and phosphorus stream loads to nutrient sources and watershed characteristics. The model output includes mean annual predictions of nutrient concentration and loads. The equations include a factor that accounts for in-stream loss of phosphorus. As described in the USGS paper, "although there are a variety of chemical, biological and physical processes that contribute to in-stream loss of nutrients, the SPARROW models do not attempt to distinguish or identify individual nutrient loss processes because adequately detailed information on these processes is generally not available." *Estimation of Total Nitrogen and Phosphorus in New England Stream Using Spatially Referenced Regression Models*, at p. 5. Because of the non site-specific method used to estimate the in-stream reductions, we believe that they should be used with caution in applying them to a particular stream and should not be used where there are monitoring data. Nonetheless, we would expect the reduction predicted by the model for the segment between the Attleboro discharge and the entrance to Central Pond to be small. The annual mean loss factor used in the model for small streams is expressed as $e^{-0.48d-1}$, meaning that the half life (the time it takes to reduce the load by half) is about one and a half days. Given the short distance between the Attleboro discharge and the entrance to Central Pond (about three miles), a travel time much less than this would be expected.

It is unclear what point the commenter is trying to make in the footnote referencing current nitrogen attenuation rates in the Ten Mile River. As addressed in previous responses, the current levels of nitrogen attenuation reflect uptake by the excessive aquatic plant growth in the Ten Mile River that is driven by the high levels of phosphorus.

Comment #F.3: The problem is compounded by the fact that EPA previously cited the same Gold Book and its Ecoregional Nutrient Criteria, which support in-stream phosphorus concentrations up to 0.24 mg/l – consistent with the MassDEP highest and best practicable treatment of 0.2 mg/l – in justifying the original 0.2 mg/l limit for the North Attleborough plant, and the Attleboro WWTP. North Attleborough Response to Comments, p. 5. To use the same data to support two significantly different conclusions, to the detriment of the City, is again arbitrary and capricious.

Response #F.3: Presumably the commenter is referring to Response #4 of the North Attleborough Response to Comments. In the response, EPA inadvertently referred to the eco-regional criteria as 0.24 mg/l instead of the correct value of 0.024 mg/l. The Fact Sheet contained the correct value of 0.024 mg/l.

Similar to Attleboro, EPA has recognized that the North Attleborough limit of 0.2 mg/l is insufficient to ensure that the Gold Book criteria of 100 ug/l will be met immediately downstream of the discharge and that the Rhode Island criteria of 25 ug/l for Turner Reservoir will be met and has issued a final permit modification with a discharge limit of 0.1 mg/l.

Comment #F.4: Nor do the EPA Criteria Recommendations set forth 24 ug/l "for this ecoregion" as a whole (see Fact Sheet, p. 3); that number applies only to certain types of water bodies. Applying the number to a river, without considering whether a WWTP discharge causes the impoundment itself to exceed applicable limits (or whether the impoundment is really a pond at all), contravenes the source document. None of the new analysis is faithful to the words or intent of the cited EPA documents, which, properly read, do not support the proposed 0.1 mg/l monthly limit.

Response #F.4: See response above explaining the role of the reference-based eco-region criteria recommendations in establishing the final permit limit for phosphorus and EPA's decision to opt for an effects-based approach. The applicability of water quality criteria to manmade bodies of water like Turner Reservoir is discussed in Response #F.6 below.

It is not clear what the commenter is referring to relative to the applicability of the ecoregional recommendations and why it concludes that EPA's use of the criteria in this context is inconsistent with the "source document." The in-stream recommended criteria of 24 ug/l clearly applies to rivers and streams in sub-ecoregion 59, which includes eastern Massachusetts and all of Rhode Island. EPA considered these criteria when assessing the overall reasonableness and protectiveness of the permit's phosphorus limit. The applicability of in-stream criteria is independent of pollutant sources and current water quality conditions.

Comment #F.5: Even RIDEM urged EPA to adopt a waste load allocation approach (with a margin of safety). See RIDEM Comments, dated September 12, 2006, on North Attleborough and Attleboro draft permits, p. 3, attached as Exhibit 3 ("the limits **must** be revised using a Waste Load Allocation strategy . . .."). Adopting a dilution approach is no substitute; RIDEM's regulations (incorporating notions of causation and average values, as discussed below) cannot be applied without doing the work required by the allocation approach. To do valid waste load allocations requires identifying the other contributing sources of phosphorus; otherwise, one use may be overregulated and others ignored or under-regulated. See accompanying CDM comments. For instance, in Arkansas, 503 U.S. at 108, the Supreme Court cited the Clean Water Act's "provisions designed to remedy existing water quality violations and to allocate the burden of reducing undesirable discharges between existing sources and new sources. See, e.g. § 1313(d)." There is no way to allocate burdens rationally without first identifying all sources, calculating the load capacity of the receiving body and then determining which discharges merit allocations of particular loadings in the

context of the "Reservoir's" watershed. The very concept of a "waste load allocation," referenced in RIDEM's comments, requires as much.

Likewise, in Friends & Fishers, 446 Mass. at 840-841, the court relied upon a "comprehensive" and "studied analysis of various sources' contributions of nitrogen to the recharge area and the watershed" -- a report of load growth scenarios and contributions of various sources to the Pond's nutrients, funded by EPA under Section 604(b) of the Clear Water Act.[21] Based upon this 604(b) report and the applicable regulations (including applicable surface water regulations), the Court affirmed a groundwater discharge permit that allowed a wastewater treatment plant to contribute nitrogen to a Pond whose waters "are already stressed." Id. at 843-844. The Court noted the MassDEP Commissioner's observation that the antidegradation provision requires, among other things "nonpoint source controls to address eutrophication." Id at 843. There is no evidence that this level of analysis (or anything of equal scientific validity) has been done here, to justify severe limits upon phosphorus.

We know, for instance, that there are many other sources of nutrients in Turner Reservoir, not the least of which may be the numerous nearby golf courses. See Attachment 5 to this letter. Neither EPA nor RIDEM provides any studied analysis of sources of nutrients, load growth (or diminution[22]) scenarios or tolerance of the Turner Reservoir. There is, of course, no TMDL or other site-specific analysis of tolerable limits. Without studying the total context in which the Attleboro WWTP's discharge allegedly contributes to any alleged water quality violation, the 0.1 mg/l limit is speculative. There is no way to know whether imposing any particular limit will even have any effect at all, other than imposing costs upon Attleboro's tax and rate payers. The Fact Sheet does not begin to perform the serious task of waste load allocation for Turner Reservoir. Nor does it refer to any study that has done so. To impose speculative limits, based upon a RIDEM's request for a waste load allocation approach, without supporting data, is arbitrary and capricious. Congress never intended to permit such an approach; it mandated TMDLs and contemplated scientific studies as a basis for allocation decisions. See, e.g. 33 U.S.C. § 1313(d)(TMDL's); 33 U.S.C. § 1285(j) (604(b) water quality management planning grants); 40 C.F.R. 130.7 (calculation of TMDL).

Response #F.5: Rhode Island is not arguing that EPA assign specific loads to all point and nonpoint sources of phosphorus in the system *prior* to establishing a limit on the Attleboro facility.[23] Indeed, in arguing for the imposition of a phosphorus effluent limit at this time, Rhode Island (see comment # C.1) itself

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[21] See Exhibit 9 [Wilcox testimony regarding EPA program].

[22] EPA should study the declining phosphorus levels cited in its original Fact Sheet on the Attleboro and North Attleborough draft permits

[23] The absence of comments from Rhode Island on the 0.1 mg/l limit and the fact that Rhode Island regularly issues permits for listed waters in the absence of TMDLs would seem to be confirmation of this.

relied on dilution-based calculations of in-stream concentrations of pollutants at the Rhode Island/Massachusetts state line using an estimated 7Q10 and the proposed permit limits, and compared those in-stream concentrations with state numeric water quality criteria. In determining that the in-stream concentrations did not meet RI water quality standards, the state noted that the limits must be revised using a wasteload allocation strategy that would account for any lack of knowledge concerning the relationship between effluent limits and water quality, that ensures an equitable distribution of pollutant loads and that at a minimum meets all Rhode Island water quality criteria. Although EPA does not to refer to its development of an NPDES permit effluent limit for phosphorus as a "waste load allocation strategy," in establishing the permit limit EPA has accounted for background sources of phosphorus through the use of ambient monitoring data, factored in uncertainty between the imposition of an effluent limit and water quality by adopting a reasonably conservative approach (*i.e.*, use of 7Q10 dilution flow), and applied the effluent limit to the two major point source dischargers of pollutants in the Ten Mile River (*i.e.*, North Attleborough and Attlelboro facilities). EPA also notes that in the line preceding the sentence fragment quoted above by the commenter, RIDEM states, "As you know, pursuant to the NPDES regulations at 40 CFR 122.44(d) and 33 U.S.C. Sec. 1341 (a)(2), NPDES limits must achieve compliance with water quality standards and *limits must be included in permits where pollutants will cause, have reasonable potential to cause, or contribute to an exceedance of the State's water quality*." (emphasis added). EPA agrees.

Even if Rhode Island were advocating that EPA delay imposition of the phosphorus limit until a TMDL or its equivalent is completed, EPA would not be required to do so under the CWA or implementing regulations. EPA is not prohibited from imposing water quality-based permit limits on mixed water bodies (*i.e.*, those impaired through a combination of point and nonpoint sources) in the absence of a TMDL. While the commenter is correct that such waters must be identified on a 303(d) list and TMDLs established to implement applicable water quality standards according to a priority ranking, nothing in Section 303(d), EPA regulations, or the cases cited above suggests that EPA must do the work of a TMDL (*i.e.*, allocate loads to the point and nonpoint pollutant sources contributing to the impairment) prior to imposing a water quality-based effluent limit.

When issuing an NPDES permit, the operative sections of the CWA and regulations remain sections 301, 402 and 40 C.F.R. §§ 122.4 and 122.44(d)(1). When determining whether a reasonable potential exists for a pollutant to cause or contribute to water quality violation, 40 C.F.R. § 122.44(d)(1)(ii) directs EPA to account for, among other factors, "*existing* [emphasis added] controls on point and nonpoint sources of pollution" and authorizes it consider dilution where appropriate. EPA has done that in this case. If EPA determines that there is a reasonable potential to contribute to a water quality violation under this section, EPA is then obligated to impose a water quality-based effluent limit under 40 C.F.R. § 122.44(d)(1)(iii). This limit must be "consistent with the assumptions

and requirements of any *available* [emphasis added] wasteload allocation prepared by the State and approved by EPA pursuant to 130.7." Thus, NPDES regulations provide an adequate mechanism for EPA to factor in existing pollutant controls and existing waste load allocations prior to imposing water quality-based limits. EPA's decision to issue a permit in the absence of a TMDL or equivalent study is reasonable in light of these regulations, which clearly do not require EPA to conduct the type of comprehensive allocation of loads among all sources of pollutants before imposing such a limit. Future TMDLs, planned by both MassDEP and RIDEM, will further help in targeting other point source and non-point source reductions. (To the extent such other sources are related to storm water, they would likely not affect the need for stringent controls on continuous discharges of wastewater which will occur during periods of critical low flow).

Contrary to the City's claim, EPA's phosphorus effluent limit is not speculative, but is based upon actual ambient data from the receiving water, is grounded in EPA guidance and peer-reviewed technical literature, and is intended to address an undisputed and serious water quality impairment. Based on the discussion in the Fact Sheet and this Response to Comments, it is clear that the receiving water is severely impaired for nutrients, that phosphorus effluent discharges from the Attleboro discharge have the reasonable potential to cause or contribute to exceedances of both Massachusetts and Rhode Island water quality standards, and the proposed limit is necessary to achieve those standards.

Comment #F.6: The new Fact Sheet cites Rhode Island regulations. Even applying the Rhode Island standard, the proposed 0.1 mg/l phosphorus standard is excessively stringent.

The relevant Rhode Island rule reads:

> **Average** Total Phosphorus shall not exceed 0.025 mg/l in any **lake, pond, kettlehole or reservoir**, and **average** Total P in tributaries at the point where they enter such bodies of water shall not **cause exceedance** of this phosphorus criteria [sic], **except as naturally occurs**, unless the Director determines on a site specific basis, that a different value for phosphorus is necessary to prevent cultural eutrophication.

Table 1.8D.(2)[emphasis added].

The draft justification for the 0.1 mg/l limit falls well short in many ways, particularly when compared to each word or phrase of the regulation highlighted in bold above:

- Neither the evidence, nor the proposed limit, deal with "average" values over the applicable time period. The limit deals with a monthly figure, when seasonal values are appropriate; it imposes a number based upon the discharge point and the discharge of the tributary into Turner Pond

without inquiring into average values in Turner Reservoir; and it ignores average total phosphorus in the Ten Mile River.

- The regulation does not require tributaries to meet the 0.025 mg/l standard; rather it asks whether the average phosphorus in tributaries contributes to an average phosphorus exceedance in the Reservoir. Yet, the rationale for the limit proceeds on the assumption that this limit applies to the tributary river (see below).

- There has been no attempt to evaluate the relative contributions of phosphorus of the various point and non-point sources and no showing that the Attleboro WWTP, more than a mile upstream, "causes" any exceedance in the Turner Reservoir.

- Turner Reservoir is a man-made impoundment, no longer used as a "reservoir". See Army Corps of Engineers Study, excerpts attached as Exhibit 7. Nor is it a "Pond" See CDM comments. It is the impoundment itself that has "caused" any exceedances. Blaming an out-of-state municipality for the alleged water quality problems caused by impounding the river is not consistent with the regulations or fair play.

- There is no showing of what phosphorus "naturally occurs." Without such data, it is impossible to lay blame at Attleboro's feet.

RIDEM's comments to the EPA on the Rhode Island regulation materially misstate the regulation's plain language. In its comments on the North Attleborough and Attleboro WWTP draft NPDES permit (p. 2), RIDEM claims that "[d]etermination of whether the water quality criterion of 25 ug/l is applicable **to the Ten Mile River** requires evaluation of whether it flows into a lake, pond or reservoir (including whether run of the river impoundments constitute a lake pond or reservoir)." [Emphasis added]. The regulation, however, does not apply the 25 ug/l criterion to any river ("tributary") itself. Rather, by its plain terms, it asks whether the tributary's average phosphorus causes an exceedance of average phosphorus in the **"reservoir"**. There is no numerical limit for the level of phosphorus in the river. By reprising RIDEM's erroneous construction, EPA has imposed a non-applicable criterion upon the Ten Mile River and upon the Attleboro WWTP. North Attleborough Response to Comments, p. 16.

Since the question is the "Reservoir's" ability to maintain an average 0.025 mg/l level, EPA must determine the "Reservoir's" Loading Capacity, which the RI regulations (Rule 7) define as "the maximum amount of loading that a surface water can receive without violating water quality standards." EPA has not done so. Nor has the Reservoir's Load Allocation been presented. See also RI Regs, Rule 7 (defining "load allocation" as "the portion of a receiving water's loading capacity that is attributed either to one of its nonpoint sources of pollution or to natural background sources"). These rules demonstrate that Rhode Island contemplates essentially the same detailed analysis as Friends & Fishers, as a

matter of interpretation of state water quality regulations. Indeed, RIDEM's comments of September 12, 2006 state that the load allocation analysis "must" be done. There is no short-cut in applying the Rhode Island regulations. The draft permit errs in attempting to employ one.

A brief review of the broader statutory and regulatory context may also be in order. As the City noted in its original comments on the draft permit, the total phosphorus limits must be justified, if at all, under Section 401(a)(2) [33 U.S.C. § 1341(a)(2)]and 40 C.F.R. § 122.44(d), relating to conditions in NPDES permits that will ensure compliance with the "applicable water quality requirements" of a "downstream affected state", namely Rhode Island. In this context, EPA must determine what state-law standards are "applicable" Arkansas, 503 U.S. at 110. A system that places burdens unequally or disproportionately upon out-of state dischargers would be discriminatory and contrary to congressional intent. Where, as argued above and in the City's original comments, the Attleboro draft permit limits are more stringent with regard to Rhode Island waters than the limits contained in the language of RIDEM's actual regulations, the permit limits contravene the CWA and the legislative purpose of uniformity. If Rhode Island can allocate the principal burden of lowering pollution *within its waters* to out-of-state dischargers (without even examining the relative contributions of various sources, including in-state ones), it can shift the responsibility and expense of improving its water quality onto those who lack a political voice in Rhode Island. As a matter of policy, fairness and law, EPA must not allow that to occur here and therefore must withdraw the total phosphorus permit limits proposed in the amended draft permit. As argued extensively above, Attleboro's concern about even-handed treatment is heightened by the level of speculation and scientific uncertainty underlying the proposed phosphorus limits.[24]

Response #F.6: As discussed below, EPA agrees with the commenter's interpretation that the numeric criterion of 0.025 mg/l applies to the reservoir, not to the stream entering the reservoir. The commenter should be aware that the 0.1 mg/l phosphorus effluent limit is necessary to attain Massachusetts narrative water quality standards in the free flowing segments of the Ten Mile River irrespective of the numeric criterion applicable within the Turner Reservoir.[25] *See*

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[24] Applying the rules based upon valid science is important, not only to ensure that public monies are spent in the most effective way for pollution abatement, but also to ensure that abrupt changes in proposed limits are based upon science, instead of pressure from one side or the other. Attleboro's file review discloses that EPA is, understandably, under pressure to deliver something to RIDEM, so that RIDEM can obtain concessions from the industries that it regulates. See Exhibit 8 to this letter. But imposing burdens upon out-of-state municipalities, who are not represented in Rhode Island's process, must be based upon science and established regulations.

[25] While the free flowing segments of the Ten Mile River in Rhode Island have not been listed for nutrient impairment, EPA notes that the instream sampling data indicate phosphorus effluent limits well above the 0.1 mg/l level that EPA has determined to be necessary to control the effects of eutrophication.

Response #F.1 discussing in-stream targets necessary to control cultural eutrophication. With that said, the 0.1 mg/l phosphorus effluent limit will, in addition, result in an in-stream concentration that is low enough at the inlet to Central Pond to ensure that the Rhode Island numeric criterion of 0.025 mg/l, applicable within the Turner Reservoir, is not exceeded. For the reasons stated in Response #F.2 above, EPA does not regard a seasonally averaged phosphorus effluent limit of 0.1 mg/l as adequately protective in this instance. EPA has determined that use of 7Q10 dilution flows to calculate the limit, along with a 30-day average for measuring compliance with the limit, is reasonable in this case.

In its comments, RIDEM compared the characteristics of Turner Reservoir to EPA criteria defining a lake found in *Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs: First Edition.* Turner Reservoir, with a surface area of about 225 acres (North and South combined), clearly meets the areal criterion of 10 acres, but as the commenter has noted, does not meet the retention time criterion at average river flow. RIDEM has informed EPA that it calculated retention time based on 7Q10 flow. Under this flow regime, the Reservoir has a retention time of about 42 days.

Notwithstanding the different calculations of retention time, the Rhode Island water quality standards do not include or reference the EPA definition of lake in its definition of "lake, pond, kettlepond, or reservoir." The RI standards define a "lake, pond or reservoir" as "any body of water, whether naturally occurring or created in whole or in part, excluding sedimentation control or stormwater retention/detention basins, unless constructed in waters of the State," and require that the "average Total Phosphorus shall not exceed 0.025 mg/l in any lake, pond, kettlehole or reservoir, and average Total P in tributaries at the point where they enter such bodies of water shall not cause exceedance of this phosphorus criteria, except as naturally occurs, unless the Director determines, on a site-specific basis, that a different value for phosphorus is necessary to prevent cultural eutrophication." Hydraulic retention time is not in the definition of lake, pond, kettlepond, or reservoir, nor in the numeric criteria established for lakes, ponds, or reservoirs. In addition, RIDEM has identified Turner Reservoir as an impaired lake in its 303(d) list of impaired waters (Waterbody ID RI0004009L-01B). Therefore, EPA has concluded that it is a "lake, pond, kettlepond or reservoir" within the meaning of the Rhode Island's water quality standards and subject to the numeric water quality criteria for phosphorus. *See also*, Rhode Island Water Quality Regulations, Rule 4 ("Liberal Application") ("The terms and provisions of these rules and regulations shall be liberally construed to allow the Department to effectuate the purposes of state law.").

Rule 8(D)(2)(10)(a), Rhode Island's numeric criterion for lakes and ponds, does not itself set forth the hydrological condition under which the "average" total phosphorus value of 0.025 mg/l must be met, but under Rhode Island's standards aquatic life criteria for freshwaters must not be exceeded at or above the 7Q10. *See* Rule 8(E)(1) ("The water quality standards apply under the most adverse

conditions…"). EPA interprets Rhode Island's numeric criterion for lakes as having to be met when the lake's inlet streams are at 7Q10.

Controlling phosphorus effluent discharges from a Massachusetts facility to ensure compliance with downstream water quality standards is fully consistent with the CWA and its implementing regulations. *See* CWA § 401(a)(2) and 40 C.F.R. §§ 122.4(d), 122.44(d)(1)(vii)(4). The CWA expressly contemplates such an interplay between the affected states to address the impacts of water pollution, and EPA therefore disagrees that the permit limit at issue here is inequitable or offends notions of fairplay.

Whether a water body is natural or artificial does not alter EPA's analysis and its decision to impose a phosphorus effluent limit of 0.1 mg/l. Rhode Island's water quality standards do not make any relevant distinction between natural and manmade water bodies; applicable water quality standards must be met in both cases. According to the Army Corps of Engineers' reports[26], the Turner Reservoir Dam was constructed around 1930 to form a water supply reservoir for the City of East Providence, submerging a previously constructed mill dam located about 0.75 miles upstream. The reservoir was used for water supply until 1969 and is currently heavily used for recreation, including non-powered boating, canoeing, recreational fishing, hiking and bird watching. The commenter's unsupported speculation that the receiving water is already impaired through a combination of nonpoint source loading and/or natural background, even if true, would not be a license for the Attleboro discharge to continue unabated. From a permitting perspective, the relevant fact is that the receiving water is being further impaired by point source phosphorus contributions from the Attleboro WCPF and this loading must be controlled sufficiently in order to protect the designated uses assigned to the water body by Rhode Island.

EPA believes it is reasonable to conclude that natural background would be below the numeric water quality criterion of 25 ug/l and is not itself resulting in a violation of the criterion. Regarding natural background concentrations, the definition in the Rhode Island water quality standards is "all prevailing dynamic environmental conditions in a waterbody or segment thereof, other than those human-made or human-induced." The ecoregion criteria value of 0.024 mg/l represents an estimate of the "best attainable, most natural condition of the resource base at this time." *See Ambient Water Quality Criteria Recommendations, Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Nutrient Ecoregion XIV* (December 2000). This value would be greater than "natural background conditions " as defined by the RI standards since it includes an attainability provision, seeming to allow some anthropogenic effects.

[26] The *Turner Reservoir Study*, February 2001 and *Draft Detailed Project Report and Environmental Assessment, Ecosytem Restoration, Ten Mile River, East Providence Rhode Island,* April 2005

EPA concurs that the numeric criterion applies to the reservoir, not to the stream entering the reservoir. The Gold Book recommends a concentration of 0.05 mg/l for a stream entering a lake or reservoir and a concentration of 0.025 mg/l in the reservoir. However, given the severe eutrophication in the reservoir, and the data showing that at times the phosphorus concentration in the reservoir exceeds the inlet concentration, it is clear that the water body has exceeded its loading capacity for nutrients. There is currently no additional assimilative capacity in the reservoir and, until phosphorus resuspension subsides, concentrations of phosphorus in the reservoir exceeding the inlet concentration may continue even with significant reductions in the inlet concentration. For this reason, EPA believes the phosphorus concentrations in the inlet to the reservoir must achieve the Gold Book recommended concentration of 0.05 mg/l and should approach Rhode Island's numeric criterion of 0.025 mg/l in order to ensure compliance with standards.

For demonstration purposes, EPA developed a mass balance spreadsheet to estimate the phosphorus concentration at the inlet to Turner Reservoir using assumed Attleboro discharge flows and concentrations and assumed background flows and concentrations.[27] The spreadsheet estimates flows under various summer average conditions and applies assumed concentrations. EPA ran the analysis using actual POTW discharge flows. See 10A through 10D . The impacts of attenuation of the Attleboro discharge were estimated by reducing the effluent concentration. For example, we estimated a 10 percent attenuation rate by using a discharge concentration of 0.09 mg/l.

EPA first looked at a scenario assuming an effluent limit of 0.2 mg/l (the limit in the first draft permit) and background at 0.03 mg/l, which resulted in an inlet concentration ranging from 0.053 mg/l under average summer conditions to 0.086 mg/l under 7Q10 conditions, which exceeds the Gold Book recommendations of 0.050 mg/l. .*See* Attachment 10A.

As can be seen in Attachment 10B, using the proposed discharge limitation of 0.1 mg/l (no attenuation) and a background concentration of 0.03 mg/l, the

[27] This analysis is based on the assumption that, over the long term, the assumed background concentration at the Attleboro WPCF will be equal to 0.030 mg/l, the average concentration seen in the Sevenmile River during the 2002 MassDEP sampling, which was the lowest concentration seen in any tributary, and would be the background in the Ten Mile River upstream of Attleboro after phosphorus load reductions from the North Attleborough facility are achieved and after the expected reduction in phosphorus resuspension occurs over time. Contributing to EPA's view in this regard is that there are seven miles and four significant impoundments between the North Attleborough discharge and the Attleboro discharge that would serve to attenuate the levels of phosphorus in the improved North Attleborough discharge. EPA does not believe it is reasonable to assume a similar level of attenuation of the Attleboro load given the short (3 mile) distance from the Attleboro discharge to the inlet of Central Pond. As discussed previously, and as evidenced by the 2002 MassDEP data, this does not reflect the existing level of background phosphorus concentrations at the point of discharge. EPA's rationale for not assuming this future background level for the purposes of establishing the permit limit, which is calculated using existing background conditions, is outlined above in Response #F.2.

concentration at the inlet to Central Pond would range from 0.039 mg/l under average summer conditions to 0.053 mg/l under 7Q10 conditions.

Attachment 10C shows an estimate using a 10% attenuation of Attleboro's phosphorus (assumed effluent concentration of 0.09 mg/l) and an assumption that background concentration equaled the ecoregion criteria of 0.024 mg/l. Under these assumptions, the estimated inlet concentration ranged from 0.033 under average summer conditions to 0.046 mg/l under 7Q10 conditions. Under this scenario, the inlet concentrations are less than the Gold Book recommendations of 0.050 mg/l under 7Q10 conditions, and closer to the Rhode Island criterion under average summer conditions.

Attachment 10D shows an estimate using a 10% attenuation of Attleboro's phosphorus (assumed effluent concentration of 0.09 mg/l) and an assumption that background concentration equaled 0.01 mg/l, which is EPA's estimate of natural background conditions. Under these assumptions, the estimated inlet concentration ranged from 0.021 under average summer conditions to 0.036 mg/l under 7Q10 conditions. Under this scenario, the inlet concentration is far less than the Gold Book recommendation of 0.050 mg/l under 7Q10 conditions, and less than the Rhode Island criterion under average summer conditions.

In each of the scenarios that include a 0.1 mg/l limitation for the Attleboro WPCF (both with and without attenuation), the projected in-stream concentration essentially meets the Gold Book value of 0.050 mg/l and comes close to the meeting the numeric criterion of 0.025 mg/l. Because the inlet concentrations will meet the recommended Gold Book value of 0.50 mg/l, and because some assimilative capacity in the Turner Reservoir will become available in the future as conditions improve as a result of point source phosphorus reductions from the North Attleborough and Attleboro treatment facilities, combined with the gradual subsidence of phosphorus resuspension from the sediments over time, EPA believes at this time that a limit of 0.1 mg/l will be sufficient to ensure compliance with Rhode Island's water quality standards. It is of course also required in order to meet Massachusetts' water quality standards.

The two definitions ("Loading Capacity" and "Load Allocation") from Rhode Island's water quality standards that are cited by the commenter are not a plausible basis to create, implicitly or otherwise, an affirmative regulatory obligation on EPA to conduct a comprehensive loading analysis before it can establish a permit limit on a point source discharger of pollutants. Such an interpretation does not logically follow from the text of those definitions and would, moreover, impermissibly conflict with EPA's explicit duties under the CWA. See previous responses relative to the need for a TMDL or the need to quantify all other sources before establishing point source limits that are consistent with ensuring that the point source will not cause or contribute to water quality impairments.

Comment #F.7: CDM commented that the agency failed to establish that the John V. Turner Reservoir is in fact subject to the quoted Rhode Island Standard. Although it is named a reservoir, it no longer functions as such and the Agency presents no information to support the assertion that the cited Rhode Island standard applies to this water body. In its comments on the initial draft permit, RIDEM has asserted that the Reservoir meets RIDEM's definition of a lake. This definition reflects nutrient management guidance developed by EPA. As indicated by RIDEM, this guidance defines lakes as water bodies with a mean water residence time of 14 days or more. According to studies conducted by the Army Corps of Engineers the reservoir has a volume of 350 million gallons (See Attachment 1 hereto). Using this value, and the flow data from the USGS gage located immediately downstream of the John V. Turner Reservoir, the mean water residence time of this impoundment is 9.68 days. Thus, the impoundment does not meet the definition of a lake used by RIDEM to distinguish between bodies of water subject to the standard, and those that are not.

CDM also commented that that in developing the proposed limits EPA did not present any information to show how a 0.1 mg/l limits is necessary to keep the "Average Total Phosphorus" below 0.025 in Turner Reservoir, and that it appeared that the Agency relied upon flow conditions associated with the seven day, ten year low flow to develop the limit. CDM pointed out that in most systems, the seven day ten year low flow is substantially below average flow, and represents a flow that happens very infrequently, far different from the "average" referenced in the state's water quality standards. CDM went on to cite EPA's argument that dilution and in-stream attenuation will serve to achieve compliance with the Rhode Island standard, but no information is presented to quantify these factors to show how this meets the Rhode Island standard.

CDM states that the use of average concentrations over appropriately long periods is recommended by the Agency's guidance. In its "Ambient Water Quality Criteria Recommendations; Information Supporting the Development of State and Tribal Nutrient Lakes and Reservoirs in Nutrient Ecoregion XIV" EPA encourages States to:

> "Identify appropriate periods of duration (how long) and frequency (how often) of occurrence in addition to magnitude (how much). EPA does not to recommend identifying nutrient concentrations that must be met at all times; rather a seasonal or annual averaging (e.g. based on weekly or biweekly measurements) is considered appropriate. However, these central tendency measures should apply each season or each year, except under the most extraordinary conditions (e.g., a 100 year flood)." See Attachment 2.

The use of seasonal averages would provide additional dilution, and would thus serve to lower the treatment requirements of the City.

Response #F.7: See Response #F6 for responses to the comments regarding whether Turner Reservoir is a reservoir within the meaning of the Rhode Island Water Quality Standards, and regarding EPA analyses of whether the 0.1 mg/l limit is necessary to achieve water quality standards in Central Pond/Turner Reservoir.

Rhode Island has promulgated, and EPA has approved, a numeric criterion for lakes, ponds and reservoirs in its water quality standards. The statement from the guidance document does not mandate the use of any particular flow regime, but specifically leaves that decision to the States ("EPA encourages States…"). Rhode Island does not use seasonal or annual average flows when applying its numeric nutrient criterion, but instead, consistent with its water quality standards, conservatively assumes critical low flows, *i.e.*, 7Q10, when determining available dilution.[28] (Consistent with the guidance, the State does not require the criterion to be met at all times, or on a daily basis). When establishing a limit that will achieve applicable Rhode Island nutrient water quality criteria, EPA thus also assumes a dilution flow at the inlet equal to 7Q10.

Also, for the reasons discussed in Response #F.2 above, EPA imposes this limit as a monthly rather than seasonal average limit.

Comment #F.8: CDM commented that the 1986 Quality Criteria for Water suggests a level of 0.1 mg/l as "a desired goal for the prevention of plant nuisances in streams or other flowing waters" and references a 1973 publication of Kenneth Makenthun, a copy of which is included as attachment 4 to this document. However, that document does not present information concerning development of the 0.1 mg/l "desired goal", but rather makes reference to a 1968 document published in the Journal of the American Water Works Association by the same author. A copy of the 1968 paper is included as attachment 5 to this document. The 1968 document indicates that " ... A considered judgment suggests that to prevent biological nuisances, total phosphorus should not exceed 100 ug/1 P at any point within the flowing stream, nor should 50 ug/1 be exceeded where waters enter a lake, reservoir or other standing water body ..." (Mackenthun, 1968 p 1053). A careful reading of this document suggests that it is referencing streams which are tributary to water supply reservoirs and lakes and standing waters that serve as sources of water supply. This would explain why it was published in what would otherwise be thought to be about water supply, and not water pollution. Moreover, the 1968 document presents no information concerning the development of the recommendation – and so it presents no guidance on how it should be applied – seasonally, monthly, or over the growing season?

[28] In terms of the relative stringency of the two approaches, it is worth noting that Rhode Island's numeric nutrient criterion, even though applied using a more stringent flow regime, is numerically less stringent than the EPA ecoregional recommendations; the Rhode Island criterion of 25 ug/l is significantly higher than the reference condition for total phosphorus concentration of 8 ug/l for subecoregion 59 of Ecoregion XIV, where the discharge is located.

Similarly, the Agency's recommendations with respect to nutrient criteria for streams in Ecoregion IV is clearly an annual average value, because it was developed based on the 25th percentile of all seasons of data, and not a value associated with 7 day 10 year low flow conditions. It is thus inappropriate to apply this criterion to low flow conditions.

Finally, it is not clear that the set of values contained in the Nutrient Criteria Technical Guidance manual are intended to be applied at extreme low flow conditions. Moreover, that table is presented in a larger context dealing with guidance to the states as to how the States might develop state water quality standards; it is not presented as proscriptive limits that must be used. In that respect, EPA should await development of actual water quality standards for phosphorus by both Rhode Island and Massachusetts.

Response #F.8: EPA disagrees with the assertion that the Gold Book recommendation regarding in stream phosphorus concentrations is limited to sources of water supply and cannot be used as guidance, among other relevant sources of information, in this matter. The Gold Book includes no such limitation or characterization of its recommendation. Similarly, the 1973 paper by Kenneth Mackenthun referenced by the Gold Book includes no such restrictions. The commenter does not explain how a "careful reading" of a 1968 publication by the same author supports the suggested restrictions on the recommendations. To the contrary, the 1968 article twice states "total phosphorus concentrations should not exceed 100 ug/l at any point within a flowing stream" with no reference that this recommendation is limited to tributaries to drinking water supplies. Indeed, if Mr. Mackenthun intended such a restriction, he presumably would have explicitly included it in his 1968 or 1973 publications.

Regarding application of the recommendations, the Gold Book values are expressed as values not to be exceeded at any time and not seasonal or annual averages.[29] EPA has elsewhere explained its rationale for applying the 0.1 mg/l phosphorus effluent limit as an average monthly limit that is imposed during the growing season and that assumes a dilution flow equal to the 7Q10.

The literature values cited previously from the Nutrient Technical Guidance Manual are based on seasonal averages and are more stringent than the 0.1 mg/l applied here.

With respect to the appropriate averaging periods for the Ecoregion guidance values for rivers and streams, the reference value was developed based on the 25th percentile of all seasons of data.[30] It does not follow, however, that the

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[29] It should be noted that several states apply total phosphorus criteria of 0.1 mg/l as a maximum criterion. See Table 2 ("Examples of Numeric Criteria and Guidelines for Total Phosphorus in the U.S.) above.

[30] EPA assumes the commenter's reference to Ecoregion IV is a typographical error and was meant to reference Ecoreogion XIV, where the discharge is located.

criteria should necessarily be applied as an annual average if the data do not vary significantly over the course of the year. The data used to calculate the reference conditions is shown in Appendix B of the Ecoregion Guidance Document and is sorted by season. For subregion 59, in which the discharge is located, the 25th percentile (P25) for each season is presented on page 11 of the Appendix. It shows that the P25 for the seasons range from 20-28 ug/l with a summer value of 25 ug/l. Given that it is most critical that phosphorus concentrations be low during the growing season, applying the ecoregion criteria as a summer average, as was done in the analyses reflected in Response #F.6, is reasonable.

EPA is not permitted to wait for development of numeric criteria for phosphorus prior to establishing an effluent limit. EPA must impose limits on pollutants that have a reasonable potential to cause or contribute to violations of water quality standards, including narrative criteria. 40 C.F.R. § 122.44(d)(1)(i). As discussed earlier in this response, EPA reliance on the ecoregional criteria, guidance and other relevant information is expressly contemplated by 40 C.F.R. § 122.44(d)(1)(vi), and EPA believes reliance on such technical materials is reasonable when interpreting a narrative criterion.

Comment #F.9: CDM commented that the City believed it could achieve the 0.2 mg/l phosphorus limit contained in the August 2006 draft permit and that achieving the newly proposed limits is expected to require the addition of new treatment processes at substantial costs to the City.

Response #F.9: Effluent data submitted by the City on its discharge monitoring reports for the May through October 2007 show that the City achieved monthly average discharge concentrations of 0.1 mg/l. However, if new facilities are necessary, in general, cost considerations are not permissible factors in setting water quality based effluent limits. Section 301(b)(1)(C) of the CWA requires achievement of "any more stringent limitation [than the technology-based requirements set forth in Section 301(b)(1)(A) and (B)], including those necessary to meet water quality standards...established pursuant to any State law or regulation...." Thus, NPDES permits must contain effluent limitations necessary to attain and maintain the water quality standards, without consideration of the cost, availability or effectiveness of treatment technologies. *See U.S. Steel Corp. v. Train*, 556 F.2d 822, 838 (7th Cir. 1977) (finding "states are free to force technology" and "if the states wish to achieve better water quality, they may [do so], even at the cost of economic and social dislocations"); *see In re City of Moscow*, 10 E.A.D. 135, 168 (EAB 2001) (stating that section 301(b)(1)(C) "requires unequivocal compliance with applicable [water quality standards], and does not make any exceptions for cost or technological feasibility"); *see also In re New England Plating Co.*, 9 E.A.D. 726, 738 (EAB, 2001) ("In the first instance, there is little question that cost considerations play no role in the *setting* of effluent limits.") (emphasis in original).

Factors such as cost can be taken into account, however, in establishing a compliance schedule. A compliance schedule for Attleboro will be reasonable

and consistent with the requirements of the Clean Water Act. In addition, it is EPA's intent to work closely with MassDEP and RIDEM to ensure that the facilities in each state are on the same approximate schedules. *See* Letter dated January 8, 2007 from Ken Moraff, Deputy Director, Office of Ecosystem Protection, EPA to Glenn Haas, Director, Bureau of Resource Protection, MassDEP and Alicia Good, Assistant Director, Water Resources, RIDEM. In this way, we will be able to best assess improvement to water quality.

Comment #F.10: If the 0.1 mg/l phosphorus limit is proposed by MassDEP as well as by EPA, MassDEP should reconsider and remove the new phosphorus limit from the state permit (as it has done with the new nitrogen limit). The Fact Sheet is replete with references to DEP's highest and best practicable treatment of 0.2 mg/l. To depart from that limit without a TMDL study or other data would be arbitrary and capricious.

At least, given MassDEP's consistent position that 0.2 mg/l is "highest and best practical treatment" and the approach that it took in Friends & Fishers, 446 Mass. at 840-844 (namely, allowing a discharge that affected a stressed pond, only after a comprehensive study of other sources and explicitly allocating permissible nursery loads for the WWTP), it would be unlawful, arbitrary and capricious for DEP to impose the 0.1 mg/l limit here.

Response #F.10: The commenter's recommendation to MassDEP is noted for the record. The highest and best practical treatment level of 0.2 mg/l is a technology-based requirement included in the Massachusetts Water Quality Standards, applicable to "any existing point source discharge containing nutrients in concentrations that would cause or contribute to cultural eutrophication…", and is not a site-specific water quality-based criterion. The revised Fact Sheet and this response to comments describe why the state's technology standard is insufficient to result in attainment of Massachusetts water quality standards and Rhode Island water quality standards.

Comment #F.11: There are procedural irregularities. First, under 40 C.F.R. 124.14, given the reopening of the comment period, there should have been a 60 day comment period, not a 30 day one. Scheduling this 30 day comment period during the month of August, a customary vacation time for many people, has not allowed as full participation as might have been desired. The EPA's procedure is therefore irregular. The City reserves its rights as well as its rights to submit additional comments, should EPA decide to follow 40 C.F.R. 124.14.

Moreover, the City requests a hearing, to address the important issues raised above. See 40 C.F.R. 124.11 and 124.12. Trying to deal indirectly through EPA with issues that are apparently driven by RIDEM is a difficult process, particularly as RIDEM may well comment on the revised draft limits, but the City is not presently privy to those comments, if any.

Response #F.11: As indicated in the Public Notice, EPA reopened the public comment on the draft permit pursuant to 40 C.F.R. § 124.14(b) and, in accordance with 40 C.F.R. § 124.14(c), sought comments on the revised monthly average total phosphorus limit. The public notice period was established in accordance with 40 C.F.R. § 124.10 and consistent with the requirements of 40 C.F.R. § 124.14(b). In addition to being consistent with the regulations, in EPA's experience, a 30 day public comment period has been adequate even where complex technical matters are at issue. EPA cannot reasonably be expected to time public comment periods around the "customary" vacation schedules of the regulated community, which it has no way of knowing. Even so, the City has not identified how its participation in these proceedings has been compromised; detailed comments on the revised permit were received from both the law firm and engineering consulting firm representing the City. Given the limited scope of the proposed permit revisions, the 30 day period for public comment allowed under 40 C.F.R. § 124.10 provided sufficient time to comment on the proposed revisions.

All comments submitted on the permit (including the revision) are part of the public record. The record has been available for the City's review.

Given the limited comments received and the fact that there were no other hearing requests, EPA has decided to deny the hearing request consistent with the provisions of 40 C.F.R. § 124.12.

This action in no way prejudices the City's right to appeal any final permit decision to the Environmental Appeals Board and/or to the Massachusetts's Division of Administrative Law should it disagree with the final permit.

The following comments were received from Sam Butterfield, President of NewStream, in a letter date August 30, 2007:

Comment #G.1: As a City of Attleboro taxpayer, sewer system ratepayer and industrial user, NewStream would like to offer the following comment on the above-referenced draft permit. Our comment has to do primarily with the issue of total phosphorus removal, and the fact that it creates a condition that may make it impossible for the City POTW to meet its limits for total nitrogen and ammonia. Such conditions make the City's treatment process so delicate and unstable that it could make industrial discharges to the City sewer system toxic. This, as well as the public cost associated with meeting these conditions, obviously has a direct effect on the long-term viability of industry in the City of Attleboro, which has already seen a tremendous decline in its economic vitality over recent years.

The process for removing phosphorus to concentrations below 0.1 ppm may require a combination of biological and chemical treatment. Enhanced biological phosphorus removal (EBPR) system requires the operation of an activated sludge process to include an anaerobic contact zone followed by an aerobic zone to develop special species of bacteria called Phosphorus Accumulating Organisms

(PAO). Increased demands for nutrient phosphorus and nitrogen removal will complicate the POTW plant operation considering the following:

1. Phosphorus, after being absorbed into the aerated biomass, is removed from the wastewater as the sludge is wasted from the daily operation. Increased daily sludge wasting required for increased phosphorus removal increases the loss of nitrifying microorganisms and increases the nitrification control difficulty.

2. The phosphorus absorption kinetics are fast and the required retention time is relatively short compared to BOD removal and nitrification. Operating parameters adjusted to maximize phosphorus removal don't favor nitrification, in particular.

3. Operation of the activated sludge system for phosphorus removal requires operational control of the F/M and BOD/P ratios within suitable range. These added operational controls complicate the operation for BOD reduction and nitrification.

4. An EBPR system needs the addition of an anoxic contact zone at the influent end; the anoxic contact zone must be deprived of dissolved oxygen below 0.5 ppm to enable the PAO to uptake fatty acids while degrading stored polyphosphates to phosphorus for generation of energy. The environments are difficult to control and may stimulate the growths of Poly-beta-hydroxyl-alkanoate accumulating (PHA) organisms. These PHA microorganisms with stored polymeric materials can slow down the uptake of BOD substances in the aeration tank to complicate the BOD removal.

5. Chemical precipitation of residual phosphorus is required to reduce the residual phosphorus to 0.1 ppm following the EBPR system. Aluminum and ferric salts are currently applied in combination with a sand filter to precipitate and remove phosphorus to extremely low levels. These tail end operations should not interfere with biological BOD, nitrification and EBPR operations, however the risk of increasing these chemicals to meet the new lower limit could result in a toxic accumulation of metals in the plant RAS that further inhibits nitrification processes and makes the plant less stable.

The end result of the EPA's proposed limits as discussed above could be counterproductive and create an increased environmental liability for the Ten Mile River as well as a less viable industrial base for the community and the Commonwealth.

Response #G.1: We concur that treatment plant operation will be more challenging when trying to balance biological phosphorus removal with biological nitrogen removal. A well-designed treatment system upgrade can minimize these challenges. Also, it is important to note that while biological phosphorus removal has some advantages, *e.g.*, reduced chemical use, it alone will not achieve the

required phosphorus limit. However, chemical precipitation and effluent filtration can achieve the limit without biological phosphorus removal.

Contrary to the commenter's claim, there is no reason to conclude that biological phosphorus removal will necessarily interfere with BOD removal or that chemicals utilized for precipitating phosphorus interfere with nitrification in a significant manner. Many facilities utilize biological phosphorus removal and/or chemical precipitation and also achieve very high BOD removal rates and very high nitrification levels.

Even if EPA were to agree with the premise of the comment above—that the proposed phosphorus effluent limit will necessarily carry with it other adverse environmental and economic consequences—this would not be justification under the CWA for removing this water quality-based permit limit. See Response #F9 relative to cost considerations and technological feasibility when establishing water quality-based limits.

The following comment was received from the Riverways Program, MA Department of Fish and Game, in an August 2007 letter:

Comment #H.1: The discussion provided in the Fact Sheet accompanying the modified permit presents sound and compelling reasoning for a reduction in the allowable total phosphorus concentration in the effluent from this facility. It is clear from the Fact Sheet discussion that the lower concentration is needed to address the water quality impairments in the receiving waters and the water quality standards established by Rhode Island - into whose waters the Ten Mile River flows. We support the 0.1 mg/l concentration limitation for phosphorus proposed and hope this limit will result in improved conditions in the Ten Mile River.

Response #H.1: The comment is noted for the record.

Section 401 Certification:

In its Section 401 certification of the permit, MassDEP raised several general technical, legal and policy issues pertaining to the permit. Further, as a condition of state certification, MassDEP included a compliance schedule for attaining the total phosphorus effluent limit.

MassDEP's first comment relates to the basis for the phosphorus effluent limit. In MassDEP's view, EPA erred by requiring Rhode Island water quality standards for lakes to be met in manmade impoundments such as Turner Reservoir. MassDEP states that this error places the entire burden of mitigation of the water quality impairments caused by impoundments on upstream communities that may have played no part in the original decision to alter the hydrology. The more equitable path, MassDEP argues, would have been for EPA to work with Rhode Island to remove the dams forming the impoundments, or worked with both states to develop an equitable distribution of costs associated with the mitigation of the water quality impairments.

At the outset, EPA wishes to emphasize that even if MassDEP's equitable argument were used as a basis for not applying Rhode Island's numeric criterion to Turner Reservoir, the phosphorus limitation in the permit would remain unchanged. MassDEP's comment assumes that the phosphorus limit was established solely to achieve Rhode Island water quality standards in Rhode Island impoundments located downstream of the Attleboro discharge. This is incorrect. As discussed extensively in the Response to Comments (see Responses #F.1 and #F.2) and the Fact Sheet, the phosphorus limit is not only necessary to achieve water quality standards in Rhode Island, but also to meet water quality standards applicable to the free flowing segments of the Ten Mile River in Massachusetts. Contrary to the implication created by MassDEP's comment, the phosphorus limitation was not made more stringent to achieve water quality standards in Rhode Island.

EPA believes that it has reasonably interpreted and applied relevant Rhode Island water quality standards pertaining to lakes and ponds. When crafting permit limits to comply with Rhode Island water quality standards, EPA cannot arbitrarily create a differentiation between manmade and naturally occurring lakes and ponds where no such distinction exists under the standards. As discussed in the Response to Comments (see Response #F.6), Rhode Island's water quality standards do not differentiate between natural and manmade water bodies in establishing the numeric phosphorus criterion applicable to lakes and ponds. Under Rhode Island standards, a "lake, pond or reservoir" is defined as "any body of water, whether naturally occurring or created in whole or in part, excluding sedimentation control or stormwater retention/detention basins, unless constructed in waters of the State." *See* Rhode Island Water Quality Regulations, Rule 7 ("Definitions"); *see also* Rule 4 ("Liberal Application") ("The terms and

provisions of these rules and regulations shall be liberally construed to allow the Department to effectuate the purposes of state law.").[31]

With respect to dam removal, EPA's authority under the NPDES program is limited to imposing reasonable limits and conditions related to the point source discharge that will, among other things, ensure compliance with applicable water quality standards of all affected states. EPA has carried out its responsibility in this regard by imposing a phosphorus effluent limit on the Attleboro facility. EPA cannot mandate removal of a downstream dam through an NPDES permit as a means to achieve compliance with standards. In this instance, questions regarding the desirability and feasibility of dam removal would appear to fall primarily within the ambit of Massachusetts and Rhode Island rather than EPA. As MassDEP is aware, portions of the downstream impoundments are in fact in Massachusetts and appear on the state's 303(d) list as impaired for nutrients. While MassDEP observes that it may take many years to fully restore uses in the downstream impoundments even with the new phosphorus limits, this in EPA's view is all the more reason to expeditiously proceed with placing necessary controls on dischargers in the watershed that are contributing to the impairment.

MassDEP also commented on the lack of a TMDL for nitrogen, and that proceeding without a TMDL is unfair to Massachusetts dischargers. This issue is also discussed extensively in the response to comments (see Response #A.1). The law is clear that a TMDL is not required before water quality-based limitation may be included in NPDES permits, as Massachusetts itself acknowledges in its certification. EPA has concluded that the permit includes effluent limits that are supported by the available information, and also believes that the limits in the permit are equitable when compared to the limitations included in numerous RIDEM permits issued to the Rhode Island POTWs impacting the Seekonk River.

Finally, as a condition of state certification MassDEP asks EPA to include a schedule in the permit for achieving the phosphorus limitation.[32] The proposed

[31] It is worth noting that under Massachusetts Surface Water Quality Standards, the definition of lake set forth at 314 C.M.R. 4.02 includes the following provision: "The Department may determine, on a case by case basis, that…a dammed river or stream impoundment is a lake or pond based on aquatic and other resources or uses to be protected."

[32] EPA assumes this condition pertains to achievement of the summer seasonal limit of 0.1 mg/l that is in effect between May 1 and October 31. The permit also includes a winter seasonal limit of 1.0 mg/l in effect November 1 through April 30. This latter limit is subject to a one year compliance schedule, which provides the facility sufficient time to develop operational experience with winter phosphorus removal (there were no winter phosphorus limits in previous permit) and to make any changes necessary to winterize its phosphorus removal equipment. The nitrogen limit in effect during this period is an optimization-only requirement. This limit requires the permittee to optimize nitrogen removal consistent with achieving the phosphorus limit of 1.0 mg/l and thus provides inherent flexibility in terms of balancing (to the extent necessary, if at all) the treatment processes for the two nutrients.

schedule requires the permittee to attain compliance with the limitation within 48 months of the effective date of the permit.

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

EPA's "duty under CWA section 401 to defer to considerations of State law is intended to prevent EPA from *relaxing* any requirements, limitations, or conditions imposed by the State law." *In re City of Jacksonville,* 4 E.A.D. 150, 157 (EAB 1992); *In re City of Moscow,* 10 E.A.D. 135, 151 (EAB 2001); *accord In re Ina Rd. Water Pollution Control Facility,* 2 E.A.D. 99, 100 (CJO 100). However, "when the Region reasonably believes that a state [WQS] requires a more stringent permit limitation than that specified by the state, the Region has an independent *duty* under section 301(b)(1)(C) of the CWA to include more stringent permit limitations." *Moscow,* 10 E.A.D. at 151 (emphasis in original); *accord In re City of Marlborough,* 12 E.A.D. 235, 252 n. 22 (EAB 2005); *Jacksonville,* 4 E.A.D. at 158; *Ina Rd.,* 2 E.A.D. at 100 (stating that such "duty is independent of State certification under [section] 401"). EPA's regulations similarly interpret the statute to impose such an independent duty when EPA issues an NPDES permit. 40 C.F.R. §§ 122.4(a), (d); 122.44(d)(1), (5).

Compliance schedules and deadlines not in accordance with the statutory provisions of the CWA cannot be authorized by an NPDES permit. Schedules of compliance are governed by 40 C.F.R. § 122.47, which requires, among other things, that "[a] permit may, when appropriate, specify a schedule of compliance leading to compliance with CWA and regulations." The schedule "shall require compliance as soon as possible, but not later than the applicable statutory deadline under the CWA." *Id.* § 122.47(a)(1). Compliance schedules have been authorized under Massachusetts Surface Water Quality Standards on a discretionary basis. *See* 314 CMR 4.03(1)(b) ("A permit may, when appropriate, specify a schedule leading to compliance with the Massachusetts and Federal Clean Water Acts and

regulations."). EPA-issued permits for Massachusetts' discharges may therefore include schedules leading to compliance with water quality-based limits on a discretionary basis if "appropriate" and if compliance is achieved "as soon as possible."

In its Section 401 certification, Massachusetts states that "as a condition of the [its] certification," it is requiring imposition of a 4-year compliance schedule to achieve the permit's phosphorus limit. Based on its review of effluent data from the facility, EPA has determined that inclusion of such a schedule is not appropriate under 301(b)(1)(C) because the City is already fundamentally in compliance with the new limit, and that a four year schedule would not represent the soonest possible compliance date. As shown on Attachment 13, the data submitted by the City in 2007 shows that the facility achieved a monthly average discharge total phosphorus concentration of 0.1 mg/l or less for the months of May through October. The facility is achieving these limits utilizing the multi-point chemical addition and filtration facilities designed to achieve a monthly average effluent concentration of 0.2 mg/l. EPA's decision to reject MassDEP's proposed compliance schedule based on recent plant performance data is consistent with NPDES regulations governing state certification conditions and schedules of compliance. *See* 40 C.F.R. § 124.55(f). ("Nothing in this section ["Effect of State certification"] shall affect EPA's obligation to comply with § 122.47. See CWA section 301(b)(1)(C)."). *See also Moscow,* 10 E.A.D. at 152 (rejecting a state's characterization of its proposal for less stringent limits as "conditions" of its certification).

EPA has also concluded that a compliance schedule would be inappropriate at this time for reasons of administrative efficiency. The limits and requirements on total nitrogen are established solely to ensure compliance with the Rhode Island Water Quality Standards. Because compliance schedules are not authorized under Rhode Island's standards, EPA intends to address compliance with the permit's nitrogen limit through an administrative order following issuance of the final permit. While information in the record currently before EPA does not suggest the need for additional time to comply with the phosphorus limit, EPA is aware that the phosphorus and nitrogen removal processes are potentially interdependent. EPA believes any future adjustment regarding compliance with the phosphorus limit should be addressed in an administrative order once the details of the nitrogen compliance schedule, including interim limits, have been determined and the justification for such schedule becomes apparent. This will allow EPA to consider the combined costs and construction implications of meeting the permit's limits for nutrients. EPA will consider MassDEP's proposed schedule in any future determination it makes. Since, as discussed above, the State's certification authority cannot limit the inclusion by EPA of any more stringent condition required by section 301(b)(1)(C) of the CWA, EPA reads MassDEP's proposed compliance schedule as describing the least stringent compliance schedule that the State would consider acceptable under State law. *See also Moscow,* 10 E.A.D. at 152 (noting use of phrase in certification calling

for compliance "on *or before*" the referenced compliance deadline and concluding that an "an approach to compliance schedules that, while more stringent, is within the outer bounds of what the State deems acceptable, would not be *inconsistent* [emphasis in original] with the State's certification").

Other Changes:

1. The final permit includes an updated Attachment A, FRESHWATER CHRONIC TOXICITY TEST PROCEDURE AND PROTOCOL. An updated procedure and protocol for this test was released by Region I since public notice of the draft permit, and is now being required of all NPDES permittees in Massachusetts required to perform this test. EPA considers this a minor change

2. The final permit includes an updated version of NPDES PART II STANDARD CONDITIONS. This version has been re-formatted and reorganized but contains the same requirements as the original.

3. A paragraph has been added to Part I..D, Unauthorized Discharges, that describes how to report an unauthorized discharge to MassDEP. The paragraph reads, "Notification of SSOs to MassDEP shall be made on its SSO Reporting Form (which includes DEP Regional Office telephone numbers). The reporting form and instruction for its completion may be found on-line at http://www.mass.gov/dep/water/approvals/surffms.htm#sso."

Attachment 1

Attachment 2

Summer Flows in Ten Mile River at East Providence USGS gage and at the North Attleborough and Attleboro WWTFs

Flow at USGS gage 01109403, Ten Mile River at East Providence, RI
Drainage area 53.1 square miles
7Q10 = 12.7 cfs

Year	Monthly mean flow in cfs				
	July	August	Sept		Avg
2002	24.5	17.6	35.0		25.7
2003	72.2	80.2	47.7		66.7
2004	35.2	54.0	53.7		47.6
2005	33.2	24.0	34.2		30.5
2006	97.2	45.5	43.3		62.0
Avg	52.5	44.3	42.8		46.5

Treament Plant flows from DMRs

Summer Discharge Flow - Attleboro WPCF

DATE	MO AVG		SUMMER AVG
	(MGD	(cfs)	(cfs)
7/31/2002	3.9	6.0	
8/31/2002	4	6.2	
9/30/2002	4.1	6.3	6.2
7/31/2003	4.7	7.3	
8/31/2003	4.6	7.1	
9/30/2003	4.4	6.8	7.1
7/31/2004	4.5	7.0	
8/31/2004	4.1	6.3	
9/30/2004	2.9	4.5	5.9
7/31/2005	2.7	4.2	
8/31/2005	2.8	4.3	
9/30/2005	2.7	4.2	4.2
7/31/2006	3.6	5.6	
8/31/2006	3	4.6	
9/30/2006	2.6	4.0	4.7
Avg	3.6	5.6	

Summer Discharge Flow - North Attleboro WPCF

DATE	MO AVG		SUMMER AVG
	(MGD	(cfs)	(cfs)
7/31/2002	2.77	4.3	
8/31/2002	2.31	3.6	
9/30/2002	2.57	4.0	3.9
7/31/2003	3.9	6.0	
8/31/2003	3.96	6.1	
9/30/2003	3.52	5.4	5.9
7/31/2004	2.8	4.3	
8/31/2004	3.05	4.7	
9/30/2004	3.09	4.8	4.6
7/31/2005	2.72	4.2	
8/31/2005	2.59	4.0	
9/30/2005	2.88	4.5	4.2
7/31/2006	3.93	6.1	
8/31/2006	3.02	4.7	
9/30/2006	3.13	4.8	5.2
Avg	3.1	4.8	

Attachment 3

Total Nitrogen Load to Ten Mile River

	North Attleborough WWTF	Attleborough WWTF	E Providence USGS gage flow minus POTW flow	Comment
Summer average conditions (cfs)	4.8	5.6	36.1	Summer average flows based on 2002-2006 data
DIN (TN - 2 mg/l for POTWS)	5	22.5	0.3	WWTF data is average of May-Oct 2007 DMR data
Total Nitrogen Load (lbs.day)	129	679	58	Total Load = 866 lbs/day
Percent of Total Load	15%	78%	7%	
Percent of POTW Load	16%	84%		

10. Corps Site Visit. On June 24, 1999, the Corps visited the site. The general impression was that Turner Reservoir did not look very appealing as a public water supply (see Figure 2). There were thick mats of aquatic weeds and algae lining most of the shoreline and extending out for a dozen yards or more in many places. There were also a lot of waterfowl, especially Canada geese, and their droppings were heavy along parts of the shoreline.

Figure 2. - Photographs illustrating the presence of duckweed at Turner Reservoir in the vicinity of the small beach area and adjacent to Route 152.

Attachment 5
Ten Mile River
2002 MassDEP Total Phosphorus Sampling Data

Station ID	Sampling Station Location	5/15/02	6/18/02	7/23/02	8/27/02	10/1/02
	Mean flow at USGS gage -Pawtucket Ave E Providence (cfs)	310	71	19	17	31
			Total Phosphorus - (mg/l)			
TM01	Ten Mile River at Fuller Street (downstream of Fuller Pond), Plainville	0.012		0.014		0.034
TM02	Ten Mile River at West Bacon Street, Plainville	0.022	0.046	0.055	0.074	0.031
TM04	Ten Mile River at Rte 1, North Attleboro	0.04	0.04	0.16	0.093	0.078
TM06	Ten Mile River at Cedar Street, North Attleboro	0.037	0.047	0.15	0.12	0.11
TM06A	Ten Mile River off Clifton Street (500 feet downstream of N Attleboro WWTP)	0.072	0.27	0.78	0.81	0.45
BG02A	Bungay River at outlet of Blackinton Pond, Attleboro	0.037	0.041	0.061	0.055	0.039
TM08A	Ten Mile River at Olive Street, Attleboro	0.12	0.13	0.19	0.2	0.19
SW01	Speedway Brook at Rte 152, Attleboro	0.044	0.048	0.049	0.058	0.069
TM11	Ten Mile River at Tiffany Street, Attleboro	0.11	0.11	0.094	0.11	0.11
TM13	Ten Mile River at Pond Street, Seekonk	0.12	0.14	0.17	0.12	0.11
SM01	Sevenmile River at County Street, Attleboro	0.053	0.036	0.03	0.022	0.033
TM14	Ten Mile River at Central Avenue, Seekonk	0.13	0.2	0.17	0.15	0.11

Attachment 6

MassDEP 2002 sampling data

Sampling Station	6/19/2002		7/24/2002					8/28/2002				
	Total P (mg/l	Chlor a mg/m^3	Total P (mg/l	Chlor a mg/m^3	DO sample time	DO mg/l	DO %sat	Total P (mg/l	Chlor a mg/m^3	DO sample time	DO mg/l	DO %sat
160 feet upstream of inlet to Central Pond	0.22							0.13				
Inlet to Central Pond			0.15									
Central Pond (center of pond)	---	5.5		3.5	11:13	10.8	130	0.32	44.5			
Turner Reservoir (Newman Avenue)										4:27	10.4	121
Turner Reservoir (deep hole, southern end)	0.16		0.12	4.5	14:13	8.3	100	0.29	45.2			

Data from samples taken closest to surface, generally at depth of 0.5 m

Attachment 7A

Estimate of Instream Total Phosphorus Concentration
Immmediately Downstream of Attleboro WWTF

Attleboro at Design Flow (13.3 cfs), Effluent limit = 0.1 mg/l, Background Concentration = 0.03 mg/l

	North Attleboro POTW	Attleboro POTW	E Providence USGS gage	Upstream of Attleborough Discharge	Background Concentration mg/l	Attleborough POTW Concentration mg/l	Instream Concentration mg/l
Drainage Area (sq mi)			53.1	29.1			
7Q10 (cfs)	3.6	13.3	22.0	5.5	0.03	0.1	0.079
Low Summer Ave (cfs)	3.9	13.3	34.8	13.5	0.03	0.1	0.065
Summer Ave (cfs)	4.8	13.3	54.2	24.6	0.03	0.1	0.055

Attachment 7B

Estimate of Instream Total Phosphorus Concentration
Immmediately Downstream of Attleboro WWTF

Attleboro at Design Flow (13.3 cfs), Effluent limit = 0.2 mg/l, Background Concentration = 0.03 mg/l

	North Attleboro POTW	Attleboro POTW	E Providence USGS gage	Upstream of Attleborough Discharge	Background Concentration mg/l	Attleborough POTW Concentration mg/l	Instream Concentration mg/l
Drainage Area (sq mi)			53.1	29.1			
7Q10 (cfs)	3.6	13.3	22.0	5.5	0.03	0.2	0.150
Low Summer Ave (cfs)	3.9	13.3	34.8	13.5	0.03	0.2	0.114
Summer Ave (cfs)	4.8	13.3	54.2	24.6	0.03	0.2	0.090

Attachment 7C

Estimate of Instream Total Phosphorus Concentration
Immmediately Downstream of Attleboro WWTF

Attleboro at Actual Flow, Effluent limit = 0.1 mg/l, Background Concentration 0.03 mg/l

	North Attleboro POTW	Attleboro POTW	E Providence USGS gage	Upstream of Attleborough Discharge	Background Concentration mg/l	Attleborough POTW Concentration mg/l	Instream Concentration mg/l
Drainage Area (sq mi)			53.1	29.1			
7Q10 (cfs)	3.6	4	12.7	5.5	0.03	0.1	0.059
Low Summer Ave (cfs)	3.9	4.2	25.7	13.5	0.03	0.1	0.047
Summer Ave (cfs)	4.8	5.6	46.5	24.6	0.03	0.1	0.043

Attachment 8

MADEP 2002 Assessment Report Sampling
Total Phosphorus

Date	Bungay River BG02 Total Phosphorus (mg/l)	Sevenmile River SM01 Total Phosphorus (mg/l)	Cole Brook CB01 Total Phosphorus (mg/l)
6/18/2002	0.041	0.036	0.062
7/23/2002	0.061 *	0.030	No Flow
7/24/2002	NS	NS	No Flow
8/27/2002	0.055	0.022	No Flow
8/28/2002	NS	NS	No Flow
10/1/2002	0.038 *	0.033	0.032
Average	0.049	0.030	0.047

* average of two samples

Attachment 9

Estimates of Phosphorus Loads Using 2002 MassDEP Sampling Data

Drainage Area (sq mi)			5/15/02			6/18/02			7/23/02			8/27/02			10/1/02		
53.1		Mean flow at USGS gage -Pawtucket Ave E Providence (cfs)		310			71			19			17			31	
		Flow Factor (cfs/sq mi)[2]		5.50			1.09			0.16			0.13			0.38	
		Average Daily flow at North Attleborough POTW (MGD)		5.625			3.683			2.615			2.283			2.779	
		Average Daily flow at Attleborough POTW (MGD)		6.058			4.841			4.216			4.089			4.169	
	ID	Sampling Station	Total P (mg/l)	Flow[3] (cfs)	Total P (lbs/day)	Total P (mg/l)	Flow (cfs)	Total P (lbs/day)	Total P (mg/l)	Flow (cfs)	Total P (lbs/day)	Total P (mg/l)	Flow (cfs)	Total P (lbs/day)	Total P (mg/l)	Flow (cfs)	Total P (lbs/day)
	TM01	Ten Mile River at Fuller Street (downstream of Fuller Pond), Plainville	0.012						0.014						0.034		
	TM02	Ten Mile River at West Bacon Street, Plainville	0.022			0.046			0.055			0.074			0.031		
	TM04	Ten Mile River at Rte 1, North Attleboro	0.04			0.04			0.16			0.093			0.078		
10.9	TM06	Ten Mile River at Cedar Street, North Attleboro	0.037	59.9	11.9	0.047	11.9	3.0	0.15	1.7	1.4	0.12	1.5	0.9	0.11	4.2	2.5
		North Attleborough WWTF [1]	0.54	8.7	25.3	0.6	5.7	18.4	0.89	4.0	19.4	1	3.5	19.0	0.63	4.3	14.6
11.2	TM06A	Ten Mile River off Clifton Street (500 feet downstream of N Attleboro WWTP)	0.072	70.3	27.3	0.27	17.9	26.0	0.78	5.8	24.5	0.81	5.0	22.0	0.45	8.6	20.8
	BG02A	Bungay River at outlet of Blackinton Pond, Attleboro	0.037			0.041			0.061			0.055			0.039		
20.5	TM08A	Ten Mile River at Olive Street, Attleboro	0.12	121.4	78.5	0.13	28.0	19.6	0.19	7.3	7.5	0.2	6.3	6.8	0.19	12.1	12.4
	SW01	Speedway Brook at Rte 152, Attleboro	0.044			0.048			0.049			0.058			0.069		
25	TM11	Ten Mile River at Tiffany Street, Attleboro	0.11	146.1	86.6	0.11	32.9	19.5	0.094	8.0	4.1	0.11	6.9	4.1	0.11	13.8	8.2
28.8	TM13	Ten Mile River at Pond Street, Seekonk	0.12	167.0	108.0	0.14	37.1	27.9	0.17	8.6	7.9	0.12	7.4	4.8	0.11	15.3	9.1
		Attleborough WWTF [1]	0.54	9.4	27.3	1	7.5	40.3	0.89	6.5	31.3	0.4	6.3	13.6	0.63	6.4	21.9
11.9	SM01	Sevenmile River at County Street, Attleboro	0.053	65.4	18.7	0.036	13.0	2.5	0.03	1.9	0.3	0.022	1.6	0.2	0.033	4.5	0.8
41.9	TM14	Ten Mile River at Central Avenue, Seekonk	0.13	248.4	174.0	0.2	58.8	63.4	0.17	17.2	15.8	0.15	15.5	12.5	0.11	26.7	15.8
47.3		Central Pond Inlet		278.1		0.22	64.7	76.7	0.15	18.1	14.6	0.13	16.2	11.4		28.8	

[1] Treatment plant flows are the average flow recorded on the day of the sample. Effluent concentrations are from samples done by DEP or samples done by plant on day of river sampling.

[2] Flow factor is estimated by subtracting WWTF flow from gage flow and dividing by 53.1

[3] flow is estimated by multiplying watershed area by flow factor and adding upstream WWTF flows

	Load upstream of TM14 (TM 13+SM01+Attleboro)	153.9	70.8	39.5	18.6	31.8
	Load at TM 14	174.0	63.4	15.8	12.5	15.8
	Percent Loss	-13%	11%	60%	33%	50%

Attachment 10A

Total Phosphorus Concentration
Inlet to Central Pond

Assuming Attleboro WWTF at 0.2 mg/l, background at 0.030 mg/l

	North Attleborough WWTF	Attleborough WWTF	E Providence USGS gage	At Inlet of Central Pond	Attleboro POTW Concentration mg/l	Background Concentration mg/l	Entrance to Central Pond mg/l
Drainage area (square miles)			53.1	46.9			
7Q10 conditions (cfs)	3.6	4	12.7	12.1	0.2	0.03	0.086
Lowest summer average conditions (cfs)	3.9	4.2	25.7	23.6	0.2	0.03	0.060
Summer average conditions (cfs)	4.8	5.6	46.5	42.3	0.2	0.03	0.053

Attachment 10B

Total Phosphorus Concentration
Inlet to Central Pond

Assuming Attleborough WWTF at 0.1 mg/l, background at 0.03 mg/l
WWTFs discharging at actual flow

	North Attleborough WWTF	Attleborough WWTF	E Providence USGS gage	At Inlet of Central Pond	Attleboro WWTF Concentration mg/l	Background Concentration mg/l	Entrance to Central Pond mg/l
Drainage area (square miles)			53.1	46.9			
7Q10 conditions (cfs)	3.6	4	12.7	12.1	0.1	0.03	0.053
Lowest summer average conditions (cfs)	3.9	4.2	25.7	23.6	0.1	0.03	0.042
Summer average conditions (cfs)	4.8	5.6	46.5	42.3	0.1	0.03	0.039

Attachment 10C

Total Phosphorus Concentration
Inlet to Central Pond

Assuming Attleborough WWTF at 0.09 mg/l, background at 0.024 mg/l

	North Attleborough WWTF	Attleborough WWTF	E Providence USGS gage	At Inlet of Central Pond	Attleboro WWTF Concentration mg/l	Background Concentration mg/l	Entrance to Central Pond mg/l
Drainage area (square miles)			53.1	46.9			
7Q10 conditions (cfs)	3.6	4	12.7	12.1	0.09	0.024	0.046
Lowest summer average conditions (cfs)	3.9	4.2	25.7	23.6	0.09	0.024	0.036
Summer average conditions (cfs)	4.8	5.6	46.5	42.3	0.09	0.024	0.033

Attachment 10D

Total Phosphorus Concentration
Inlet to Central Pond

Assuming Attleboro WWTF at 0.09 mg/l, background at 0.010 mg/l

	North Attleborough WWTF	Attleborough WWTF	E Providence USGS gage	At Inlet of Central Pond	Attleboro POTW Concentration mg/l	Background Concentration mg/l	Entrance to Central Pond mg/l
Drainage area (square miles)			53.1	46.9			
7Q10 conditions (cfs)	3.6	4	12.7	12.1	0.09	0.01	0.036
Lowest summer average conditions (cfs)	3.9	4.2	25.7	23.6	0.09	0.01	0.024
Summer average conditions (cfs)	4.8	5.6	46.5	42.3	0.09	0.01	0.021

Attachment 11

Seekonk Reach POTW Loads						
	Proposed DIN Limit (TN-2 mg/l) (mg/l)	Design Flow (MGD)	Load at 90% design flow no attenuation (kg/day)	Percent of total load	Load at 90% design flow w/attenuation (kg/day)	Percent of total load
NBC-Bucklin Point	3	31	317	24%	317	28%
Wooonsocket	3	16	164	12%	142	13%
Upper Blackstone PAD	3	56	572	43%	498	45%
Attleboro	6	8.6	176	13%	105	9%
North Attleborough	6	4.6	94	7%	56	5%
Total			1322		1119	

Attachment 12

Seekonk Reach Loads

Permit Name	Design Flow of Existing Facilities (MGD)	Summer 95-96 Monthly Ave flow (MGD)	Flow used for buildout calculation (MGD)	Recommended DIN (TN effluent limit-2 mg/l) (mg/l)	Load at 95-96 flow (lbs/day)	Load at 95-96 flow, w/atten (lbs/day)	Load at design flow (lbs/day)	Load at design flow, w.atten (lbs/day)	Load at buildout flow (lbs/day)	Load at buildout flow, w.atten (lbs/day)
UBWPAD	56	32.7	50.4	3	818	712	1401	1219	1261	1097
WOONSOCKET WWTF	16	7.37	14.4	3	184	160	400	348	360	313
NARRAGANSETT BAY COMM-BUCKLIN	31	20.95	27.9	3	524	524	776	776	698	698
ATTLEBORO	8.6	4.52	7.74	6	226	136	430	258	387	232
NORTH ATTLEBORO	4.6	2.68	4.14	6	134	80	230	138	207	124
				Total (lbs/day)	1887	1613	3238	2739	2914	2465
				(kg/day)	856	731	1468	1242	1321	1118
				($mM/m^2/day$)	6.11E+07	5.22E+07	1.05E+08	8.87E+07	9.44E+07	7.99E+07
Area of Seekonk River	2.81E+06 (m2)		Load/area	($mM/m^2/day$)	21.8	18.6	37.4	31.6	33.6	28.5
				MERL Loading Condition (X)	7.6	6.5	13.0	11.0	11.7	9.9

Attachment 13

Attleborough WWTF
Total Phosphorus DMR Data

Month		Mo Avg	Wkly Avg	Mo Avg	Wkly Avg	Daily Mx
		lb/day	lb/day	mg/l	mg/l	mg/l
5/31/2005		3	3	0.1	0.1	0.2
6/30/2005		2	3	0.1	0.1	0.2
7/31/2005		3	7	0.1	0.3	0.4
8/31/2005		1	1	0.1	0.1	0.1
9/30/2005		2	3	0.1	0.1	0.2
10/31/2005		5	13	0.1	0.2	0.4
5/31/2006		12	21	0.4	0.6	1.2
6/30/2006		41	49	0.6	0.7	2.7
7/31/2006		3	107	0.1	1.5	0.3
8/31/2006		21	49	0.9	2.1	3.6
9/30/2006		8	31	0.4	1.2	1.4
10/31/2006		6	17	0.3	0.8	2.1
5/31/2007		3	3	0.1	0.1	0.2
6/30/2007		2	2	0	0.1	0.1
7/31/2007		1	2	0	0.1	0.1
8/31/2007		1	1	0	0	0.1
9/30/2007		2	2	0.1	0.1	0.1
10/31/2007		1	2	0.1	0.1	0.1
Limit		72	72	1	1	1.5
Ave:		6.50	17.56	0.20	0.46	0.75