EXHIBIT 2

UBWPAD RESPONSE TO COMMENTS

On March 23, 2007, the United States Environmental Protection Agency began the public comment period for a draft permit for the Upper Blackstone Water Pollution Abatement District (UBWPAD). A public meeting and a public hearing were held in Worcester, MA on May 9, 2007. At the public hearing, EPA extended the public comment period until May 25, 2007. Comments were received from UBWPAD, its consultant Camp Dresser and McKee and its attorneys, as well as from numerous other organizations and individuals. After review of the comments, EPA has determined to issue a final National Pollutant Discharge Elimination System (NPDES) permit for the UBWPAD facility.

The final permit is issued only by EPA. The permittees should contact the Massachusetts Department of Environmental Protection regarding authorization to discharge pursuant to the requirements of the Massachusetts Clean Water Act, as amended, Mass. Gen. Laws ch. 21, §§ 26-53. In addition, EPA has determined that Massachusetts has waived certification pursuant to Section 401(a)(1) of the Clean Water Act (CWA), 33 U.S.C. § 1341(a)(1) and 40 C.F.R. Section 124.53.[1]

The following responses address both written and oral comments provided to EPA during the comment period. Where comments are similar, we have cross-referenced rather than repeated relevant responses. This document also describes changes and clarifications EPA has made to the final permit.

This response is generally organized as follows:

Part A responds to comments from the following individuals and organizations: Massachusetts Department of Fish and Game, Riverways Program; Mark A. Briggs Blackstone River Watershed Council; Trout Unlimited; Mass Audubon; Blackstone River Valley National Heritage Corridor Commission; Blackstone Headwaters Coalition; Stephanie D. Matheny; Blackstone River Watershed Association; Narragansett Bay Estuary Program; Blackstone River Coalition; Rhode Island Bays, Rivers, & Watersheds Coordination Team; Senator Richard T. Moore; Save The Bay; Donald Pryor; Conservation Law Foundation; The Smart Growth Task Force, Bristol, Rhode Island Preserve Bristol; and Jan Reitsma.

Part B addresses comments received from Grace Ross; Tatnuck Brook Watershed Association; and City Councilor Frederick Rushton.

Part C addresses comments from Dr. Mauri S. Pelto.

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[1] The final permit reflects that the permit is issued solely by EPA pursuant to its authority under the CWA. Please note we have modified footnote 4 of the permit which relates to limits for DO, pH range and seasonal fecal coliform to make clear that the limits are consistent with historical state certification requirements and are required by antibacksliding requirements.

Part D responds to comments from the Rhode Island Department of Environmental Management.

Part E responds to comments submitted by the Massachusetts Department of Environmental Protection.

Part F addresses comments received from the Upper Blackstone Pollution Abatement District, including from its technical consultants and legal counsel.

Part G responds to comments received from the following: New England Plating Co., Inc.; Town of Holden; City of Worcester (City Manager); Town of West Boylston; Worcester Regional Chamber of Commerce; City of Worcester (DPW); UBWPAD Board of Directors; Town of Leicester; and Pepe & Hazard

PART A.

Comments were received from many organizations and individuals noting the significance of the UBWPAD permit relative to water quality in the Blackstone River and/or Narragansett Bay and expressing support for the nutrient limits in the draft permit. These organizations and individuals include:

Massachusetts Department of Fish and Game, Riverways Program
Mark A. Briggs
Blackstone River Watershed Council
Trout Unlimited
Mass Audubon
Blackstone River Valley National Heritage Corridor Commission
Blackstone Headwaters Coalition
Stephanie D. Matheny
Blackstone River Watershed Association
Narragansett Bay Estuary Program
Blackstone River Coalition
Rhode Island Bays, Rivers, & Watersheds Coordination Team
Senator Richard T. Moore
Save The Bay
Donald Pryor
Conservation Law Foundation
The Smart Growth Task Force, Bristol, Rhode Island
Preserve Bristol
Jan Reitsma

Other comments from the above individuals and organizations include the following:

Comment #A1: The Narragansett Bay Estuary Program, and Rhode Island Bays, Rivers,

& Watersheds Coordination Team commented that the available science supports the conclusion that attenuation of nitrogen in the Blackstone River is low.

Response #A1: Attenuation is defined as the difference between the amount of nitrogen released to the river and the amount delivered to the mouth of the river. We agree that the available science indicates that the majority of nitrogen discharged from the UBWPAD is delivered to the Providence and Seekonk River system (Upper Narragansett Bay). *See also* Response #F17 below.

Comment #A2: Several commenters, including Blackstone River Watershed Council, Trout Unlimited, Blackstone River Valley National Heritage Corridor Commission, Blackstone River Coalition, Stephanie D. Matheny, Senator Moore, Mark A. Briggs, and Save The Bay indicated that compliance with the permit limits should be pursued with urgency. A few specifically commented that the Massachusetts Department of Environmental Protection (MassDEP) proposed schedule (*see* MassDEP Comment #E2) is too long.

Response #A2: EPA recognizes the severity of the water quality impacts in the Blackstone River and Upper Narragansett Bay and the contribution of the UBWPAD discharge to these impacts. Consequently, we intend to establish a compliance schedule that is reasonable but that also ensures compliance with the permit limits as soon as possible. We believe that the UBWPAD can achieve compliance with its total nitrogen limit in the same time frame as the Rhode Island facilities, which will expedite the process of assessing the water quality response in Upper Narragansett Bay.
See also Response #E2.

Comment #A3: The Blackstone Headwaters Coalition, Mark A. Briggs, and the Blackstone River Coalition all commented that a phosphorus total maximum daily load (TMDL) for the Blackstone River should be completed but that the current permit limits are necessary and should not wait for the TMDL.

Response #A3: Pursuant to 40 CFR §130.7(c), States are required to prepare TMDLs for impaired waters. While we believe that a TMDL can be a useful tool for ensuring that all sources of phosphorus are adequately addressed, EPA has a clear obligation to establish water quality based limits that will ensure attainment of water quality standards even in the absence of a TMDL. In fact, the 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 CFR §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 wasteload allocation" applicable to the discharger. 40 CFR §122.44 (d)(1)(vii)(B).

Comment #A4: The Riverways Program commented that the infiltration/inflow removal requirements are important to minimize partially treated discharges.

Response #A4: We concur that the infiltration/inflow (I/I) removal requirements are important. A large percentage of the annual flow to the UBWPAD is a result of infiltration/inflow in the system. In its NPDES permit re-application, UBWPAD indicated that I/I is approximately 15 million gallons per day. *See* NPDES Permit Application at page 7. Improved control of I/I would minimize discharges that do not receive full treatment and would also reduce energy and chemical use associated with the transport and treatment of the extraneous flow. *See also* Response #F8 below.

Comment #A5: The Riverways Program commented that continuous chlorine monitoring is an important addition to protect aquatic life.

Response #A5: We agree that continuous chlorine monitoring is an important addition to the permit's monitoring requirements and will help to protect aquatic life by providing instantaneous detection of equipment or operational problems with the disinfection system. We do not believe that the use of grab samples alone to measure chlorine is sufficient where wastewater flow and chlorine demand vary significantly throughout the day. The fluctuation of flow at this facility is of particular concern in light of CSO contributions and the high volume of I/I in the sewer system.

Comment #A6: The Riverways Program commented that whole effluent toxicity testing of outfall 001A is appropriate.

Response #A6: We concur. Because discharges through outfall 001A will receive only primary treatment and disinfection, whole effluent toxicity testing during periods when outfall 001A is activated is necessary to ensure that the resulting discharge does not have a toxic effect on the receiving water.

Comment #A7: Trout Unlimited commented that the permit should address concerns with aluminum toxicity.

Response #A7: We agree that aluminum toxicity is a potential concern. The final permit contains a monitoring requirement in order to obtain more information relative to the potential to violate receiving water criteria for aluminum. If the data indicate that there is a reasonable potential to violate receiving water criteria, future permit actions will include an aluminum limit.

Comment #A8: The Blackstone Headwaters Coalition and the Blackstone River Coalition commented that the proposed limit of 0.1 mg/l total phosphorus may not be sufficiently low because the upstream water contains some phosphorus. Several commenters (Blackstone Headwaters Coalition, Congressman McGovern, City Councilor Frederick Rushton, John Reed) noted that impoundments should be considered.

Response #A8: The calculations assuming zero upstream phosphorus were included to demonstrate that both the limit of 0.75 mg/l in the expired permit or a limit of 0.2 mg/l (as MassDEP has interpreted the "highest and best practicable treatment" requirement in

its standards in the context of certain other permitting decisions) are insufficient to ensure that the downstream concentration of phosphorus does not exceed 0.1 mg/l. Because the available dilution is very small relative to the design flow of the treatment facility, and because the upstream dilution water will contain some phosphorus, we have established the effluent limit at 0.1 mg/l to ensure that the discharge does not cause or contribute to a downstream exceedance of the 0.1 mg/l target.

We agree that downstream sediments may be a source of phosphorus. While the improved treatment required by this permit will have a beneficial effect relative to the accumulation of phosphorus in downstream sediments, we believe that this issue warrants further evaluation upon completion of the treatment upgrades. If sediment sources of phosphorus are demonstrated to be causing or contributing to non-attainment of water quality standards, then either sediment remediation and/or lower permit limits may be pursued. In addition, the permit includes a winter phosphorus limit from November through March to ensure that the higher level of phosphorus discharged in the winter period does not result in the accumulation of phosphorus in downstream sediments. MassDEP has indicated its intent to develop a phosphorus TMDL (*see* Comment #E3 below). A better understanding of the role of downstream sediments should be an important component of any TMDL effort.

Comment #A9: The Blackstone River Coalition, Save The Bay, Conservation Law Foundation, and Stephanie D. Matheny all commented that cost is not an appropriate basis for establishing permit limits. Save The Bay also commented that the limits do not represent an unfair and disproportionate burden to sewer ratepayers. Donald Pryor commented that water and sewer costs in Worcester are a lower percentage of median household income than costs in Rhode Island. Mass Audubon noted that the costs of the current upgrade are primarily to address CSO issues rather than nutrient reduction and that, while we do need to be mindful of Worcester's sewer fees, we also need to note that other communities are doing more than their share to improve water quality by paying $750 million to address CSO issues. Mark A. Briggs commented that necessary funding to bring the facility up to current standards must be supplemented from sources beyond Worcester and the Blackstone Valley. The Blackstone River Valley National Heritage Corridor Commission commented that a number of downstream communities are strenuously working to achieve higher water quality standards and that the UBWPAD also must achieve improved water quality discharge.

Response #A9: We agree that cost and technological considerations are not appropriate factors to consider in establishing water quality-based effluent limits. *United States Steel Corp. v. Train*, 556 F.2d 822, 838 (7th Cir. 1977); *see also In re City of Moscow*, 10 E.A.D. 135, 168 (EAB 2001). We also recognize, however, that the improvements necessary to meet the new permit limits will result in sewer rate increases. As discussed earlier, if a permittee cannot immediately meet new water quality-based limits because of the need to design and construct additional treatment facilities, EPA may establish a compliance schedule, which we intend to do for this discharge (*see* Response #A2).

State regulations also include provisions for allowing a revision or variance from water quality standards under specific conditions. One of the conditions is if the cost of controls necessary to attain the existing water quality standards would result in widespread economic and social impact. If such a condition were shown to exist, relief could be granted through a revision or variance to water quality standards (*see* Massachusetts Surface Water Quality Standards, 314 CMR 4.03(4); Rhode Island Water Quality Regulations, Rules 19 and 20. *See also* EPA's Use Attainability Analysis regulations at 40 CFR §131.10(g) and Interim Economic Guidance for Water Quality Standards, March 1995.

For additional discussion regarding evaluation of cost impacts in the context of setting water-quality based effluent limitations, *see* Responses #F1, #F2 and #F4 below.

Comment #A10: The Conservation Law Foundation (CLF) commented that the warm weather total nitrogen limit should be no higher than 3 mg/l (limit of technology as defined by Rhode Island Department of Environmental Management) and that the warm weather total phosphorus limit should be no higher than 0.1 mg/l. CLF further indicated that the permit must quantify any further contribution of nitrogen and phosphorus to the present water quality standards violations and must include further conditions and limitations designed to ensure that there is no remaining contribution from the UBWPAD to the violations. CLF commented that such additional conditions and limitations should be an offset to known discharges from the plant.

Response #A10: While RIDEM's nitrogen reduction analysis (referenced in the comment) suggests that permit limits for nitrogen based on the limit of technology may be necessary to achieve water quality standards, there are uncertainties associated with use of a physical model such as the MERL tank experiments. As noted in the Fact Sheet and further detailed in this response to comments, 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 Upper Narragansett Bay. These differences may overestimate the impact that a given nitrogen load would have on the Seekonk and Providence River system. *See* Response #F18A. Consequently, we believe that the significant nitrogen reductions required by the permit, as well as other permits in the watershed, are consistent with achieving water quality standards. Further limitations (including offsets) are not warranted at this time. We also recognize the importance of monitoring the receiving water response to these nitrogen reductions; as noted in the Fact Sheet at page 14, 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. If warranted, further reductions will be required.

The final permit includes a phosphorus limit of 0.1 mg/l. We concur it cannot be higher and ensure attainment of water quality standards. The phosphorus limit in the permit is based on an analysis of the limit necessary to achieve water quality standards. It is not a

technology-based limit nor does it reflect the limits of available technology. Available technology is capable of achieving phosphorus limits lower than 0.1 mg/l.

Comment #A11: CLF commented that, in addition to the currently documented dissolved oxygen stress in Narragansett Bay, the NPDES permit should consider the added impacts that will result from global warming over the life of the permit. CLF argues that this supports that no higher TN limit than that technically achievable should be permitted.

Response #A11: We agree that this is a concern that needs further consideration in the future. While temperature changes in Narragansett Bay are expected to be small over the life of this permit (five years), increasing temperatures are a significant concern over the longer term. EPA will work with RIDEM to ensure that the post nitrogen reduction monitoring and evaluation effort includes consideration of the effects of global warming on water quality standards attainment.

Comment #A12: CLF commented that the seasonal CBOD of 10 mg/l should be required year round. Acknowledging that the 10 mg/l limit is of maximum benefit in the warm months, CLF comments that the River system should benefit year-round from UBWPAD's investment to achieve 10 mg/l.

Response #A12: Treatment plants designed to meet a CBOD limit in the summer period may not be able to meet the same limit in the winter period due to the effects of colder temperatures on treatment efficiencies. In addition, the dissolved oxygen waste load allocation used to establish the effluent limits for CBOD in both the previous permit and this reissued permit indicates that minimum dissolved oxygen criteria will be met in the receiving water during the winter period. (Note that the CBOD limits are the same in the expired permit and this reissued permit).

Comment #A13: CLF commented that the limited flushing capacity of this system, combined with the persistence of phosphorus and nitrogen in the system, warrant consideration of year round application of nutrient controls.

Response #A13: In typical wastewater treatment plant effluent, both phosphorus and nitrogen are present in the dissolved phase. Typical effluent also includes particulate phosphorus, but very little particulate nitrogen. The predominate form of nitrogen in municipal wastewater discharges is dissolved inorganic nitrogen (primarily ammonia, nitrite and nitrate). Also, dissolved inorganic N forms, especially nitrite and nitrate, are highly soluble and do not precipitate easily or sediment out when freshwater enters the brackish zone of estuaries as inorganic P is likely to do. *See* Nutrient Criteria Technical Guidance Manual, Estuarine and Coastal Marine Waters (EPA-822-B-01-003, October 2001).

The RIDEM nitrogen reduction analysis and supporting scientific documentation indicates that the winter contribution is not significant. *See, e.g.*, RIDEM Response to Comments on Total Nitrogen Permit Modifications, June 27, 2005, page 26. However,

in light of the uncertainties with the fate and transport of winter contributions of nitrogen through the system and the potential that these contributions will add to the pool of nitrogen available during critical periods, the permit requires that UBWPAD optimize the treatment facilities in the winter period in order to minimize the potential for higher winter loadings to prevent attainment of water quality standards.

For phosphorus, we agree that there is a significant potential for particulate phosphorus loadings to settle and accumulate in downstream impoundments during non-growing seasons and to contribute to impairments in the Blackstone River during the summer growing period. Consequently, the permit includes a winter phosphorus limit of 1.0 mg/l to ensure that the particulate fraction of the phosphorus is removed prior to discharge to the River. The limit assumes that the vast majority of the phosphorus discharged will be in the dissolved fraction and that dissolved phosphorus will pass through the system and not accumulate in the sediments. The limitation is higher than the seasonal limit of 0.1 mg/l because EPA has assumed, based on experience with other treatment facilities, that achieving a limit of 1.0 mg/l will result in the removal of the majority of the particulate fraction of phosphorus in the discharge. For instance, water quality surveys conducted in the Assabet River indicate that 90% of the total phosphorus in the discharge of four wastewater treatment facilities was in the dissolved form. *See* Assabet River TMDL for Total Phosphorus, Report Number: MA82B-01-2004-01. To verify the dissolved fraction of phosphorus discharged, a dissolved orthophosphorus monitoring requirement is included in the permit; if water quality monitoring indicates that it is accumulating, then lower winter limits will be required in the future.

Comment #A14: The Blackstone River Watershed Council commented that EPA "should re-invest its efforts to forge a watershed-wide planning team and enable this team to engage both RIDEM and MADEP (and their legislators) to sync the actions to be taken to invest and improve upon the whole watershed. Whether it's the planning for a 'river wide' TMDL, fish passage planning and implementation strategies, bike path connections, or standardized NPDES permits to limit nutrients and other impairments, we believe EPA needs to play a larger role." Several other commenters noted the importance of coordinated efforts to improve water quality in the River and watershed.

Response #A14: EPA will continue to support the Blackstone River Watershed Council/Friends of the Blackstone and its partner, the Blackstone River Coalition, in their many efforts to bring about improvements along the Blackstone. EPA, RIDEM, MassDEP and the watershed organizations all play important roles in protecting and improving water quality in the Blackstone River watershed. We agree that coordination of efforts is important. Currently, EPA is working closely with both MassDEP and RIDEM to ensure that we address nutrient discharges from municipal treatment plants in a coordinated fashion. We intend to continue to play an active role in this and other issues related to improvement of the watershed.

PART B.

Some commenters (including Grace Ross, Tatnuck Brook Watershed Association, and City Councilor Frederick Rushton) focused on alternatives to the low nutrient limits.

Comment #B1: Wastewater source reductions (phosphate free detergents and alternative chemicals for copper control in the water supply) and non-point source reductions (organic lawn care and other storm water controls) should be pursued instead of another expensive upgrade.

Response #B1: Regarding the attainment of the new water quality-based effluent limitations for UBWPAD, the Clean Water Act (CWA) and EPA's regulations do not dictate the method by which UBWPAD must meet the new water quality-based effluent limits. While the suggested source controls would have positive benefits and we encourage the permittee to pursue them, they would not be sufficient to achieve the necessary effluent limits. The commenters' suggested source controls for phosphorus would have the benefit of reducing phosphorus in the influent, which should reduce the chemicals and energy used to treat for phosphorus. However, there is a significant amount of phosphorus that is inherent to human waste and will not be affected by source controls. The level of treatment to be provided in the current upgrade is not sufficient to meet the permit limits, even with a significant reduction in the influent concentration of phosphorus from other sources.

While efforts to reduce non-point sources of phosphorus and nitrogen are encouraged and would have beneficial effects, the available science indicates that the significant majority of the total phosphorus loads to the Blackstone River (*see* Reports cited in the Fact Sheet at page 8) and of the total nitrogen loads to Narragansett Bay (*see* Response #F40 below) are from point sources. Even a high level of non-point source nutrient reductions would not preclude the need for significant point source reductions. *See also* Response #C1 below.

Several commenters in addition to UBWPAD (including elected officials, representatives of organizations and members of the public) expressed concern as to the lack of funding to meet the new permit limits. With regard to cost considerations in establishment of water quality-based effluent limits, please see Response #A9. Some suggested that the new permit limits represent an unfunded mandate.

Comment #B2: The need to comply with the limits is an unfunded mandate.

Response #B2: We interpret the reference to "unfunded mandates" as a reference to the requirements of the Unfunded Mandate Reform Act of 1995 (UMRA). The UMRA, however, is inapplicable to this permitting action. The UMRA applies to rulemaking, and not individual NPDES permit decisions. For example, in *In re City of Blackfoot Wastewater Treatment Facility*, NPDES Appeal No. 00-32 (EAB September 17, 2001)

the Environmental Appeals Board denied a petition for review of compliance with UMRA on grounds that UMRA applies only to regulations, not to individual NPDES permits, which are more akin to licenses than a regulation.

In addition, EPA helps to finance the cost of treatment needed to achieve compliance with the Clean Water Act through the Clean Water Act State Revolving Fund (SRF). Through the SRF program, Massachusetts maintains revolving loan funds to provide low-cost financing for a wide range of water quality infrastructure projects. Funds to establish or capitalize the SRF program are provided through federal government grants and state matching funds (equal to 20% of federal government grants). EPA has provided Massachusetts with a total of $956,861,571 in Clean Water Act SRF grant funds for the period from 1989 through July, 2008.

PART C.

Comments were received from Dr. Mauri S. Pelto, Department of Environmental Science, Nichols College on May 24, 2007. Dr. Pelto's letter, in its entirety, is included below:

Comment #C1: The goal of everyone is to achieve a clean Blackstone River by 2015. I have spent seven years working with the BRC (Blackstone River Coalition), BHC (Blackstone Headwaters Coalition), and BRWA (Blackstone River Watershed Association) to setup a system to monitor the water quality and quantity of the Blackstone River Watershed. My role with the BRC has been to establish rating curves at monitoring stations in all significant tributaries to the Blackstone River in Massachusetts. On the second Saturday of each month from April-November, the BRC volunteers and coordinators collect data from throughout the watershed. Through use of the rating curves established by myself, discharge is also determined at many of the locations. Availability of discharge data allows determination of phosphorus load, or more appropriately the mass balance, in the system on a given day based on the measured concentrations. These data fill a key gap in data collected by the DEP and EPA, which have not routinely monitored tributaries to the Blackstone.

One key to achieving a healthy Blackstone River is to minimize the tremendous load of nutrients in the river. The question is how best to do this, given the limited monetary resources that can be allocated. I feel that informed management decisions cannot be made until we attempt to determine the mass balance of phosphorous in this watershed. Data collected by the BRWA provide the ability to do this for select days, although a more continuous mass balance would be ideal. The latter can only be provided by a model, tested against the field data.

I have developed a mass balance for the watershed based on orthophosphate concentrations and discharge measured by the BRWA in 2005 and 2006. These data provide a conservative (low) estimate for total phosphorous loading from the tributaries at the time of measurement as other forms of phosphorus are not accounted for. In addition, not all tributaries are monitored every month, thus additional loading can be

expected from unmonitored tributaries. I was careful to include only non-redundant measurements, that is not utilizing an upstream station and a downstream measurement station that is fed by that upstream station. Values were utilized from either Middle River or Leesville Outflow for the Worcester Headwaters. The main stem tributaries utilized include the Mumford River, West River, Mill River, Mill Brook, Emerson Brook, Cold Spring Brook, Peters River, Quinsigamond River Singletary Brook and Broad Meadow Brook. In each case, the most downstream station for which data were available was used. Data for all of the above noted stations were only available during one month. Thus, as noted above, the measured load in kg/day is conservative because of the use of orthophosphate measurements and the lack of completely comprehensive data.

The attached file has the loading data for 2005 and 2006 measured by BRC and that discharged by waste water treatment plants along the river. Treatment plant load data were provided by Paula Rees, from UMass, based on data acquired from the plants to facilitate their model development at UMass. Data for plants other than the Upper Blackstone plant are not yet available for 2006. Tributary loading has been compared to discharge from the Upper Blackstone plant on two figures, one for 2005 (Figure 1) and one for 2006 (Figure 2). Note that on figures 1 and 2, there are two values presented for the phosphorous load emitted from the Upper Blackstone plant on each date (provided by Dr. Rees), in addition to the load monitored in the tributaries, based on the BRWA data. The first plant load estimate is based on the observed plant effluent discharge and total phosphorus concentration for the given day. The second plant load estimate is based on the observed plant effluent discharge and a total phosphorus concentration of 0.6 mg/L total phosphorus. The concentration of 0.6 mg/L is the target total phosphorus concentration the on-going construction at the plant is designed to meet (or 80% of the allowed limit of 0.75 mg/L). It is conservatively assumed that all of the total phosphorus is actually dissolved orthophosphorus. Additional figures (not numbered) compare tributary loading against loading from other treatment plants along the river in addition to the Upper Blackstone. In these figures, a third estimate of load from the Upper Blackstone has been added. This load is based on the observed plant effluent discharge and a total phosphorus concentration of 0.09 mg/L, or 90% of the proposed future total phosphorus limit for the plant. Load estimates for both the on-going construction and proposed limit were also provided by Dr. Rees.

The data suggest that the main source of phosphorous after the current upgrades are in place will not be from the Upper Blackstone waste water treatment facility. It is also worth noting that the current loading from the treatment plant is typically of the same magnitude as the conservative measure of phosphorous loadings from the tributaries feeding the Blackstone River. This leads me to several conclusions;

1. I have spent more than 300 different days in our streams, and seen countless examples of cappuccino colored brooks indicating the substantial nutrient loading and turbidity issues of our brooks feeding the Blackstone River.
2. That after the current upgrades with respect to phosphorous, Upper Blackstone's output except during low water events, will be much smaller than contributions from the basin's non-point sources. This needs our attention.

3. That support of BRC-BRWA-BHC is providing us with the data to identify these problems specifically and through their advocacy to try to address them.
4. These preliminary investigations indicate the value that can be gleaned from this system of volunteer monitoring and professional coordination. This system needs to be further supported to enhance the data, and to provide a better answer to the TMDL question for the Blackstone River Watershed, sooner rather than in 2013.
5. This field data in combination with the UMASS model can provide us with a preliminary understanding of the phosphorous mass balance of the watershed, that in turn would allow quantitative determination of the best management practices to reduce nutrient loading.

As noted in a letter from the BRC, by Donna Williams, "DEP also calls for a TMDL for Phosphorous to be performed for the Blackstone by 2013. The BRC supports the development of TMDLs for nutrients on the Blackstone, however the TMDL should be completed as soon as possible. It could, in fact, indicate the need for even stricter limits." The BRC, through its tireless efforts, has acquired the resources and the data to provide a preliminary answer to this question and spurs us to do more. This organization is invaluable in addressing this question today and in the future and spreading solutions in the communities through its advocacy.

I look forward to continuing to work with the many people and organizations seeking to clean the Blackstone River and seeing the results with my own eyes, in clearer water.

Response #C1: We commend the efforts of organizations such as the Blackstone River Coalition and volunteers to monitor water quality and to improve the Blackstone River and its watershed.

The analysis provided is difficult to review given the lack of supporting information. Flow and concentration data, sampling locations, and precipitation information are not provided. Key to the loading estimates are the rating curves for estimating flow, but no information is provided as to how the rating curves were developed or how well they calibrate to data from USGS permanent gage sites.

In addition, most of the data provided is not from low flow conditions. The only data set in 2005 from typical low flow periods was the July data set and it rained 2.5 inches the day before the sampling. In 2006 there were only two data sets from typical low flow periods (July and September) and the non-point source loadings during July and September were much lower than at other times of the year.

The permit limits are established to meet water quality criteria under 7Q10 low flow conditions. Under these conditions, non-point sources are minimal and controlling the point source discharges is critical. Under 7Q10 conditions, point sources will continue to be the dominant source of phosphorus loadings even after the current upgrade is completed. However, on an annual basis, loadings from non-point sources are significant and are an issue that warrants further attention, especially to the extent that these loadings may accumulate in downstream impoundments. The storm water permits issued to most

communities in the Blackstone River watershed will help address the non-point sources but more targeted Best Management Practices (BMPs) in future storm water permits will likely be necessary. We agree with the commenter's statement that the usefulness of this type of data is to help allow a quantitative determination of BMPs.

PART D.

Comments were received from the Rhode Island Department of Environmental Management (RIDEM) in a letter dated May 18, 2007. RIDEM noted the significance of the UBWPAD permit relative to water quality in the Blackstone River and Narragansett Bay and expressed support for the nutrient limits in the draft permit. RIDEM also commented that the available science supports the conclusion that attenuation of nitrogen in the Blackstone River is low and urged EPA to ensure the expeditious implementation of WWTF modifications. (See Responses #A2 and #E2 relative to a compliance schedule). Other specific comments are as follows:

Comment #D1: The assumption that the concentration of metals in the upstream water is zero is not reflective of actual conditions and when coupled with allocation of the entire criteria, results in permit limits that cause violations of the downstream Rhode Island Water Quality Standards. Copper, zinc, and cadmium criteria at the state line, based on a hardness value of 50 ug/l which RIDEM has determined is appropriate for the Rhode Island portion of the Blackstone River, would be exceeded by 18%, 16%, and 5% respectively.

In addition, the Fact Sheet indicates that MassDEP has submitted revised site-specific water quality criteria for dissolved copper of 18.1 ug/l chronic and 25.7 ug/l acute. The Fact Sheet further indicates that if EPA approves these criteria, the limits in the final permit will be based on the revised criteria, the available dilution at 7Q10 flow, and the upstream concentration of copper under low flow conditions. Using these new criteria and EPA's monthly average permit limit calculation procedures, the copper concentration at the state line will be 17.6 ug/l, or 241% over the Rhode Island criteria of 5.2 ug/l. RIDEM strongly objects to establishment of permit limits using the site-specific criteria. The metals limits in the draft permit must ensure that Rhode Island water quality criteria will be met at the state line.

Response #D1: The assumption of pollution concentrations of zero above the UBWPAD discharge has a minor effect on the calculations because the UBWPAD discharge reflects over 90% of the receiving stream flow at the point of the discharge. In addition, the Rhode Island analysis of in-stream metals concentrations indicating exceedances of the Rhode Island criteria at the state line assumes that metals are 100% conservative in the water column. However the river flows for approximately 28 miles from the UBWPAD discharge to the state line. Analyses of metals in the receiving water conducted under near 7Q10 flow conditions indicate that there is a significant reduction in metals concentration and loads from the UBWPAD discharge to the state line. The average results for two low flow surveys – conducted in July and August 2001 – indicate that the

reduction in copper loading between the UBWPAD discharge and the state line is approximately 20%. The surveys showed an average reduction of cadmium of approximately 52%. Zinc was not included in these analyses. (The data from these surveys can be found in the Blackstone River Initiative, May 2001). These reductions were measured notwithstanding other point source discharges downstream from the UBWPAD facility. Taking into account the reduction of metals concentrations as the discharge flows downstream, we believe that the metals limits in the permit are sufficient to ensure that Rhode Island water quality standards are met at the state line.

With regard to the new Massachusetts site-specific criteria for copper, we concur that a significant increase in the draft permit limit based on the recently approved Massachusetts site-specific criteria would result in a reasonable potential to exceed the Rhode Island criteria at the state line. The revised chronic criterion for dissolved copper is 18.1 ug/l and the revised acute criterion for dissolved copper is 25.7 ug/l. Using a dilution factor of 1.1 (*see* Attachment B to the Fact Sheet), the new criteria would result in the following limits:

Monthly Average Limit = (chronic criterion) (dilution factor) = (18.1 ug/l)(1.1) = 19.9 ug/l
Daily Maximum Limit = (acute criterion) (dilution factor) = (25.7 ug/l)(1.1) = 28.3 ug/l

Even accounting for an approximate 20% reduction of copper concentration as the discharge flows downstream, it appears that copper concentrations would be well in excess of the Rhode Island water quality standard for copper of 5.2 ug/l at the state line. Accordingly, the final permit limits for copper are the same as in the draft permit. We note, however, that Rhode Island has also been evaluating development of a site-specific water quality criteria for copper. If such criteria are adopted by the State and approved by EPA, it may be appropriate to evaluate a modification of the copper limit.

Comment #D2: EPA should utilize effluent data collected as part of the bioassay testing to determine whether reasonable potential exists for the UBWPAD facility to cause or contribute to water quality violations for additional pollutants. Since EPA does not enter pollutant data collected as part of the bioassay testing into ICIS, RIDEM was unable to evaluate reasonable potential for the following pollutants: Chromium, lead, nickel and aluminum. At a minimum, based on typical lead levels seen in effluent from Rhode Island waste water treatment facilities, it appears that the UBWPAD would have "reasonable potential" for lead and therefore would require lead limits. To ensure that bioassay pollutant monitoring data is readily available for review, RIDEM requests that EPA list the pollutants monitored during the bioassay testing in Part I.A.1 of the permit.

Response #D2: We reviewed the bioassay reports from 2005 and 2006. The effluent chromium data are all below detection levels (detection levels ranged from 5 – 10 ug/l) and well below the applicable ambient criteria values in state standards. The effluent nickel data ranged from 5 – 20 ug/l which also is well below ambient criteria values. The effluent lead data are all below detection levels (detection levels ranged from 5 – 10 ug/l). However, the detection levels are higher than the ambient criteria values. Consequently,

we have included a monthly lead monitoring requirement in the final permit, with a quantification level of 0.5 ug/l, in order to be able to assess the need for a permit limit in a future permit action. Effluent aluminum levels are of concern. Effluent values ranged from 70 – 240 ug/l. As indicated in Response #A7, we have included a monthly monitoring requirement for aluminum in the final permit. A permit limit will be established if the data indicate a reasonable potential to exceed criteria.

We concur that requiring reporting of selected effluent data from bioassay testing on Discharge Monitoring Reports (in addition to submitting the information to EPA in a separate report) would make it easier to review these results. Copper, zinc, cadmium, aluminum and lead are all required to be monitored more frequently than quarterly. Accordingly, for these metals, the final permit requires that the effluent results from the WET tests must be included in the required discharge monitoring reports. For nickel, a quarterly monitoring requirement has been included in the final permit in order that effluent results for nickel from the WET tests are also included in the required discharge monitoring reports.

Comment #D3: Pursuant to footnote 10 of the permit, compliance with the phosphorus limitation is evaluated based on a 60-day rolling average. Use of a 60-day rolling average is not consistent with the Fact Sheet which refers to the limit as a monthly average. The permit does not provide an explanation of how it was determined that a 60-day average will ensure compliance with water quality standards. The fact sheet notes that the national ambient criteria recommendations range from 24 ug/l (based on the Ecoregional Nutrient Criteria) to 100 ug/l (based on the Gold Book Criteria) and the proposed limit will result in River concentrations just below 100 ug/l. Therefore, the permit should evaluate compliance based upon a 30-day average.

Response #D3: The reference to a monthly average limit in the Fact Sheet is an error and should have said "60-day rolling average."

Water quality-based limits that are developed to protect against chronic impacts such as eutrophication are typically established as monthly average limits. For the phosphorus limit in this permit, the 60-day rolling average limit possesses advantages over a monthly average limit: it provides the permittee with flexibility to deal with occasional, perhaps unavoidable, excursions above limits, while at the same time necessitating that such excursions are short-term and that optimum removal efficiencies are maintained overall. Short-term exceedances of the phosphorus limit are unlikely to result in a significant response in the receiving water relative to aquatic plant growth. Longer term exceedances capable of eliciting a response in plant growth would likely result in a violation of the rolling average limit.

The 60-day rolling average ensures the best possible performance on any given day since the results for that day will be averaged with the next 59 days to determine compliance. The uncertainty of future results that will be used for determining compliance dictates the best possible performance on any given day. Short-term excursions will have to be responded to quickly in order to ensure compliance. In contrast, a 30-day (monthly)

average limit can result in relaxed performance towards the end of the 30-day period if performance early on in the period exceeded what was necessary to meet the permit limits.

Comment #D4: The language in Footnote #7 is not consistent with other footnotes regarding minimum levels. It should be revised to read that "sample results less than 20 ug/l" rather than "sample results of 20 ug/l or less" shall be reported as zero on the DMR.

Response #D4: We concur and have made this change.

Comment #D5: Footnote #8, regarding the use and reporting of a total residual chlorine analyzer, is somewhat confusing since these analyzers are not approved under 40 CFR Part 136 for reporting on compliance with NPDES permits. EPA should consider using language similar to language included in the 2006 permit modification issued to the Newburyport Waste Water Treatment Facility which required continuous monitoring of TRC both before and after dechlorination of the effluent, as well as installation of a low TRC level alarm of the pre-dechlorination TRC analyzer.

Response #D5: Analytical methods (not sampling methods) are approved under 40 CFR Part 136. The final permit clarifies EPA's intent that the permittee use an analyzer that employs an EPA approved analytical method. In addition, while serving as a supplement to grab samples, the continuous monitor results are report-only. Continuous monitoring is required based on our concern that grab samples alone may not be adequate for determining compliance with the permit limits for such a fast acting toxicant as chlorine. The data reported from use of the continuous monitor will help to further evaluate the effectiveness of relying on grab samples. *See also* Response #F33.

We do not believe it is necessary to include all of the requirements in the Newburyport permit. The Newburyport requirements were due to concerns we had with both the effectiveness of the chlorine dosing system ***and*** with the adequacy and reliability of the dechlorination system at that particular facility. Our concern with the UBWPAD facility relates to the adequacy and reliability of the dechlorination system in light of flow fluctuations -- not with the effectiveness of the kill of fecal coliform bacteria. Accordingly, we have required continuous monitoring of the final effluent only.

We do believe, however, that some limited additional reporting is warranted to allow for better evaluation of the data submitted from the continuous chlorine monitor. A recent review of results reported by other facilities with a continuous chlorine monitoring requirement indicate that reporting this data via weekly charts alone does not provide enough detail to fully evaluate the continuous monitoring data. (These facilities include: Greenfield, Haverhill, Westfield and Plymouth). Consequently, in addition to submission of weekly charts, we have included in the final permit additional reporting requirements related to the data collected by the continuous monitor. These include the following: monthly maximum daily value, monthly average value, monthly maximum instantaneous value, and duration of time that recorded values were in excess of the permit limits.

PART E.

Comments were received from the Massachusetts Department of Environmental Protection (MassDEP) in a letter dated May 9, 2007. Because the permit is jointly issued by MassDEP and EPA, MassDEP limited its comments to the nitrogen limit which is a federal requirement only.

Comment #E1: The effluent limit for nitrogen in the draft permit is expressed as milligrams per liter. However, EPA permitting requirements at 40 CFR 122.45(f)(1) state that "All pollutants limited in permits shall have limitations, standards or prohibitions expressed in terms of mass."[2] The expressed results needed to reduce impairments to Narragansett Bay are a reduction in mass loading. While no Total Maximum Daily Load (TMDL) has been calculated to ascertain how to allocate load reductions, it is important to note that in the case of Long Island Sound, a TMDL has been completed for nitrogen that calls for a reduction in mass loading of nitrogen. In this case the discharge permits issued by Connecticut correctly contain only mass limits. Finally, mass limits for nitrogen in the UBWPAD discharge permit would give the facility the needed flexibility to manage the treatment plant while attaining strict effluent requirements and would encourage the facility to reduce its discharge volume, a notable goal unto itself. Consequently we believe that EPA should express any nitrogen limit in terms of a mass only limit.

Response #E1: An exception to 40 CFR 122.45(f)(1) applies when applicable standards and limitations are expressed in terms of other units of measurements (*see* 40 CFR 122.45(f)(1)(ii)). In this instance, we believe expression of limits on total nitrogen as concentration limits is necessary to meet Rhode Island's water quality standards. A key report underlying the proposed permit limits is the December 2004 report, *Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers*, completed by RIDEM. The report documents that the Seekonk River is the most nutrient impacted area of Narragansett Bay: current total nitrogen loads to the Seekonk River are 24 times higher than the total nitrogen load to all of Narragansett Bay on a per unit area basis. If the concentration limitations recommended by the report were used to establish mass limits using the design flows of the waste water treatment facilities, the Seekonk River would receive nitrogen loads of approximately 10 times higher than the Bay-wide loads per unit area. With the limitations established as concentration limits, at current flows the Seekonk River would receive nitrogen loads of approximately 6.5 times higher than the Bay wide load. *See, e.g.,* Evaluation of Nitrogen Target and WWTF Load Reductions for the Providence and Seekonk Rivers, RIDEM, December 2004 at 28. 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. We have established UBWPAD's limit at 5.0 mg/l in light of uncertainties in the physical model. As indicated in the Fact Sheet and in Response #F6, EPA believes that the limit cannot be any less stringent than 5.0 mg/l under all flow conditions and ensure that water quality standards will be met. Concentration based total nitrogen limits have also been

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[2] There are exceptions but they do not apply in this instance.

established in permits for other municipal treatment facilities in Massachusetts and Rhode Island that discharge to Narragansett Bay in order to achieve a nitrogen loading of approximately 6.5 times the Bay-wide loading. Further, at least in the short term, all these facilities will be discharging at flows approximating current flows, not design flows.[3] Setting the limits in terms of concentration will enable assessment of the response to a loading of 6.5 times the Bay-wide loading. Finally, we note that MassDEP did not raise this issue in the context of other recently issued permits containing nitrogen limits expressed as concentration limits, including Attleboro and North Attleboro.

Comment #E2: The Draft permit contains limits for nitrogen and phosphorus that the UBWPAD facility cannot currently attain and therefore a schedule for the facility to come into compliance with those limits is necessary. The nitrogen effluent limit is meant to address impairments for Rhode Island waters and we understand that the Rhode Island Water Quality Standards for surface waters do not allow for compliance schedules to be included in a discharge permit. However, the phosphorus effluent limit addresses impairments to waters within Massachusetts and the Massachusetts Water Quality Standards for surface waters do allow for compliance schedules to be included in discharge permits. Therefore we suggest that a schedule for compliance with the phosphorus limit be incorporated into the final permit. From an engineering and economic standpoint it only makes sense that when a compliance schedule for the nitrogen limit is established, the schedule should be consistent with the schedule outlined below that we are proposing for compliance with the phosphorus limit and we encourage EPA to follow this approach.

Below is MassDEP's suggested schedule for UBWPAD to attain the phosphorus effluent limits:

1. August 2009- Complete construction of ongoing upgrade
2. January 2011- initiate engineering evaluation of necessary upgrades to meet phosphorus effluent limit.
3. January 2012- complete engineering evaluation of necessary upgrades to meet phosphorus effluent limit.
4. January 2013- complete design of necessary upgrades to meet phosphorus effluent limit.
5. July 2013- initiate construction of necessary upgrades to meet phosphorus effluent limit.
6. December 2014- complete construction necessary upgrades to meet phosphorus effluent limit.
7. May 2015- obtain operational level to meet phosphorus effluent limit.

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[3] Recent annual average flows from the UBWPAD facility have been as follows: 34 mgd in 2002; 41 mgd in 2003; 36 mgd in 2004; 43 mgd in 2005; 35 mgd in 2006; and 30 mgd in 2007. While the flows demonstrate some variation, due at least in part to inflow/infiltration, flows are well below the permitted design flow and there is no upward trend.

Response #E2: Compliance schedules to meet water quality based effluent limits may be included in permits only when the state's water quality standards clearly authorize such schedules and where the limits are established to meet a water quality standard that is either newly adopted, revised or interpreted after July 1, 1977. As noted in the Fact Sheet supporting the draft permit, EPA recognizes that it is unlikely that UBWPAD will be able to comply immediately with the water quality based effluent limits proposed for total nitrogen and phosphorus. With regard to nitrogen, the limits on total nitrogen are necessary to ensure compliance with the Rhode Island Water Quality Standards, not Massachusetts Water Quality Standards. Rhode Island has not included provisions in its Water Quality Regulations for surface waters allowing for schedules in permits. Rhode Island's practice is to incorporate any appropriate schedules in an Administrative Compliance Order or a Consent Agreement. While Massachusetts Water Quality Standards do allow schedules in permits, the decision of whether to include a compliance schedule is discretionary. *See* 314 CMR 4.03(1)(b)(indicating that a "permit may, when appropriate, specify a schedule leading to compliance…").[4] Thus, even if only Massachusetts standards were applicable, the standards do not mandate that a schedule be included in the permit itself. In this matter, there are many overlapping issues related to the planning, design and construction of facilities to meet the limits for phosphorus and nitrogen. Indeed, as MassDEP notes in its comment, the schedules for nitrogen and phosphorus should be consistent from an engineering and economic standpoint. Compliance issues should be handled comprehensively based on the best information when more is known about such issues as modes of compliance and costs. In light of these overlapping issues and the fact that Rhode Island standards do not include provisions allowing for schedules, EPA intends to issue a compliance schedule to meet both the phosphorus and nitrogen limits in a separate administrative order.

There are many factors to be considered in establishing a schedule and these will be fully evaluated prior to establishing a schedule in an administrative order. Several commenters have noted the importance of ensuring compliance expeditiously (*see* Comment #A2 above). As stated in Response #A2, it is our intent to establish a compliance schedule that is reasonable in light of the necessary treatment upgrades but that, consistent with our regulations, also ensures compliance with the permit limits as soon as possible. It is also our intent to ensure that the UBWPAD achieves compliance with its total nitrogen limit in a similar time frame as the Rhode Island facilities achieve compliance with their nitrogen limits in order to facilitate the process of assessing the water quality response in Upper Narragansett Bay.

Comment #E3: Finally, MassDEP is concerned that the effluent limits for phosphorus and nitrogen were established without the benefit of scientific guidance provided by TMDLs and the water quality goals they establish. So as to avoid a large capital expenditure without the benefit of a TMDL, MassDEP is committed to completing a

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[4] The Mass. Standards referenced above are those adopted in 2007. By letter dated September 19, 2007, EPA approved certain modifications to the Mass. Standards, including modifications to the cited provision related to compliance schedules. Like the 1996 version of the Standards, however, the 2007 version provides that incorporation of schedules into permits is discretionary.

TMDL for phosphorus for the Blackstone River prior to the start of construction in the above schedule. We expect that EPA will require Rhode Island to similarly complete a nitrogen TMDL for Narragansett Bay.

Response #E3: The Clean Water Act requires states to complete TMDL analyses for receiving waters listed on the 303(d) list. We do not agree, however, with the suggestion that the establishment of water quality-based nutrient limits in this permit is dependent on completion of TMDLs. While water quality-based effluent limitations in NPDES permits must be "consistent with the assumptions and requirements of any *available* wasteload allocation," (emphasis added) 40 CFR §122.44(d)(1)(vii)(B), an approved TMDL is not a precondition to the issuance of an NPDES permit for discharges to an impaired segment nor is it a precondition for compliance with limits established in the permit. Where a TMDL does not exist, EPA cannot abdicate its responsibility to establish effluent limits necessary to achieve water quality standards and protect existing and designated uses of the receiving water. *See* 40 CFR 122.4(d) and 40 CFR 122.44(d)(1)(i). Until development and approval of TMDLs, EPA will base effluent limits for nutrients on its interpretation of the narrative nutrient criteria in approved water quality standards.

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 UBWPAD 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).

It is also important to note that phosphorus TMDLs are very difficult to develop and often take much longer than anticipated. For example, the recently completed draft

Nashua River phosphorus TMDL was more than five years overdue, and there are still many issues to be addressed before it can be approved by EPA. Simulating the fate and transport of phosphorus in river systems is very complex, due to the variety of types of aquatic plants utilizing and then releasing phosphorus after the plants die and decay. Likewise, a nitrogen TMDL for Narragansett Bay has proven to be very difficult to develop, as demonstrated by the extensive resources expended to date and the documented complexities of the Upper Narragansett Bay system. See, e.g., *Evaluation of Nitrogen Target and WWTF Load Reduction for the Providence and Seekonk Rivers,* RIDEM, December 2004 at page 1. *See also Plan for Managing Nutrient Loadings to Rhode Island Waters* (RI-DEM, February 1, 2005) at 3. As described in the RIDEM 2004 Evaluation, "It has recently been determined that due to problems encountered when modeling the interaction between deep channel and shallow flanks of these water bodies, the mass transport component of the system cannot be successfully calibrated and validated. This problem has been encountered in other estuaries and has not been resolved with state of the art numerical solution techniques. 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."

While well-developed TMDLs for the Blackstone River and Narragansett Bay may be very useful in determining what, if any further reductions of phosphorus and nitrogen may be necessary, the Clean Water Act does not allow delay until completion of a TMDL. This is particularly important given the extensive and documented adverse impacts of cultural eutrophication in the Blackstone River and in Upper Narragansett Bay. *See also* Response #A8, and Response #F5, #F6 and #F9 below.[5] In the time that RIDEM has been attempting to develop a dynamic model, for instance, the Seekonk/Providence River system and waters downstream have continued to suffer from the effects of severe cultural eutrophication, including occasional fish kills. *See* www.dem.ri.gov/bart/fishkill.htm. The approach proposed by the commenter – to await the conclusion of complex TMDLs that may take years to complete – would forestall water quality improvements and would be inconsistent with EPA's regulatory obligations. *See also* Response #F47(a)(3)(i)-(iii).

PART F.

Comments were received from the Upper Blackstone River Water Pollution Abatement District in a letter dated May 24, 2007. The letter includes two attachments: Attachment A (Technical Issues/Comments) prepared by CDM and Attachment B (Legal and Policy Issues/Comments) prepared by counsel. The comments are repeated here in their entirety.

Comments raised in UBWPAD's cover letter dated May 24, 2007 are addressed below.

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[5] EPA's response to the comments above are applicable to comments raised by participants at the public hearing urging delay pending TMDLs or further scientific study.

Comment #F1: The Upper Blackstone facility treats waste water from Worcester and eight surrounding communities. The District and its members do not question the intent or the noble goal of restoring the Blackstone River to a place where we can safely swim and fish. We embrace it. We want a clean Blackstone River and a healthy Narragansett Bay. But we want to achieve these conditions using common sense with careful planning, guided by proven science and based on sustainable and cost-effective engineering. To that end, we are sponsoring development of an advanced model of the Blackstone River that will be capable of broad use in evaluating the condition of the River and in assessing management options. Through development of the model we are also supporting work by the U.S. Army Corps of Engineers to preserve and develop habitat along the River, as well as River assessments being completed by U.S. Geological Survey and DEP. We want the benefits of our investments to justify the costs that will burden our rate payers (not the federal or state governments that impose these mandates).

Response #F1: While we recognize the investment made by UBWPAD in water quality modeling, permit issuance cannot await conclusion of these modeling efforts. Where EPA determines that a discharge of a pollutant causes or contributes to an excursion above any State water quality standard, including State narrative criteria for water quality, EPA must include an effluent limitation in the permit for that pollutant. *See also* Response #E3, Response #F6 and Response #F47(a)(3)(i)-(iii) (relative to arguments that this permit await the completion of TMDLs or other studies). If the results of UBWPAD's efforts yields information indicating that any final effluent limit is more or less stringent than necessary to attain water quality standards, a permit modification can be pursued. *See* 40 CFR §122.62. *See also* Response #F43 for additional discussion of the timing of this permit issuance and UBWPAD's modeling efforts.

We recognize that improvements to meet the new limits will increase costs. Cost considerations or technological feasibility, however, are not permissible factors in **setting** water quality based effluent limits. *United States Steel Corp. v. Train*, 556 F. 2d 822, 838 (7th Cir. 1977); *see also In re City of Moscow*, 10 E.A.D. 135, 168 (EAB 2001). Such factors can be taken into account, however, in establishing a compliance schedule. In addition, under certain circumstances, permittees can conduct an analysis of affordability issues for the purposes of determining whether a designated use cannot be obtained or for obtaining a variance. In determining affordability for such an analysis, EPA uses *Interim Economic Guidance for Water Quality Standards,* EPA-823-B-95-002 (March 1995). *See also* Massachusetts Surface Water Quality Standards, 314 CMR 4.03(4); Rhode Island Water Quality Regulations, Rules 19 and 20; 40 CFR §131.10(g). *See also* Response #A9 and Response #F2 and #F4 below for more discussion on the affordability evaluation.

The need for and benefits of the nutrient limits are detailed below. *See, e.g*, Responses #F5, #F6, #F9, #F18, #F51.

Comment #F2: The District believes that the draft discharge permit is not supported by current science, and it is not justified for several reasons. It is an expensive order that fails to consider $180 million in ongoing capital improvements at the District, and as

such imposes an unfair burden on District ratepayers, many of them members of Environmental Justice populations. Without evidence, it will require costly treatment changes that are not environmentally sustainable.

Response #F2: There is an extensive amount of science documenting the need for the permit limits as outlined in the Fact Sheet and detailed throughout this Response to Comments. Further, the upgrades currently being undertaken to meet the limits in the expired permit will be unable to achieve limits that are necessary to ensure attainment of water quality standards. *See* Response #F5. As noted above in Response #F1, EPA can take cost into consideration in establishing a compliance schedule and applicable regulations include a process to evaluate whether, under certain circumstances, relief from requirements to meet water quality standards may be available. While upgrades necessary to meet the new limits will result in increased costs, UBWPAD has not provided the basis for its cost estimates (which vary in its oral and written comments from $100 to $200 million). It is premature to evaluate costs until UBWPAD has had the opportunity to evaluate alternative treatment technologies to meet the limits. In establishing a schedule to meet the new permit limits, EPA will include a reasonable amount of time for UBWPAD to conduct facilities planning including an alternatives evaluation. When UBWPAD has a better understanding of the most cost effective treatment options, we can work with UBWPAD to evaluate the associated economic impacts and the availability of any relief from meeting permit limits. Such an evaluation includes consideration of the timing of design and construction, how the project will be funded, and the resulting impact on ratepayers.

We are aware of Environmental Justice populations within the UBWPAD sewer area. In addition, we note that for these communities and the significant Environmental Justice populations downstream from the UBWPAD discharge,[6] the use and enjoyment of waters has been adversely affected by the associated water quality degradation. While we are mindful of cost impacts to communities in the UBWPAD sewer area, we also are mindful that the Environmental Justice populations in these communities are affected by water quality degradation to the point that designated uses such as swimming and fishing have been impaired.

Comment #F3: The permit imposes legal and administrative burdens on the District for management of member sewers through the co-permittee process that are not allowed in our enabling legislation and that the District has no authority to accept.

Response #F3: The co-permittee language makes the co-permittees directly responsible for controlling flow and maintaining their own sewer systems. *See also* Response #F45.

Comment #F4: The District is financed by each of our member communities based on use, with Worcester paying nearly 90 percent of our costs. For the City of Worcester, the current $180 million upgrade has increased treatment costs more than 300 percent in four

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[6] See GIS map dated October 24, 2007 depicting Environmental Justice populations among the communities that discharge to UBWPAD and among communities downstream of the discharge.

years - and more cost increases will come to finance remaining construction. As a result, the city's sewer rates have more than doubled in four years. Median household income in Worcester is $37,000, 35% below the state's median. To impose further costly requirements on Worcester and our other member communities without justification is simply wrong.

Response #F4: *See* Response #A9, #F1 and #F2 as to the role of cost in the process of establishing water quality-based effluent limitations.

We understand that rates have increased and the importance of this issue to residents and public officials in Worcester and the UBWPAD service area. One of the reasons that Worcester residents have experienced recent increases is that they have been paying below average rates for many years. The UBWPAD facility went on line in 1976. The first major upgrades ever undertaken are those currently ongoing, and one of the main objectives was to bring the aging facility up to standards. In 2006, the consulting firm, Tighe & Bond, compiled statewide annual sewer use rates for a typical household. The sewer use rate for the typical household in Worcester was $338 while the statewide average was $485. The water quality of the Blackstone River is clearly not attaining water quality standards, in part due to the UBWPAD discharge. Again, if UBWPAD believes the added costs of treatment necessary to meet the new limits will be unaffordable under EPA's guidelines, the appropriate course is to pursue such a demonstration.

Finally, it is worth noting that other communities are also required to reduce nutrients to address the downstream water quality impairments. *See* Comment #A9. The predominant sources of the nutrient loading in the Providence and Seekonk Rivers are municipal wastewater treatment facilities in Rhode Island and Massachusetts. The State of Rhode Island has recently reissued several Rhode Island Pollutant Discharge Elimination System (RIPDES) permits for POTWs which discharge to the Providence and Seekonk Rivers. These permits include limitations on the discharge of total nitrogen in order to address the cultural eutrophication in these waters and Narragansett Bay. There are several municipal POTWs in Massachusetts, including UBWPAD, which discharge nitrogen into tributaries of the Seekonk and Providence Rivers. To date, EPA has issued final permits with nitrogen and phosphorus limits to North Attleborough and Attleboro, Massachusetts. *See* Response #F47(b)(iv) for additional detail on these other permits.

Comment #F5: In 2001, the District and EPA negotiated a discharge limit for phosphorus (P) of 0.75 milligrams per liter (mg/L) in summer; with no limit on total nitrogen (TN). EPA based these limits on its river model, even though its own Science Advisory Board recommended against doing so. This model remains EPA's only scientific basis for effluent limits on the river today. EPA determined then that these were the limits needed to improve conditions in the Blackstone and to benefit Narragansett Bay (40 miles away). The current proposal lowers the P limit to 0.1 mg/L in summer and to 1.0 mg/L in winter; and TN is set at 5 mg/L in summer. Our new facilities will achieve less than 0.75 mg/L P and less than 8.0 mg/L TN year-round. We

will be approaching the 40-50% summer TN reduction legislated by the Rhode Island Governor's Special Committee by 2009. We note that this goal was set without benefit of having set numerical water quality standards, or completion of a Total Maximum Daily Load (TMDL) assessment as required in EPA regulations.

Response #F5: In the draft 2001 permit, EPA established a phosphorus limit of 0.75 mg/l based on a waste load allocation for achieving minimum dissolved oxygen criteria [*Blackstone River Watershed Dissolved Oxygen Waste Load Allocation for Massachusetts and Rhode Island* (November 1997)]. A final permit was subsequently issued with the 0.75 mg/l phosphorus limit. The District appealed the permit and a settlement of the appeal was negotiated that left the phosphorus limit unchanged.

It is well documented in the 1997 Dissolved Oxygen Waste Load Allocation, the 1999 Response to Comments for the expired permit, and in the Fact Sheet for the current draft permit that the 0.75 mg/l total phosphorus limit was based on meeting dissolved oxygen criteria in the Blackstone River only and did not address eutrophication related impairments in either the Blackstone River or Narragansett Bay. In its response to UBWPAD's comments on the expired permit, EPA cautioned that future permit limits might include more stringent phosphorus limits if warranted by eutrophication impacts. As documented in the Fact Sheet for the current permit, the 0.75 mg/l limit does not ensure that eutrophication related criteria will be met in the Blackstone River and the addition of a total nitrogen limit is necessary to control eutrophication in Narragansett Bay. With regard to nitrogen, the 1998 Fact Sheet for the expired permit noted that the Blackstone River Initiative and the Narragansett Bay studies have shown that dry weather loadings of nitrogen to Narragansett Bay are significant and may be contributing to excessive productivity and DO concerns in the Bay. The Fact Sheet for the expired permit further stated that total nitrogen limits might be recommended in future permits and urged UBWPAD to consider denitrification capability at its treatment plant during future facility planning efforts.

The admonitions regarding more stringent nutrient limits in the administrative record for the expired permit reflect EPA's growing awareness of nutrient-related issues and commitment to resolve those issues. Nutrients (nitrogen and phosphorus) are one of the leading causes of water quality impairment in our Nation's rivers, lakes and estuaries. Virtually every State and Territory is impacted by nutrient-related degradation of our waterways. Massachusetts has listed Clean Water Act Section 303(d) nutrient-related impairments for numerous water bodies. Over the last nine years, EPA has taken a number of steps to provide leadership and to work in partnership with states, territories and authorized tribes to address nutrient impairments. EPA issued a National Strategy for Development of Nutrient Criteria in June 1998, and followed with a November 2001 national action plan for the development and establishment of numeric nutrient criteria. EPA published technical guidance for developing criteria for lakes and reservoirs in May 2000, rivers and streams in June 2000, and estuaries and coastal waters in October 2001. EPA also published recommended nutrient criteria for most streams and lakes in 2001.

In the facility planning conducted for the current upgrade, UBWPAD considered the possibility of more stringent effluent limits for nutrients than required by the expired permit. We understand that UBWPAD has designed treatment consistent with achieving total nitrogen levels of 8 to 10 mg/l and consistent with treatment that would be necessary to achieve a total phosphorus level of 0.2 mg/l. While UBWPAD may achieve even better performance, the current design will not be able to achieve the 0.1 mg/l limit for total phosphorus or the 5 mg/l limit for total nitrogen.

The scientific basis for the nutrient limits in the new permit is documented in the Fact Sheet and in this response to comments. The permit limits are not based on the 1997 Dissolved Oxygen Waste Load Allocation or on Rhode Island legislation requiring reduction in nitrogen loading at point sources in that State [R.I. Gen. Laws § 46-12-2]. *See also* Response #F43 below.

In addition, we disagree with the suggestions in the comment that numeric water quality criteria and a TMDL are necessary in order for EPA to establish water quality-based effluent limits. *See also* Responses #A3 and #E3.

Finally, we disagree with UBWPAD's characterization of the comments made by EPA's Science Advisory Board ("SAB") regarding the dissolved oxygen model developed in conjunction with the Blackstone River Initiative. To promote interstate assessment and cleanup of the Blackstone River, EPA established the Blackstone River Initiative (BRI) in 1991. The BRI included an intensive environmental sampling and assessment program to describe interstate water quality, biology and toxicity in the river system under both dry and wet weather conditions, and to develop a wasteload allocation model and a toxics model to predict impacts of contaminant loadings to the system. It is one of several sources of data documenting the severe eutrophication in the Blackstone River and the significance of the nitrogen loadings to Narragansett Bay from the Blackstone River. The University of Rhode Island, MassDEP, and RIDEM all participated. The Region requested that the SAB review the results of the BRI. In no way did the SAB recommend that the use of the dissolved oxygen model be restricted in establishing effluent limits in NPDES permits. To the contrary, the SAB noted that the model was specifically suited for modeling BOD/DO in rivers and streams. The SAB did recommend some additional calibration to "fine tune" the model so that it could be used with more confidence under flow conditions other than dry weather. In addition, EPA and the other participants developed a response to the SAB's report, which fully addressed all points (including those related to the dissolved oxygen model) and was posted on the SAB website. [Letter dated February 4, 1999 from John P. DeVillars, Regional Administrator to Drs. Joan M. Daisey and Dr. Mark A. Harwell.] In any event, UBWPAD's comment is irrelevant to establishment of nutrient limits in this permit; as detailed above, EPA did not use the 1997 Dissolved Oxygen model as the basis for the phosphorus or nitrogen limits in the current permit.

Comment #F6: There is no defensible evidence that the proposed TN limits will improve the water quality in the Blackstone River or Narragansett Bay. DEP, the Narragansett Bay Commission and other Rhode Island dischargers all have challenged

the science of the new nitrogen limit. In its comments on analysis conducted by Rhode Island Department of Environmental Management, DEP said that the limits were based on incomplete science at best and that it was more appropriate for the District to complete its ongoing upgrades and analyze what needs to be done next. In addition, DEP is undertaking studies with USGS of sediment transport in the Blackstone River to assess nitrogen attenuation and DEP is also studying the cost of TN compliance to better understand the financial impact of plant upgrades.

While we know some of potential negative impacts, we don't know what the benefits will be from the new limits. The District believes that our ratepayers, many of them members of Environmental Justice populations – should know if another $200 million to improve sewers and build the plant, plus an additional $3.7 million to operate it annually will provide a commensurate or discernable benefit.

Response #F6: 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 Narragansett Bay. Excessive nitrogen loadings are significantly impairing water quality criteria and uses in Narragansett Bay. Impairments include low dissolved oxygen, which is so severe that it causes occasional fish kills, and dramatic loss of eel grass (which provides important spawning, nursery, foraging and refuge habitat for many fish and invertebrate species, including commercially important species). The *Governor's Narragansett Bay and Watershed Planning Commission, Nutrient and Bacteria Pollution Panel, Initial Report* (March 3, 2004) summarizes and references many of the studies and reports that have evaluated these impacts and loadings to the Bay.

The Blackstone River discharges directly into the upper part of the Seekonk River, which is the most severely impaired section of Narragansett Bay. On a per unit area basis, current total nitrogen loads to the Seekonk River are 24 times higher than the nitrogen load to Narragansett Bay as a whole. The predominant sources of the nitrogen loading are municipal wastewater treatment facilities in Rhode Island and Massachusetts. As reflected in the Blackstone River Initiative and RIDEM's 2004 study (*Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers*, RIDEM, December 2004), the UBWPAD is the dominant source of nitrogen loading to the Blackstone River. The UBWPAD facility represents approximately 70% of the municipal wastewater flow to the Blackstone River.

The nitrogen limit in this permit is based upon an application of the requirements of the federal Clean Water Act and has been imposed to meet Rhode Island's water quality standards. 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* any downstream affected state. Rhode Island, like most states, has not yet developed statewide numeric total nitrogen criteria or numeric response variable criteria, nor has Rhode Island developed site-specific numeric criteria for total nitrogen or response variable 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).

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's regulations direct the Agency (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.[7]

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

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[7] 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).

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 – 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.[8] 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 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. 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. *See* Response #F18A for additional detail on EPA's use of the MERL experiments and water quality data in establishing the nitrogen limits in the permit.

The CWA requires EPA to establish water quality-based effluent limits that ensure that standards are met. The limits in this permit are based on the available science, which in this case is quite extensive. EPA cannot avoid its responsibility to establish water quality-based limits simply because further studies are underway, especially since there is no reasonable likelihood that a less stringent limit will meet standards. In making its decision to move forward with nitrogen limits at this time, 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

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

suffer from the effects of severe cultural eutrophication. These adverse affects have included fish kills (see www.dem.ri.gov/bart/fishkill.htm).

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 a nitrogen limit on UBWPAD's discharge based on information currently available to EPA. EPA also notes that the permit was last issued to the facility in 2001, has expired, and has been administratively continued for several years.

The ongoing upgrades at the UBWPAD are designed to achieve total nitrogen levels of approximately 8.0 - 10.0 mg/l. While actual performance might result in lower levels, the upgrade will not achieve 5.0 mg/l and, therefore, will not ensure water quality standards will be met. While we welcome further analyses of sediment transport in the Blackstone River, the current evidence indicates that attenuation of nitrogen in the Blackstone River is small and further reductions in phosphorus-driven eutrophication levels in the Blackstone are likely to result in even lower nitrogen attenuation rates in the future. *See also* Response #F17 below.

The loading reduction targeted in the RIDEM December 2004 report represents a significant reduction and reflects an appropriate and reasonable determination of water quality-based limits necessary to achieve water quality standards. The reductions required at the UBWPAD facility through this permit in conjunction with reductions at other facilities will have substantial environmental benefits, including significant reductions in algal growth and associated dissolved oxygen impairments. The reductions and anticipated improvements are necessary to address the ongoing severe impairments to the marine fish community and to restore the recreational use of Narragansett Bay.

In establishing the nitrogen limit in the permit, EPA took into account uncertainties in extrapolating the physical model to a complex, natural setting such as Upper Narragansett Bay. *See* Response #F18A for additional detail on this issue. The uncertainties in extrapolating the physical model may ultimately mean that additional nitrogen reductions are needed, but there is no realistic likelihood that water quality standards could be met with a less stringent nitrogen limit than 5.0 mg/l. With the limitations established as a concentration limit of 5.0 mg/l, at current flows, the Seekonk River would receive nitrogen loads of approximately 6.5 times higher than the Bay-wide load. In the event future permit issuances result in an even lower nitrogen limit, the technologies to reduce beyond 5 mg/l can be added to the facilities installed to meet the requirements in this permit. We encourage UBWPAD to evaluate compatibility of add-on technologies in selecting the treatment necessary to achieve the 5 mg/l limit.

With regard to the proceedings related to RIDEM's issuance of permits to facilities in Rhode Island, RIDEM prepared a response to significant comments as part of the referenced permitting proceedings. In addition, the appeals in NBC Fields Point, NBC Bucklin Point and East Providence have all been resolved with final permits including the proposed nitrogen limits – 5.0 mg/l for the NBC facilities and 8.0 mg/l for the East

Providence facility. RIDEM recently resolved the appeal of the Woonsocket permit with an agreement that the facility will meet a nitrogen limit of 3.0 mg/l. *See* Consent Agreement, In re: AAD No. 05-004/WRA dated June 27, 2008.

As to UBWPAD's cost estimates (which range in oral and written comments from $100 to $200 million), EPA has not seen the basis for these estimates and cannot evaluate their validity. Further, implicit in UBWPAD's comment is the notion that, in establishing water quality-based effluent limits, EPA must conduct a cost-benefit analysis and evaluate the costs of treatment against quantified benefits to the receiving water. As noted above, EPA cannot set water quality-based effluent limits based on the cost of treatment. *See* Response #A9. Relief is available where a permittee can demonstrate that costs warrant a variance or modification of the state's water quality standards. In addition, it is EPA's intent to establish a reasonable schedule for UBWPAD to come into compliance with the new nutrient limits. *See* Response #E2.

Comment #F7: The timing of the permit revisions is premature and illogical. Given that the District is scheduled to complete its current upgrade project in two years, it makes sense to operate the new plant for two full seasons beyond the completion date to assess its capabilities. At that time we will know what levels of P and TN the new plant can achieve. Other facilities along the river and around Narragansett Bay are also being upgraded and it makes sense to see how the river fares with all of these upgrades before imposing further mandates. Moreover, by December [2007], the results from a new model of the river developed by University of Massachusetts School of Engineering and the District's environmental consultants, CDM, will be known. The model, together with the results obtained by operating the improved plant, will provide the needed science to guide rational decision making – and complete required TMDLs. It would make sense to continue under the terms of the current permit until we have all had a chance to assess these results.

The District believes that a more common sense approach to establishing discharge limits for the Blackstone River is to complete the new river model; finish the current wastewater treatment improvements; optimize and fine-tune the new facilities; and monitor the results for two years. In 2012 we could review and revise river management decisions as needed based on science, experience and a true cost-benefit analysis. If we find that more stringent effluent limits than the new plant can achieve are needed to make a proven difference in water quality, the District can then undertake reasonable upgrades. We think this common sense cost-effective approach can be accomplished more cooperatively and with equal expedience to the alternative approach of drawn out court battles.

Response #F7: The CWA and EPA's regulations require that permits be issued for fixed periods of time not to exceed five years. 33 U.S.C. §§1342(a)(3) and (b)(1)(B); 40 CFR §122.46(a). EPA revisits all aspects of NPDES permits when the term expires, consistent with the CWA's goal of restoring and maintaining the chemical, physical, and biological integrity of the Nation's waters. The clear intent of the statute is to ensure that permit

requirements are updated on a regular basis rather than left in effect, unexamined and unchanged for long periods of time.

The facilities planning for the current upgrade makes clear that these upgrades will not achieve the new permit limits of 5 mg/l for total nitrogen and 0.1 mg/l for total phosphorus and, therefore, cannot ensure attainment of water quality standards. The UBWPAD is the dominant source of nitrogen to the receiving waters. The UBWPAD is approximately 70 percent of the municipal wastewater flow to the Blackstone River based on its permitted design flow of 56 MGD and a total permitted municipal wastewater flow to the Blackstone River of 80.4 MGD. The loadings data utilized in RIDEM's 2004 study indicate that UBWPAD represented approximately 64% of the nitrogen load discharged to the Blackstone River from municipal wastewater treatment facilities for the period of time considered in the study. After accounting for attenuation, UBWPAD is also the dominant source of nitrogen loadings from the Blackstone River into the Seekonk River. *See* Response #F17. In addition, the Blackstone River discharges into the headwaters of the Seekonk River, where the greatest impairments in the Narragansett Bay Basin have been measured.

As reflected in the Blackstone River Initiative and other reports cited in the Fact Sheet, UBWPAD is also the dominant source of phosphorus loadings to the Blackstone River and the Blackstone River demonstrates substantial phosphorus-driven eutrophication. *See* Response #F9 and #F10 below.

Water quality standards will not be met if UBWPAD does not further reduce discharges of nitrogen and phosphorus beyond treatment planned as part of the current upgrade. *See* UBWPAD Regional Wastewater Treatment Facilities Plan (May 2001). Under these circumstances, the CWA and EPA's regulations mandate that EPA establish water quality-based effluent limitations to control discharges of nutrients. It is not appropriate to adopt a "wait and see" approach following the current upgrades, because there is no reasonable likelihood that water quality standards relative to eutrophication will be achieved with less stringent limits.

UBWPAD's concerns regarding the timing of permit issuance as it relates to the ongoing upgrades are more appropriately addressed through compliance scheduling, rather than through delay of permit issuance. For example, it may be appropriate to allow some period of time to operate the new plant before making a final decision on all aspects of additional treatment facilities to enable UBWPAD and its consultants to determine the most cost-effective technologies for achieving the new limits. (With regard to the specifics of establishing the compliance schedules, *see also* Response #E2 and Response #F21 below).

With reference to UBWPAD's modeling efforts, if the model being developed for the UBWPAD, together with any other relevant evidence, makes it clear that alternative limits will result in attainment of water quality standards, EPA will modify the permit accordingly. In order to be used for development of water quality based effluent phosphorus limits, UBWPAD's model needs to be calibrated and verified to 7Q10 flow

conditions. In addition, use of any model to establish phosphorus limits must also ensure that both Massachusetts' and Rhode Island's relevant water quality standards are met. If the intent is to also simulate the role of non-point sources of phosphorus, the model must be able to not only simulate non-point source phosphorus loadings but also must be able to simulate the fate of the phosphorus in the river system as it is taken up by a variety of aquatic plants and then released as the plants die and undergo the decay process. *See also* Response #F1 and Response #F43 below. As detailed above, phosphorus models and TMDLs can be very difficult to develop. *See* Response #E3.

Relative to nitrogen limits, we note that the model will not simulate Narragansett Bay water quality and thus will not be able to evaluate the full range of nitrogen sources, the responses to the nitrogen sources, or reductions necessary to achieve water quality standards. The model may, however, provide further information on attenuation rates of nitrogen in the Blackstone River. While much is currently known relative to attenuation rates (*see* Response #F17 below), EPA will evaluate any significant new information relative to attenuation to determine if a permit modification is appropriate.

Comment #F8: The facilities currently being built by the District have predictable costs that are based on reliable treatment processes. If new facilities are to be built to achieve the latest proposed limits, the treatment processes will not be as sustainable, using large quantities of chemicals (including an energy source such as methanol) and about 20 percent more electricity. Chemical addition will increase sludge production, and since the inert chemicals in the sludge are more difficult to burn, the District will have to use more fuel for incineration, increasing air emissions, and landfill volume needed to dispose of more ash. We wonder if these negative environmental consequences were fully evaluated in assessing the draft permit limits.

Response #F8: We are supportive of UBWPAD's efforts to plan and design the most environmentally sustainable treatment processes necessary to meet the effluent limits. These considerations, however, come into play in selection of the appropriate treatment technologies – not in setting water quality-based effluent limits. As noted above, cost and technological considerations are not factors in establishment of water quality-based limits. *See* Response #A9.

The improved treatment will result in additional sludge being generated and the most cost-effective and environmentally sustainable method of managing sludge should be carefully considered as part of facilities planning. There are treatment processes that can be pursued that minimize the need for chemical addition and/or minimize the chemicals in the discharge and the sludge. In light of heightened scrutiny on energy costs and advances in engineering designs, we would expect the current and future upgrades to be much more energy efficient than current or previous designs.

We also believe it is important to examine energy efficiency holistically, across a utility's management and operations. *See also* Response #52. Examination of current incineration processes presents one opportunity for improving efficiency and sustainability. Another opportunity for gains in energy efficiency at UBWPAD is

through control of flow volumes to the treatment facility. A large percentage of the total annual flow volume reaching the UBWPAD is the result of storm water and groundwater entering separate sewer pipes and, to a lesser extent, combined sewer flows. UBWPAD estimates that 15 million gallons per day of the total current average flow to the facility of 37 million gallons per day is inflow/infiltration. *See* NPDES Permit Application. The estimated CSO flow to the treatment plant is currently about 3 million gallons per day. *See* CSO Phase II CSO Long-Term Control Plan Report (February 2004). Pumping and treating all of this flow is a very energy-intensive process. A more aggressive infiltration/inflow control program should be an important component of an overall plan to reduce energy consumption. In addition, further sewer separation within Worcester's combined sewer service area may be appropriate to reconsider in light of the energy and chemical use concerns related with pumping and treating peak flows that cannot be treated at the Quinsigamond CSO Facility.

EPA is very supportive of efforts to reduce power use and associated costs at wastewater treatment facilities. Energy is the largest expense for many facilities and one of the top three expenses at almost all of them. By working to reduce the amount of energy these facilities use without compromising the quality of treatment, we can help to save public money and protect the environment at the same time. We applaud UBWPAD for participating in a MassDEP pilot to reduce energy use at wastewater treatment facilities. EPA staff assisted in the initial energy benchmarking of the facility through the use of EPA's new ENERGYSTAR® benchmarking tool. We look forward to continuing to support MassDEP and UBWPAD in efforts to save energy and to realize the associated financial and environmental benefits.

Comments raised in Attachment A (Technical Issues/Comments) prepared by CDM on behalf of UBWPAD are addressed below.

Comment #F9: The information cited in the Fact Sheet to create the impression that the proposed permit limits are justified is erroneously applied. The Fact Sheet states:

> The impacts associated with the excessive loading of phosphorus are documented in the following reports: *Blackstone River Initiative Report*, May 2001 (EPA New England); *Blackstone River Basin 1998 Water Quality Assessment Report* (Mass DEP); *Blackstone River Watershed 2003 DWM Water Quality Monitoring Data*, May 2005 (Mass DEP); *Phase I: Water Quality Evaluation and Modeling of the Massachusetts Blackstone River, Draft - March 2004* (US Army Corps of Engineers (http://www.nae.usace.army.mil/projects/ma/blackstone/wqe.htm); and Blackstone River Watershed 2003 Biological Assessment, April 4, 2006 (Mass DEP), as well as in the Massachusetts and Rhode Island 303(d) Lists of Impaired Waters as discussed above.

But, as the EPA well knows, the District is in the process of constructing facilities to comply with the phosphorus limit contained in the 2001 permit, according to a schedule agreed to by the EPA. Thus the "excessive phosphorus levels" alluded to by the EPA that led to the conditions cited in the Fact Sheet are not the conditions that will exist after

the completion of the ongoing construction, but rather reflect the same loadings that compelled the implementation of the 0.75 mg/l phosphorus limitation. In that respect, it was misleading to suggest that the referenced information compelled the draft limits. Moreover, the cited reports contain no quantitative data on the occurrence of macrophytes and or periphyton. Development of quantitative data with respect to these two metrics is a necessary precursor to the development of programs to reduce their existence to acceptable levels.

Response #F9: EPA is aware of the ongoing upgrade and discusses it in the Fact Sheet. As explained in the Fact Sheet, the limit of 0.75 mg/l in the expired permit was established to address dissolved oxygen criteria only. *See* Response #F5 for a description of the establishment of the limit in the expired permit. The reference to excessive phosphorus loadings is made relative to phosphorus loadings that would be necessary to control cultural eutrophication. As documented in the Fact Sheet for this permit issuance, federal recommended criteria and guidance documents clearly indicate that a limit of 0.75 mg/l would result in instream concentration far in excess of levels that would be necessary to control cultural eutrophication.

The most recent data set collected under low flow conditions by MassDEP (August 28, 2003) indicates that UBWPAD was discharging total phosphorus at a level very close to the current permit limit of 0.75 mg/l (August monthly average discharge was 0.8 mg/l). At the first station downstream of the UBWPAD discharge, instream aquatic vegetation was described as being "extremely abundant, covering virtually the entire river bottom and dominated by rooted submergent macrophytes (coontail, Ceratophyllum sp.; waterweed, elodea sp.; pondweed, Potamogeton crispus). Slight turbidity in the water column was noted during sampling. A luxuriant algal community was also observed, with green filamentous algae attached to submergent vegetation and a brown flock covering much of the rocky substrates."

This qualitative/quantitative data on macrophytes and periphyton is a clear indicator of cultural eutrophication and reinforces the conclusions based on discharge concentrations of phosphorus and appropriate instream phosphorus concentration targets. The *Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition* (EPA 1999) states that > 40% cover by macroalgae is an indication of nutrient or organic enrichment.

See also Response #F48 for additional detail regarding EPA's establishment of the phosphorus limit in this permit.

Comment #F10: The permit references The 1986 Quality Criteria for Water as the source document for its recommend instream concentration. The 1986 document is clear that there is no national criteria for control of Phosphorus. (*See* Attachment Al to this document.) It begins by saying "Although a total phosphorus criterion to control nuisance aquatic growths is not presented, it is believed that the following rationale to support such a criterion, which currently is evolving, should be considered." (Gold Book, page 240 of 477). It goes on to describe various recommendations and

observations of Mackenthun and Hitchinson concerning tolerable levels of phosphorus in receiving waters. It also suggests that:

> The majority of the Nation's eutrophication problems are associated with lakes or reservoirs and currently there are more data to support the establishment of a limiting phosphorus level in those waters than in streams or rivers that do not directly impact such water. There are natural conditions, also, that would dictate the consideration of either a more or less stringent phosphorus level. Eutrophication problems may occur in waters where the phosphorus concentration is less than that indicated above and, obviously, such waters would need more stringent nutrient limits. *Likewise there are those waters within the Nation where phosphorus is not now a limiting nutrient and where the need for phosphorus limit is substantially diminished.* Such conditions are described in the last paragraph of this rationale. (Gold Book, page 241 of 477)

The last paragraph contains a number of caveats that need to somehow be taken into account in the development of the criterion. The factors include the following

1. Naturally occurring phenomena may limit the development of plant nuisances.

2. Technological or cost effective limitations may help control introduced pollutants.

3. Waters may be highly laden with natural silts or colors which reduce the penetration of sunlight needed for plant photosynthesis.

4. Some waters morphometric features of steep banks, great depth, and substantial flows contribute to a history of no plant problems.

5. Waters may be managed primarily for waterfowl or other wildlife.

6. In some waters a nutrient other than phosphorus is limiting to plant growth: the level and nature of such limiting nutrient would not be expected to increase to an extent that would influence eutrophication.

7. In some waters phosphorus control cannot be sufficiently effective under present technology to make phosphorus the limiting nutrient. (Gold Book, page 243 of 477)

Thus, although there was no criterion established in the 1986 document, and the rationale was only evolving and proposed for consideration, the EPA elected to ignore the caveats about its use. This was improper because, as discussed below the EPA had the tools to make substantive assessments that could incorporate these caveats, and which would not have relied on the irrelevant field data to support its conclusions.

Response #F10: In the course of determining the trophic status of the receiving water and deriving a protective phosphorus effluent limit that would meet the narrative phosphorus criterion, the Region looked to a variety of sources, including the Gold Book, Ecoregional Nutrient Criteria (*Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria, December 2000*) and Nutrient Criteria Guidance (*Nutrient Criteria Technical Guidance Manual: Rivers and Streams, July 2000).* These constitute information published under CWA §304(a) and were used as *guidance* to interpret the State's narrative criterion for nutrients and not as substitutes for state water quality criteria. The Region's use of the Gold Book and other relevant materials published under Section 304(a) to develop a numeric phosphorus limit sufficiently stringent to achieve the narrative nutrient criterion is consistent with applicable NPDES regulations. When deriving a numeric limit to implement a narrative water quality criterion, EPA is authorized (40 CFR §122.44(d)(1)(vi)(B)) to: "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."

EPA recognizes that the Gold Book does not contain a phosphorus criterion *per se*, but instead presents a "rationale to support such a criterion." Gold Book at 240. The guidance document goes on to recommend in-stream phosphorus concentrations of 0.05 mg/l in any stream entering a lake or reservoir, 0.1 mg/l for any stream not discharging directly to lakes or impoundments, and 0.025 mg/l within the lake or reservoir.

The commenter references a statement in the Gold Book that indicates that, at the time of the Gold Book's publication, there was more data to support the establishment of a limiting phosphorus level in lakes than in streams or rivers. Much more recent data and criteria guidance published under Section 304(a) of the CWA reinforces the Gold Book recommendations related to streams and rivers.

The more recent Nutrient Criteria Guidance document, as well as the Ecoregional Nutrient Criteria, indicate that instream phosphorus concentrations need to be less then 100 ug/l (0.1 mg/l) in order to control cultural eutrophication. The Nutrient Criteria Guidance document cites a range from 10-90 ug/l to control periphyton and from 35-70 ug/l to control plankton (*see* Table 4 on page 101). The Ecoregional Nutrient Criteria document outlines so-called "reference" conditions in waters within specific ecoregions across the country, which are minimally impacted by human activities, and thus are representative of waters without cultural eutrophication. The UBWPAD is in Ecoregion XIV, *Eastern Coastal Plain.* Recommended criteria for this ecoregion is a total phosphorus criterion of 24 ug/l.

The commenter also recites verbatim seven site-specific considerations that the Gold Book indicates can reduce the threat of phosphorus as a contributor to eutrophication in lakes. The commenter does not indicate which, if any, of the site-specific considerations is determinative in this case and how it would specifically alter the permit limits for phosphorus. For instance, the commenter does not cite and EPA is not aware of any evidence that "naturally occurring phenomena;" "steep banks, great depth and substantial

flows;" "natural silts or colors;" or a "nutrient other than phosphorus" are inhibiting plant growth in this case. To the contrary, certain characteristics of the Blackstone River exacerbate the impacts associated with phosphorus. For instance, the River is characterized by numerous shallow impoundments and low velocity. Further, management of waters "primarily for waterfowl or other wildlife" would conflict with the designated use of contact recreation. In addition, consideration of "technological or cost effective limitations" in establishment of the water-quality based phosphorus limit is inappropriate. *See* Response #A9.

The well documented cultural eutrophication in the Blackstone River does not support that site-specific factors are mitigating the effects of excessive phosphorus loadings. Rather, there is substantial evidence of extensive impairments related to phosphorus loadings, and phosphorus is widely recognized as the limiting nutrient in most freshwater systems. *See Nutrient Criteria Technical Guidance Manual – Rivers and Streams*, July 2000 (EPA-822-B-00-002). Further, there is no indication that available control technologies, which have improved greatly since the Gold Book was published, are insufficient to make phosphorus the limiting nutrient. Any such demonstration could be made as part of a Use Attainability Analysis (*see* Response #F1).

Comment #F11: 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 Mackenthun, a copy of which is included as Attachment A2 to this document. However, that document does not present information concerning the development of the 0.1 mg/1 "desired goal," but rather makes reference to a 1968 paper published in the Journal of the American Waterworks Association by the same author. A copy of the 1968 paper is included as Attachment A3 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?

Response #F11: EPA disagrees with the suggestion that the Gold Book recommendation regarding in stream phosphorus concentrations is limited to sources of water supply and cannot be used as guidance 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 clearly referenced as values not to be exceeded at any time, not simply annual averages. The Ecoregional values represent average values during the critical growing season. *See also* Response #F10 and Response #F49 below relative to the use of Gold Book values.

Comment #F12: In recent times the EPA and Commonwealth have collaborated on the development of Total Maximum Daily Load Studies to establish nutrient management goals. These studies have been or are being conducted on the Assabet, The Nashua River and the Lower Charles River. The TMDL studies on the Assabet and Lower Charles are available on DEP's website (*see* http:/www.mass.gov/dep/water/resources/tmdls.htm). Studies on the Nashua are reported to be underway and supportive of phosphorus effluent limits proposed for the City of Leominster, but are not yet available for public review. The studies of the Lower Charles and the Assabet clearly attempted to take into account the myriad of factors presented as caveats in the EPA's 1986 guidance, as well as others. In the case of the waste water plants discharging to the Assabet River, limits were developed based not on the diluted concentration of phosphorus in the receiving waters, but rather on the reduction in aggregate biomass (measured as chlorophyll a) achieved in response to reductions in waste water loads and sediment phosphorus sources. For the Charles River, required reductions in phosphorus loadings from various sources were developed based on seasonal average chlorophyll a levels, rather than in- stream, dilution driven phosphorus levels. This criterion was declared to be adequate to "satisfy all Class B narrative (nutrients, aesthetics and clarity) and numeric (dissolved oxygen in the photic zone of the upper water column and pH) criteria as specified in the MAWQ" (Draft Nutrient TMDL Development for the Lower Charles River Basin, Massachusetts, page vii). Such investigations attempt to address the many factors that impact the growth of nuisance algae; comparable studies should have been undertaken on the Blackstone, rather than resorting to overly simplistic concentration and dilution based analyses.

Response #F12: Of the three examples of TMDL development cited in the comment, the Assabet River is the most similar to the Blackstone River, i.e., effluent dominated with many shallow impoundments. The Assabet River TMDL concluded that total phosphorus limits of 0.1 mg/l for each of four POTWs is necessary to control eutrophication and additionally, 90% of the sediment sources of phosphorus in the river system need to be remediated.

The Nashua River TMDL, was more than five years overdue with much work remaining for it to be approvable by EPA. *See also* Response #E3. In the absence of an approved TMDL, EPA issued a final permit to the City of Leominster, and is preparing a draft permit for the City of Fitchburg with phosphorus effluent limitations developed using an approach similar to this permit – i.e., the Region looked to a variety of sources, including the Gold Book, Ecoregional Nutrient Criteria and Nutrient Criteria Guidance to develop a

numeric phosphorus limit sufficiently stringent to achieve the state's narrative nutrient criterion.

The Lower Charles is very different than the Blackstone River. The Lower Charles acts more like a large lake, and the phosphorus contributions to the Lower Charles are predominately from non-point sources. The average total phosphorus concentration in the Lower Charles River necessary to meet the seasonal chlorophyll a target was determined to be 28 ug/l, much lower than the instream target of 100 ug/l used for the Blackstone River.

In light of the existing nutrient impairments documented in the Blackstone River, the fact that MassDEP has only recently announced plans to initiate a phosphorus TMDL (which, according to MassDEP's proposed schedule, would not be completed until July 2013 – *see* Comment #E3), and the difficulty of conducting nutrient TMDLs, it is not appropriate for EPA to delay issuance of the phosphorus limit in the permit. Neither the CWA nor EPA regulations require that a TMDL be completed before a water quality-based effluent limit may be included in a permit. Rather, water quality-based effluent limitations in NPDES permits must be "consistent with the assumptions and requirements of any *available* [emphasis added] wasteload allocation." 40 CFR 122.44(d)(1)(vii)(B).

Comment #F13: In order to support the development of the 0.75 mg/1 permit limit contained in the existing permit the EPA developed a waste load allocation using the QUAL2E model that was developed as part of the Blackstone River Initiative (BRI). Although the EPA argues that the model was not used to assess cultural eutrophication, it was used to assess the fate of chlorophyll a under various phosphorus control strategies. Seasonal average chlorophyll a was directly used in the Charles as a measure of cultural eutrophication, and in the Blackstone model it serves as an indicator of general plant growth. The Blackstone model runs indicated that at extreme low flow conditions (as compared to seasonal average values) with the phosphorus limitations contained in the existing permit (0.75 mg/1) and with 25% reduction in sediment phosphorus flux, that chlorophyll a levels would be reduced substantially from 67 ug/1 to 22 ug/l. The increased seasonal average flow would undoubtedly have lowered the chlorophyll a limits further, both as a result of dilution and significantly reduced residence time that would serve to mitigate algal growth.

We had never thought that the previous implementation of the QUAL2E model was particularly well done. But it represented the EPA's estimate of the best science it had at the time. It seems surprising then that it was not used in the development of this permit, particularly since the Fact Sheet accompanying this permit makes reference to the response to comments from the previous permit. Those responses indicated that "We believe that the model in its current form is scientifically sound and that further refinements will have little effect on the model predictions... the model indicates that under the permit conditions chlorophyll a values and diurnal dissolved oxygen variations will still be at levels of concern relative to eutrophication impacts." (RTC, 1999 permit page 5). If the model were sufficient to indicate problems then, why was it not used in this permit development to determine an appropriate level of control? Moreover, it

should be noted that the in-stream values that the EPA seeks to apply in this permit were known as far back as 1968 – the date of their original publication and certainly 1986 when they were incorporated into the Gold Book. If these are immutable criteria that need to be met under all conditions, as the EPA now claims, why then were they not used in the BRI analyses? The answer of course, is that to adopt them and apply them in the manner now proposed is too simplistic, and does not reflect real world conditions.

Response #F13: The comment incorrectly characterizes EPA's position on the model and the basis for the previous permit limits. While the model assesses cultural eutrophication, as represented by the response variable chlorophyll a, the waste load allocation did not establish limits necessary to control eutrophication consistent with the narrative criteria in the standards. Phosphorus reductions were evaluated only to the point where the model indicated that minimum dissolved oxygen criteria would be met. As documented in the Fact Sheet for the new permit, the resulting phosphorus limit of 0.75 mg/l is insufficient for addressing cultural eutrophication.

The model was not used to develop effluent limitations addressing cultural eutrophication in the new permit because efforts to update the model in light of new data were unsuccessful. Data collected as part of the Corps of Engineers study [*Phase I: Water Quality Evaluation and Modeling of the Massachusetts Blackstone River, Draft - March 2004* (US Army Corps of Engineers [http://www.nae.usace.army.mil/projects/ma/blackstone/wqe.htm)] indicate that there have been some significant changes in the system relative to productivity since the Blackstone River Initiative study that was the basis for the dissolved oxygen waste load allocation. The Corps of Engineers study indicated high levels of productivity and resulting losses of phosphorus in the upstream reaches immediately below the UBWPAD discharge. Macrophytes were documented as dominating these upstream reaches but were not evident in downstream reaches. The plants that dominated these reaches all have in common that they grow in dense, thick, and long masses and are all indicators of eutrophic freshwater. Since the model is not able to simulate rooted aquatic plants, efforts to update the model based on the new Corps of Engineers data were unsuccessful relative to simulating instream phosphorus levels.

EPA agrees that the in-stream phosphorus recommendations in the Gold Book have been available since at least the time of the Gold Book's publication in 1986. That initial efforts to calibrate the QUAL2E model were not successful or that MassDEP has not yet initiated a phosphorus TMDL does not result in the conclusion that EPA should not address the impacts of cultural eutrophication. The record includes evidence that significant impairments of the receiving waters due to phosphorus-driven eutrophication have already occurred, as discussed elsewhere in Responses #F5 and #F9. Based on these impacts and the fact that UBWPAD is by far the dominant source of bioavailable phosphorus loading to the Blackstone River under critical low flow conditions, it is not appropriate to delay establishment of limitations to address cultural eutrophication. Absent an approved TMDL, EPA must base effluent limits for phosphorus on the narrative criteria in the currently approved water quality standards.

Comment #F14: As is required by EPA, the Commonwealth of Massachusetts is developing its own criteria for nutrients that will be used for determining compliance with its nutrient criteria. The Commonwealth periodically reports on the progress of these efforts as part of the State and EPA Performance Partnership Agreement (PPA). According to the most recent PPA, this activity is ongoing. Given that recent nutrient TMDL's in the Commonwealth have relied on response criterion (e.g. biomass reduction, water clarity or chlorophyll a levels) rather than specific numeric criterion, it would seem that the EPA should have at least attempted to use these metrics, rather than arbitrarily selecting a numeric criterion.

Response #F14: While MassDEP has begun the process of developing numeric criteria for controlling nutrients, the Commonwealth has not yet submitted any proposed revisions to its water quality standards that incorporate numeric criteria for controlling cultural euthrophication and has not proposed a specific time frame for making such a submittal. If MassDEP chooses to propose site specific criteria based on reponse variables, it must also include a procedure for translating these criteria to phosphorus limits. Further, any proposed revision to standards must then be approved by EPA after an evaluation of whether the proposed criteria are sufficient for protecting and achieving designated uses.

In the process of setting the effluent limitation for phosphorus, we did consider response variables. As detailed in the Fact Sheet, we considered the relationship of phosphorus and cultural eutrophication, as measured by response variables such as chlorophyll a, periphyton and macrophytes. (Data on response variables is contained in the studies documented in the Fact Sheet.) In interpretation of MassDEP's narrative criterion, we consulted nationally recommended criteria and other technical documents to establish effluent limitations designed to address the response variables and to ensure attainment of water quality standards. *See* 40 CFR 122.44(d)(1)(vi)(B). *See also* Response #F9 and #F13 relative to response variable considerations in setting permit limits.

Comment #F15: The Fact Sheet is in error at page 7 when it suggests that the limits on phosphorus are necessary to meet technology based standards of the Massachusetts Surface Water Quality Standards. As presented on page 10, the EPA rejects the use of its interpretation of the Commonwealth's technology based requirement for highest and best practicable treatment, suggesting that such a level of treatment is insufficient because "the receiving water does not provide sufficient dilution to ensure that a limit of 0.2 mg/1 would adequately control eutrophication to meet water quality criteria". Thus, the limits presented in this Fact Sheet are not technology based standards under Massachusetts FS page 10, contrary to the claim of page 7 of the Fact Sheet.

Note that the District does not believe that the Commonwealth's requirement for highest and best practicable treatment compels the use of a 0.2 mg/1 phosphorus limit. The actual language from the Commonwealth's water quality standards defines it as "...The best practicable waste treatment technology for publicly owned treatment works that is the most appropriate means available on a regional basis for controlling the direct discharge of toxic and non-conventional pollutants to navigable waters....". 314 CMR 4.02 and

further, that "....Any existing point source discharge containing nutrients in concentrations that would cause or contribute to cultural eutrophication, including the excessive growth of aquatic plants or algae, in any surface water shall be provided with the most appropriate treatment as determined by the Department, including, where necessary, highest and best practical treatment (HBPT) for POTWs and BAT for non POTWs, to remove such nutrients to ensure protection of existing and designated uses..." 314 CMR 4.05(5)(c).

It is thus clear that if higher levels of phosphorus discharge would serve to mitigate cultural eutrophication, that those levels are acceptable under Massachusetts' Water Quality Standards.

Response #F15: As outlined in the Fact Sheet, the phosphorus limit is based on water quality criteria and is not based on technology requirements. Specifically, the limit is based on the narrative criteria for controlling cultural eutrophication. The reference on page 7 of the Fact Sheet to the "highest and best practicable treatment" for nutrients was included to provide a more complete discussion of references to eutrophication in Massachusetts Surface Water Quality Standards. We note for the record UBWPAD's interpretation of the "highest and best practicable treatment" requirement in the Commonwealth's standards.

Comment #F16: The District suggests that the most appropriate way forward is for it to complete construction of the upgraded facilities, that the District should monitor operation of these facilities for a period of not less than two full growing seasons that the District, in conjunction with others, should complete and refine its ongoing modeling efforts, which would form the basis of a TMDL by the Commonwealth. Thereafter, the permit should be modified to incorporate the appropriate level of treatment. The current consent agreement could be modified to affect these efforts. The District believes that this approach is substantially in agreement with the proposal submitted by the Commonwealth of Massachusetts at the permit hearing of May 9, 2007.

More importantly, this approach is entirely consistent with the intention of the 1999 permit. As the EPA indicated in their response to comments on that permit

> "...It is important to note that [the] permit limits reflect a phased approach and are based on a WLA designed to increase minimum predicted dissolved oxygen levels to 5.0 mg/l. The model indicates that under the permit conditions chlorophyll-a values and diurnal dissolved oxygen variations will still be at levels of concern relative to eutrophication impacts. ***If these problems persist,*** then more stringent phosphorus limits.... will need to be implemented... " RTC, 1999 permit, page 5, emphasis supplied.

It thus seems clear that the EPA expected the District to complete the upgrade of the facilities and to assess the efficacy of the improvements before moving forward with new limits.

Response #F16: *See* Response #A3, #E3, #F9 and #F12 relative to delaying establishment of more stringent nutrient effluent limitations; Responses #A2, #E2 and #F7 relative to schedules; Response #F9 relative to persistence of eutrophic impacts even with discharge levels approaching the 0.75 limit in the expired permit; and Response #F7 relative to inappropriateness of delay in setting limits pending UBWPAD's modeling efforts. With regard to the above-quoted language in the response to comments for the expired permit (and EPA's caution to UBWPAD regarding the possibility of more stringent phosphorus limits), please see Response #F5.

Comment #F17: EPA and RIDEM have used an 87% delivery factor as an estimator of the amount of nitrogen discharged at UBWPAD that is delivered to the Seekonk River (EPA Fact Sheet). However, in its response to comments, RIDEM has said the following:

> The fate and transport from the MA/RI state line to the mouth of the River expected when WWTF's meet their current permit limits, was evaluated by applying the methods described above to the results of the 1997 WLA model. It was determined that 79% of the MA loading at the state line and 86% of the Woonsocket WWTF load will be delivered to the mouth of the Blackstone River when the required WLA is met. By combining the delivery from each MA WWTF to the state line with that from the state line to the mouth of the river, refined delivery factors were computed for each MA WWTF. It was determined that between 71 and 77% of the individual MA WWTFs nitrogen loading will be delivered to the mouth of the River (72% for UBWPAD) and 86% of the Woonsocket WWTF. In the DEM evaluation, the Woonsocket and UBWPAD WWTFs were both assigned a river delivery factor equal to 87%.

Thus, while RIDEM may have used 87% as a River delivery factor, their actual analysis indicates that for the Upper Blackstone, the value is actually 72%, assuming compliance with the 2001 permit limits for phosphorus. If only 72% of the discharge makes it to the Seekonk River, then this suggests that an effluent limit of 6.94 mg/l is more appropriate if one accepts RIDEM's analysis -- or that the limit on plants discharging directly into the Seekonk and Providence Rivers ought to have an equivalent limit of 3.6 mg/l.

Compounding this error is that fact that RIDEM's analysis to produce the 87% value used in their analysis is conceptually flawed. According to their supporting materials, the 87% factor reflects the fact that the amount of nitrogen discharged out the Blackstone River in 1995/1996 (1,552 kg/day) was 87% of the amount discharged from the Upper Blackstone and Woonsocket treatment plants (1,782 kg/day). But this analysis ignores the baseload associated with the watershed, which RIDEM has separately estimated at 370 kg/day, and the nitrogen discharge of other plants in the Blackstone River Watershed in Massachusetts and Rhode Island. RIDEM makes no separate estimate of the load from these 8 plants. A reasonable estimate suggests that the loadings from these plants could approach an additional 400 kg/d, which would make the delivery factor for the combined Woonsocket and District discharge drop to 61% (1,552/(1782+370+400). If, as indicated by RIDEM that the UBWPAD river delivery factor was actually at 72% as compared to the combined 86%, then the UBWPAD river delivery factor would be 51% (61*(72/86)).

If the river delivery factor is only 51%, then the appropriate limits for the UBWPAD discharge to ensure an equivalent 5 mg/1 discharge at the mouth of the Blackstone is 9.8 mg/l.

Response #F17: The nitrogen attenuation processes in the Blackstone River will vary due to many factors, including water quality, season, weather conditions, and flow regime. The estimates prepared by RIDEM were intended to estimate attenuation during dry weather summer periods, when receiving water quality impacts due to eutrophication have been shown to be most severe. During these conditions, non point source discharges would be expected to be minimized due to the minimal storm water runoff, and in-stream nitrogen removal processes such as algal growth and biological denitrification would be maximized due to the warmer temperature and increased sunlight.

The estimated total nitrogen delivery factor of 87% used by RIDEM in its recommendation of loading reductions for facilities in Rhode Island and Massachusetts [*Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers*, RIDEM, December 2004] was based on an analysis of 1995/1996 data and assumed that the majority of nitrogen delivered to the system was from the two major point sources – UBWPAD and Woonsocket. Importantly, the 87% estimate was based on the conditions existing at the time of data collection, and did not attempt to predict the effect of future reductions of phosphorus loadings on nitrogen attenuation rates.

A subsequent analysis used data from 2001 and 2002 (*see* RIDEM Response to Comments document cited in the Fact Sheet) and employed a model that did account for other point sources, as well as non-point sources. The second analysis also took into account the impact of NPDES-required reductions in phosphorus loadings from the wastewater treatment plants (using the 0.75 mg/l total phosphorus limit in the expired permit for UBWPAD), assumed a total nitrogen discharge of 10 mg/l from UBWPAD, and assumed that the treatment plants were discharging at design flow. The analysis indicated that under these conditions, the UBWPAD total nitrogen delivery factor to the state line will increase from 69% to 92%, and 79% of the loading at the state line will be delivered to the mouth of the Blackstone River. This results in an overall river total nitrogen delivery factor of approximately 73%.[9]

Significantly, the second analysis showed that as phosphorus discharges to the river are reduced, the delivery of nitrogen increased. The reason for the reduced attenuation for nitrogen is that phosphorus-driven algal growth is the primary cause of nitrogen uptake. Given that the two largest sources of phosphorus to the River (UBWPAD and

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[9] The commenter suggests further adjustments based on its estimates of non-point and point source loadings, resulting in a proposed delivery factor of 51%. However, the second analysis conducted by RIDEM quantified these loadings and accounted for them in the revised estimate of attenuation. The commenter does not identify any specific concerns with the loadings in the revised analysis that warrants use of the commenter's estimated loadings.

Woonsocket) are both proposed to have limits of 0.1 mg/l total phosphorus (which are more stringent than the 0.75 mg/l limit on which RIDEM's analysis was based) and that other point sources will also be required to reduce phosphorus loadings, a further increase in the delivery of nitrogen to Narragansett Bay can be expected.

An additional analysis of attenuation in the Blackstone River (Nixon et al. 2005), as pointed out in the comments submitted by The Rhode Island Bays, Rivers, & Watersheds Coordination Team, indicates that attenuation is minimal. In this study, measurements of in-stream nitrogen concentration and stream flow for the period from April 2004 to August 2004 were used to estimate attenuation in the segment of the Blackstone River from Millville, MA to Pawtucket, RI, a distance of 32.5 river miles. The study showed that the average nitrogen load actually increased in the segment, even when the load discharge by the two treatment plants discharging to the segment (Woonsocket and Burriville) were removed. The data indicates that the load from processes adding nitrogen to this segment are greater than the load attenuated or, as Nixon concludes: "The simple interpretation of these results is that we see no direct evidence of DIN attenuation or removal in the lower Blackstone." (Nixon et al. 2005). The data collected during the driest month (August) -- when non point discharges of nitrogen should be minimal and nitrogen removal processes associated with algal growth and biological denitrification should be maximized -- also shows no attenuation in this segment, even when subtracting the average POTWs loadings to the segment (which will undoubtedly be lower than the calculated average load under August conditions). This study shows that the delivery factors estimated by DEM for the Blackstone River from the state line to the Seekonk River may be too low. If the delivery factor estimated in the DEM model (92%) were coupled with the delivery factor from the Nixon report (100%), a delivery factor as high as 92% could be calculated for the UBWPAD discharge.

While scientific study of attenuation is ongoing, EPA must use its judgment to establish nutrient reductions for this discharge necessary to ensure attainment of water quality standards based on the information available now. Based on all the available data and analyses, EPA's judgment is that a delivery factor of 87% for the UBPWAD discharge, based on future conditions associated with required reductions in phosphorus loadings, is within the range of values that could be calculated and is therefore reasonable and appropriate. Accordingly, EPA has used that estimate for establishing water quality-based nitrogen limits in this permit issuance.

Comment #F18: In the course of issuing permit modifications to various dischargers in Rhode Island, RIDEM received comments, and responded to many of those comments. However, they failed to respond or inaccurately responded to numerous comments of the various parties which were central to the resolution of the technical matters associated with the issuance of the permits. These comments are as follows:

A: Numerous comments indicated that extrapolation of the MERL experimental results to the Providence and Seekonk Rivers was inappropriate because of the significantly different conditions between the Rivers and those of Narragansett Bay that the MERL experiments were intended to simulate. In particular, the comments indicated that area

loading rates used by RIDEM were inappropriate because the River systems flush at substantially faster rates than the Bay. Because of this, the concentration of nutrients in the river will be less than in the Bay at the same area loading rate, and the level of algal productivity comparably lower. Comments of the City of Woonsocket, included as Attachment A4, comments of the Commonwealth of Massachusetts included as Attachment A5 and comments of the Narragansett Bay Commission, included as Attachment A6.

In its response to comments, DEM provides no information to refute this observation, or to justify its position. Instead they make a series of erroneous statements that appear to justify their analysis, but in fact do the opposite, as follows:

> In response [to] the Massachusetts Department of Environmental Protection's comment that DEM did not consider the importance of detention time and hydrodynamics of the river system, DEM characterizes the Providence and Seekonk Rivers as "poorly flushed." (RTC, page 13). In reality, according to RIDEM's own work, and as commented upon by the City of Woonsocket, (see comments of the City of Woonsocket), the Providence and Seekonk Rivers flush far more rapidly than does the Bay. Since flushing controls concentrations of nutrients, which control productivity, the use of the MERL experiments are incorrect.

In response to a comment made by the Narragansett Bay Commission concerning the same issue, DEM states that "The behavior of dissolved oxygen and algae (chlorophyll-a) observed in the Providence and Seekonk River systems is very similar to that observed in the MERL experiment." This is, however, not true, as was indicated the City of Woonsocket's comment entitled "Contradictory Data are presented in the Analysis" (see comments of the City of Woonsocket). Those comments pointed out that the MERL studies showed a congruence of low dissolved oxygen and high chlorophyll-a, while the 1995/1996 data relied on by DEM showed high DO with high chlorophyll-a, and low DO with low chlorophyll a.

Response #F18A:

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. EPA recognizes and acknowledged in the Fact Sheet 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 Upper Narragansett Bay. Part of that complexity includes spatial and temporal fluctuations in flushing rates. As is detailed below, EPA took such uncertainties into account in establishing the nitrogen limit in the permit.

The MERL enrichment gradient experiments 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 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 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 nitrogen loadings, dissolved oxygen impairment and chlorophyll *a* levels corresponds to what is actually occurring in the Providence/Seekonk River system.[10] 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. 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 5 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 5 mg/l corresponds to a loading scenario in the Seekonk River of approximately 6.5 times the Bay wide loading at current facility flows and approximately 10 times at 90% design flows. *See, e.g.,* Evaluation of Nitrogen Target and WWTF Load Reductions for the Providence and Seekonk Rivers, RIDEM, December 2004 at 28. 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

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[10] 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.

for the foreseeable future, as treatment plant flows remain well below the facility's permitted design flow.[11]

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 5 mg/l and 8 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, December 2004. In arriving at its decision to impose a nitrogen effluent limit of 5 mg/l on the UBWPAD facility, 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. [12]

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[11] Recent annual average flows from the treatment facility have been as follows: 34 mgd in 2002; 41 mgd in 2003; 36 mgd in 2004; 43 mgd in 2005; 35 mgd in 2006; and 30 mgd in 2007. While the flows demonstrate some variation, due at least in part to inflow/infiltration, flows are well below permitted design flow and there is no upward trend.

[12] 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

Accordingly, it is incorrect to suggest that EPA did not account for uncertainties between the model and the complex, natural setting of the receiving waters. Uncertainties in extrapolating the model to the natural environment were the major factor in our decision not to impose more stringent nitrogen load reductions at this time.

The commenter also notes that: "the MERL studies showed a congruence of low dissolved oxygen and high chlorophyll-a, while the 1995/1996 data relied on by DEM showed high DO with high chlorophyll-a, and low DO with low chlorophyll a." The MERL tank results do not indicate that low dissolved oxygen levels occur simultaneously with high cholorophyll *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). Additionally, while the MERL tank data referenced reflects minimum dissolved oxygen values, the 1995-1996 Providence/Seekonk River data reflects tidally averaged dissolved oxygen values. The commenter's conclusions are based on a direct comparison of the data, which is inappropriate as it fails to take into account the effects of these different values relative to the relationship with chlorophyll *a* levels.

Comment #F18B: DEM fails to respond to the City of Woonsocket's comment that RIDEM has not taken all potential oxygen demanding sources into account in its analysis of the dissolved oxygen problem. (See comments of the City of Woonsocket) The City is concerned that other DO "sinks" could have contributed to the low dissolved oxygen in the Providence and Seekonk Rivers, and that nutrient reductions may not serve to reduce the observed DO problem. These sinks include the large demands associated with the carbonaceous and ammonia nitrogen oxygen demand from the waste water treatment plants discharging directly into the Providence and Seekonk Rivers, the oxygen demand associated with combined sewer overflows and urban runoff, and sediment oxygen demand that could be created as a result on winter time discharges of all of the above sources, settling to the bottom and then expressing itself over the summertime. This is especially important in light of the fact that the observed 1996 and 1995 DO patterns are inconsistent with the MERL experiments, strongly suggesting that other factors may be at play. When viewed in conjunction with the comment below with respect to circulation patterns in the Providence and Seekonk Rivers, it is entirely possible that low bottom water DO is created by the trapped discharge of the Rhode Island plants being entrained in the upstream bound lower layer, which is shut off from reaeration by steep, salinity driven density gradients. This would serve not only to concentrate the plant oxygen demand in the bottom waters, but would limit the volume over which the bottom

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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."

sediments would express its oxygen demands. Such a condition could produce an oxygen deficit similar to that observed in the 1995/1996 period, where the dissolved oxygen and chlorophyll a values are inconsistent with the MERL experiments.

Response #F18B: 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. This is especially true where 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.

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*), and nutrient stimulation of phytoplankton production was leading to the oxygen depletion. *See* Response #F19 relative to trapped effluent. Treatment to address total nitrogen (and associated phytoplankton production) would also address ammonia, to the extent it may have a minor impact on dissolved oxygen dynamics.

The high levels of chlorophyll a and the clear relationship between nitrogen, chlorophyll a, and dissolved oxygen levels (*see* Response #18A) suggests that CSOs are not a major contributor to the eutrophication impacts in Narragansett Bay. CSO discharges in Rhode Island represent 1% of the total annual loading of ammonia and 0.2% of the total annual loading of nitrate to Upper Narragansett Bay. In addition, a very high level of CSO remediation is being implemented in Rhode Island. *See also* Response #F22 below and RIDEM Response to Comments, page 9.

Supersatured levels of dissolved oxygen can only result from photsynthesis or an outside physical aeration mechanism. Supersaturated levels of dissolved oxygen measured in Upper Narragansett Bay are entirely a function of nitrogen enrichment. The data collected in the Seekonk and Providence Rivers offers compelling evidence of excessive nutrient enrichment. 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 systems, and show that the common thread through the observed dissolved oxygen problems is nutrient enrichment. Total nitrogen and chlorophyll *a* concentrations are well above the MassDEP guidelines for TN and environmental health. To the extent that sediment oxygen demand (SOD) plays a role in the low dissolved oxygen levels, the decay of nitrogen stimulated phytoplankton that has accumulated in the sediments would be expected to contribute significantly to the SOD levels. Accordingly, given the reasonably conservative approach EPA adopts in nutrient permitting, which emphasizes the need to break the eutrophic cycle, 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.

Comment #F18C: DEM failed to answer the City's comment that substantial, newer DO data was available through the EMPACT program which it could have attempted to use to validate its conclusions. See comments of the City of Woonsocket.

Response #F18C: 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. EMPACT data for the critical summer periods are available from only two sites. The data includes 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 #F18D: The City of Woonsocket commented that DEM erroneously attributed all the nitrogen discharged into Narragansett Bay via the Blackstone River to two waste water treatment plants, while numerous cited authors and the DEM's own Blackstone River Initiative data indicated otherwise. DEM has failed to provide any analysis of the information presented by the City, except to make reference to "several" analyses that say otherwise, while citing only one (Pryor, 2004). And that one analysis is not included in the list of references included in the document. This is a particularly important issue because if the District's discharge is a smaller fraction of the nitrogen than RIDEM asserts, then this would suggest that an even smaller fraction of the District's effluent makes it to the Providence and Seekonk River systems, as is discussed above.

Response #F18D: While UBWPAD and Woonsocket discharges represent the vast majority of the nitrogen loadings in the Blackstone River there are other sources of nitrogen to the river. Accounting for these other sources would result in an increase in the estimated attenuation rate. However, as indicated in Response #F17, the current high level of eutrophication in the Blackstone River has the effect of increasing the attenuation rate. The large reductions in levels of phosphorus discharged will result in a significant reduction of the attenuation rate in the future. Consequently, we believe that the estimate of an 87% delivery factor to the mouth of the River for UBWPAD nitrogen discharges is reasonable. As indicated in Response #F17, a more recent study (Nixon, 2005) indicated that attenuation is minimal.

Comment #F18E: Both the City of Woonsocket and the Massachusetts Department of Environmental Protection observed that RIDEM, in establishing 5 mg/l limits for the Woonsocket facility and the District's facility did not appear to take into consideration the reductions in nitrogen load that would result from attenuation in the watershed. Put simply, if there is an 87% attenuation factor in the river, then a discharge of 5.74 mg/l is

the equivalent of a 5 mg/l discharge into the Seekonk River, as is required of other RI facilities. If the delivery factor is lower then the value is proportionately higher as presented above. It is unclear as to why the District's limits were not adjusted for the river attenuation factor.

Response #F18E: EPA established a nitrogen limit of 5.0 mg/l for the UBWPAD facility based on consideration of both the facility's relative nitrogen contribution and the location of the discharge. Both the Woonsocket and UBWPAD discharges enter Upper Narragansett Bay through the headwaters of the Seekonk River, which is the most impaired section of Upper Narragansett Bay. The RIDEM 2004 study indicates that this segment of the Bay currently receives nitrogen loads at a rate 24 times higher than the average Bay-wide loading. The limit EPA believes necessary to attain water quality standards (i.e., 5.0 mg/l) will result in a loading to the Seekonk River of 6.5 times the Bay-wide loading. UBWPAD is the dominant source of nitrogen to the Blackstone, even after accounting for attenuation, from the Blackstone to the Seekonk. In addition, the estimated nitrogen delivery factor for the Blackstone River will increase in the future as actions are taken to address phosphorus driven eutrophication (*see* Response #F17). Accordingly, EPA determined that a limit of 5.0 mg/l total nitrogen for UBWPAD's discharge is necessary in order to achieve water quality standards. RIDEM required a similar limit in the permit initially issued to Woonsocket. In settlement of an appeal of the permit, Woonsocket has agreed to a compliance schedule that will require construction of facilities to meet a total nitrogen limit of 3.0 mg/l. *See* Consent Agreement, In re: AAD No. 05-004/WRA, June 27, 2008).

Comment #F19: RIDEM's analysis is based on area loadings of nitrogen to various portions of the bay, and comparison of those area loadings to area loading of the MERL experiments. In addition to this approach being an improper application of the MERL experiments because of the significant differences in flushing times that would lead to significant differences in concentrations, the analysis ignored certain critical aspects of the circulation of the upper portion of the Bay. In constructing their analysis RIDEM used reaches of the upper bay that were originally developed by Nixon and Chinman to assess flushing times in the bay as a whole (*Evaluation of Nitrogen Targets and WWTF Load Reductions for the Providence and Seekonk Rivers*, page 9). RIDEM then calculates the area loading as the sum of the loads discharged in that reach and above, divided by the area of that reach and the reaches upstream. Thus, for example, the loads from the Upper Blackstone plant are distributed to the Seekonk River reach, as are those of the Woonsocket plant and the Bucklin Point plant, together with the plants on the Ten Mile River. As calculated by RIDEM, the load to this reach does not include the discharge from the Fields Point plant, or the East Providence plant, as their point of discharge is further down river into different reaches. This approach ignores the following factors:

- For half the day, the flood tide will actually carry the discharges from East Providence and Fields Point up river, in the direction of the Seekonk reach. Absent information showing that the tidal excursions are insufficient to transport the discharges as far as the Seekonk reach, all or part of the loadings to the reach should have been included in the calculation.

- Information suggests that the Providence and Seekonk Rivers may exhibit classic estuarine circulation — shoreward (or upriver) flow in the denser, bottom layer, and seaward, or downstream in the less saline upper layer (see Attachment A7). This would suggest that under stratified conditions the lower layer discharges would all be transported up into the Seekonk reach, and that all of the loads from the two downstream plants should have been included in RIDEM's analysis.

The fact that RIDEM relies on conceptually inaccurate and incorrect representations of the circulation of Narragansett Bay system compels the conclusions that one cannot rely on their analyses to justify the reductions in Nitrogen, and that it is wholly inappropriate to suggest that levels as low as 5mg/1 in the Upper Blackstone discharge are absolutely necessary to restore the health of the Providence and Seekonk Rivers.

Response #F19: The Providence and Seekonk Rivers do exhibit classic estuarine circulation. As such, wastewater discharges, which are fresh water, would be expected to stay in the upper fresh water layer and not be subject to significant transport upstream. 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 the MERL tank experiments cannot exactly replicate the complex dynamics of the Providence/Seekonk River systems. These differences include flushing rates. In establishing the nitrogen limit in this permit, EPA took into account uncertainties in extrapolating the MERL experiments to the natural setting of Upper Narragansett Bay. *See* Response #18A.

Comment #F20: The proposed permit requires compliance with the nitrogen limit of 5 mg/1 for the period May 1 through October 31. Achieving such low limits in the early and late part of this period can become problematic if high flows and or low temperatures limit the ability of the biological treatment systems to convert and remove nitrogen or phosphorus. The same factors would also serve to limit adverse impacts in the receiving waters. High flows decrease residence time, thereby limiting the growth of algae, and low temperatures suppress biological kinetics, causing the same effect. For this reason, we suggest that the permit limits be tied to both flow and temperature. The EPA should attempt to develop these limits using the tools it has available -- such as the QUAL2E model or it should await the development of other models by the District or the Narragansett Bay Commission. Failing that, the approach used by RIDEM to set limits for the City of Warwick could be used as guidance. In that permit, there is no limit for May, and in the months of June and October, the limit is 12 mg/l. And for the months July through September, the limit is 10 mg/1 if the flow is below a certain level, or 8 mg/1 if the level is above a certain level. In any event, the EPA should explain why there are permit limits for some plants in the month of May, but not for others.

Response #F20: To the extent the commenter suggests establishment of water quality based effluent limits must await a TMDL or UBWPAD's modeling efforts, EPA

disagrees. *See* Responses #A3, #E3 and #F7. In addition, efforts to update the QUAL2E model were unsuccessful relative to simulating in stream phosphorus levels. *See* Response #F13. It is unclear what, if any, modeling work is being undertaken by NBC or that the modeling being undertaken by UBWPAD will be able to accurately simulate water quality in the Blackstone River.

The period for which the nitrogen limits are applied in the permit corresponds to the peak growing season. Minimizing the potential for nitrogen uptake throughout the growing season, including May and October, is necessary to achieve water quality standards. The purpose of the seasonal limits is to minimize the potential for nitrogen to accumulate in the system through uptake by phytoplankton and then to settle into the sediments and potentially resuspend into the water column. As is detailed above, the Region employs a reasonably conservative approach when permitting nutrient discharges because, once begun, the cycle of eutrophication can be difficult to reverse given the tendency of nutrients to recycle through the ecosystem. *See* Response #18A.

Further, the Technical Advisory Committee for RIDEM's water quality modeling and TMDL development work recommended the seasonal limits (*see* RIDEM Response to Comments document, page 26), and such limits have been incorporated into recently issued permits for MA and RI facilities. With regard to Warwick, RIDEM has advised EPA that when the permit is reissued, it will include limits that correspond to the peak growing season in line with other facilities.

Comment #F21: Although it might appear that most dischargers in Rhode Island have accepted the permit limits that have arisen from the RIDEM analysis, careful inspection suggests that it will be many years before the limits will be achieved, if ever. Rather, the consent agreements implementing the limit provide substantial time for compliance, and provide for consideration of data that might defer achievement of the limit far off into the future. The main direct dischargers to the Providence are the Narragansett Bay Commission's Fields Point and Bucklin Point plants. Although both of the permits for nitrogen for these plants were appealed, the appeals have been dropped by virtue of a consent agreement entered between the State and NBC. Careful inspection of the consent agreements reveals that:

The consent agreement for the Fields Point plant (see Attachment A8 to this document) provides that the Commission will develop a facilities plan amendment, and design and construct certain initial facilities. These are essentially the facilities that NBC has been studying for several years, the components of which RIDEM was well aware. For a period following completion of the initial upgrades to the facility, the NBC will run the plant to determine if the facility can meet the 5 mg/1 permit limit. If the facilities cannot meet the 5 mg/1 limits, then the NBC is afforded the opportunity to propose the construction of additional facilities. And as part of doing the studies on the new facilities, NBC may take into consideration the costs and benefits of providing additional treatment in developing its schedule for constructing these new facilities. (See consent agreement, paragraph 11.b.(ii)).

We understand that NBC is moving forward expeditiously to complete construction of its initial upgrade. The final facilities plan amendment has been submitted for RIDEM's review, and work on the design phase has begun. But we find it hard to believe that the initial facilities will be complete before about late 2012 at the earliest. Assuming that the initial facilities do not meet the 5 mg/1 level, and then making allowances for further studies, planning and design, we might expect that compliance with the 5 mg/1 limit may not happen until as late as 2016 to 2018.

We think it odd that the consent agreement associated with a permit that explicitly requires a 5 mg/1 limit has a provision for what to do if the limit isn't met. Why would this be? The answer is found in the draft facilities plan prepared by the Narragansett Bay Commission, copies of which are included as Attachment A9 to this document. This document makes it clear that complete compliance with the 5 mg/1 limit is not certain, and will be achieved only under favorable conditions. Accordingly, we believe that the agreement struck between the NBC and RIDEM essentially says: we will build a treatment facility of a certain configuration. That configuration is constrained by space and cost considerations. If the facility meets 5 mg/1 then we will continue to operate the facility according to the permit. If we cannot meet the limit, we will then get additional time to propose new facilities. And, when we are proposing those new facilities, the schedule we propose may take into consideration the marginal costs and water quality benefits of the new facilities.

We actually believe that this is a rational way forward for the construction of nitrogen removal facilities: One should build facilities to a cost effective end-point, operate those facilities to the maximum extent feasible and then see if additional facilities are needed.

Response #F21: We disagree with the characterization of the Consent Agreement as not requiring that the Fields Point facility actually achieve a 5.0 mg/l permit limit. 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. The Consent Agreement for the Fields Point facility requires that NBC (the entity responsible for operation of the facility) complete major upgrades and optimize operations as soon as possible in order to achieve a nitrogen limit of 5.0 mg/l. These upgrades are currently under design with a design completion date of November 2008. The commenter references a provision in the Consent Agreement (paragraph 11.b.(ii)) that allows NBC a longer period of time to achieve final compliance in the event that initial major upgrades do not result in achievement of the 5.0 mg/l limit. Pursuant to this provision, NBC may consider a number of factors in proposing a schedule for additional upgrades, including the extent of noncompliance in achieving the 5.0 mg/l limit, costs and extent of additional modifications needed, whether a permit modification is pending and anticipated water quality benefits. The Consent Agreement nowhere, however, indicates that NBC does not need to meet the 5.0 mg/l, or that such considerations can be used to revisit the limit. The permit limits are final limits that remain in effect regardless of any analyses NBC wishes to do relative to scheduling. Changing the permit limit would require a permit

modification, and a cost benefit analysis is not an appropriate basis for modifying a water quality based permit limit (*see* Response #A9). [13]

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. Rhode Island's Water Quality Standards do not include provisions allowing for schedules in permits; Rhode Island's practice is to incorporate schedules in an Administrative Compliance Order or a Consent Agreement. Because the nitrogen limit in the UBWPAD permit is based on Rhode Island's standards, EPA is not including a compliance schedule in the permit. In light of overlapping issues related to design of treatment to meet the nitrogen and phosphorus limits in the permit, EPA intends to handle compliance issues comprehensively when more is known about such issues as modes of treatment. *See* Response #E2. Further, as we have indicated in Response #A2, #E2, and #F7, a compliance schedule for UBWPAD will be reasonable and consistent with the requirements of the Clean Water Act. Facilities in Massachusetts have been and will continue to be afforded the same considerations as facilities in Rhode Island in the establishment of schedules. 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 #F22: The effluent limits and monitoring requirements established in Part I.A.1 apply to both outfall 001 and 001A (the wet weather discharge). These are excessive and inconsistent with permits issued in the watershed.

The District's Phase I water treatment facility improvements increased the capacity of the preliminary and primary treatment facilities to handle a peak hour flow of 160 mgd. The Phase II waste water treatment facility improvements now under construction and expected to be completed in August 2009, are designed to handle an average daily flow of 45 mgd, a maximum daily flow of 80 mgd, and a peak hour flow of 120 mgd. The advanced treatment facilities were designed to meet the total phosphorus limit of 0.75 mg/L and a total nitrogen limit of 8 to 10 mg/L (even though the 2001 permit did not require a total nitrogen limit). During high flow events, the analysis performed during design revealed that the 2001 permit limits for TSS, CBOD, ammonia and total phosphorus could be achieved by blending the advanced treatment effluent with the wet

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[13] 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. To second guess the motives of the state and the discharger with respect to implementation of compliance with permits terms, as the commenter invites EPA to do, would be mere speculation and would not amount to a reasonable or rational basis to assess UBWPAD's permit limit for nitrogen. When accounting for existing controls on other point sources, EPA instead believes that 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.

weather discharge, given the expected frequency and duration of blending events. It will not be possible to meet the permit limits for total nitrogen and phosphorus proposed in the draft permit without pumping and treating the full 160 mgd peak hour flow through advanced treatment. The cost to achieve this provides no benefit to the receiving waters.

Since the proposed total phosphorus limit is based on 7Q10 conditions, discharge 001A, which only occurs under an extreme wet weather event, should not be held to the total phosphorus limit of 0.1 mg/L. In addition, as presented above, it would be more prudent to complete construction of the ongoing facility upgrades, monitor operation of these facilities for a period of at least two full growing seasons, complete and refine the ongoing modeling to better assess the fate and transport of phosphorus under wet weather events, and then determine if permit modifications are required.

Since the total nitrogen limit is driven by conditions in Narragansett Bay, and both the Narragansett Bay Commission's facilities (Fields Point and Bucklin Point) have wet weather discharge outfalls that are not subject to the nitrogen limit, not to mention the numerous CSO outfalls under the jurisdiction of NBC that discharge to the Seekonk, Moshassuck and Blackstone Rivers during rainfall events, UBWPAD should not be held to a nitrogen limit at discharge 001A which would likely activate concurrently with the overflows in Providence.

The Bucklin Point Facility is designed to receive a maximum daily flow of up to 116 mgd. Flow to the WWTF's headworks is reported. All flows up to 46 mgd on a maximum day basis receive secondary treatment. Flows received in excess of the 46 mgd secondary treatment capacity receive primary treatment and disinfection and is diverted through the North Diversion Structure (outfall 002A). No sampling or reporting is currently required for the discharge from outfall 002A with the exception of the quantity of flow discharged.

For the Fields Point facility, all [flow] to the waste water treatment facility headworks is reported. All flows received at the headworks receive at least primary treatment and disinfection. Up to 77 mgd must receive secondary treatment. Flows greater than 77 mgd but less than 91 mgd must receive secondary treatment during the first hour of such flows. Flows greater than 77 mgd, received after the first hour of such flows, are diverted to the wet weather treatment facility and discharged through outfall 002A. The maximum daily flow discharged from outfall 002A is 123 mgd. For outfall 002A, CBOD and TSS is monitored and reported (no limit has been established at this time) based on a 24-hour composite sample (hourly grabs) when in use. On an average monthly basis, for storms less than or equal to the one-year six-hour storm, 35% BOD removal and 50% TSS removal is required. Fecal coliform and Total Residual Chlorine is monitored and reported (no limit has been established at this time) based on a grab sample taken at the same time.

Currently there are 65 CSO outfalls under the jurisdiction of the Narragansett Bay Commission, which result in 71 discharge events per year[.] NBC currently plans to spend one billion dollars on CSO control. The first phase of these improvements will go on line in 2008. Shouldn't the effects of CSO control of direct discharges to Narragansett

Bay be monitored prior to mandating additional treatment on the wet weather discharge at Upper Blackstone?

Response #F22: The water quality-based phosphorus limit of 0.1 mg/l was established to ensure that designated uses in the Blackstone River are achieved and maintained at all times. The limit was established under 7Q10 flow conditions, consistent with the requirements in the Massachusetts Surface Water Quality Standards, in order to ensure that the minimum criteria that are necessary to protect designated uses are met under worst case conditions and that water quality is better than the minimum criteria under higher flow conditions. These minimum criteria are only protective of designated uses if aquatic life are exposed to these levels infrequently and for short periods of time. We disagree that the phosphorus limit is not necessary during high flow events to ensure that water quality standards will be met. The UBWPAD facility discharges into the headwaters of the Blackstone River and is very large (peak hour flow of 160 MGD during wet weather) relative to the flow in the river. The discharge dominates the flow in the river under low flow conditions and during most storm events. In addition to the substantial increase in discharge flow during wet weather conditions, the background concentration of phosphorus is significantly elevated compared to dry weather conditions (see Response #C1 and *Blackstone River Watershed 2003 DWM Water Quality Monitoring Data,* May 2005 (MassDEP)). Wet weather monitoring conducted by MassDEP under its Smart Monitoring program at a water quality station (Middle River) just upstream of the UBWPAD discharge, at a time when the Worcester Combined Sewer Overflow Facility upstream was not discharging, resulted in total phosphorus concentrations ranging from 45 - 330 ug/l with an average of 132 ug/l (MassDEP Smart Monitoring data: 9/20/2000, 11/20/2003, 4/28/2004, 6/23/2004). The lack of dilution and the elevated background concentrations of phosphorus during wet weather events supports the applicability of the 0.1 mg/l total phosphorus limit under all flow conditions.

With regard to nitrogen, RIDEM's 2004 study documents that current total nitrogen loads to the Seekonk River are 24 times higher than the total nitrogen load to all of Narragansett Bay on a per unit area basis. If the concentration limitations recommended by the report were used to establish mass limits using the design flows of the waste water treatment facilities, the Seekonk River would receive nitrogen loads of approximately 10 times higher than the Bay-wide loads per unit area. With the limitations established as concentration limits (5.0 mg/l for UBWPAD), at current flows the Seekonk River would receive nitrogen loads of about 6.5 times higher than the Bay-wide load. Even at 6.5 times the Bay-wide loading, further reductions may be necessary and the monitoring program in place will allow for making this determination (*see* Response #E1). 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. We have established UBWPAD's limit at 5.0 mg/l in light of uncertainties in the physical model. *See* Response #F18A. As indicated in the Fact Sheet and in Response #F6, EPA believes that the limit cannot be any less stringent than 5.0 mg/l under all flow conditions and ensure that water quality standards will be met. Concentration based total nitrogen limits have also been established in permits for many other municipal treatment facilities in Massachusetts and Rhode Island that discharge to Narragansett Bay in order to achieve a nitrogen loading of 6.5 times the Bay-wide loading.