EPA - NEW ENGLAND'S REVIEW of MAINE'S
SALMON FALLS/PISCATAQUA RIVER TMDLs

BACKGROUND: The Maine Department of Environmental Protection (ME DEP) submitted to EPA-New England the Salmon Falls/Piscataqua River TMDLs for ammonia, biological oxygen demand (BOD), and total phosphorus (TP) with a transmittal letter dated May 19, 1999 (received by EPA May 25, 1999), and a re-submittal memo dated and received on October 13, 1999. This waterbody, which changes name in the estuary, also forms a portion of the boundary between the States of Maine and New Hampshire. The TMDL submittal includes the following documents:

- *Salmon Falls River Waste Load Allocation* (ME DEP, February 1994)
- *Salmon Falls/Piscataqua River Watershed TMDL Project Data Report* (ME DEP, April 1996)
- *Salmon Falls/Piscataqua River Economic Analysis* (Earth Tech, Inc., October 1998, revised January 1999)
- *Salmon Falls River Use Attainability Analysis Responses to Public Comment* (ME DEP, February 1999)
- *Salmon Falls River Watershed TMDL Responses to Public Comment* (ME DEP, May 1999)
- *Phased TMDL for the Salmon Falls River Watershed and Use Attainability Analysis for the Lower Salmon Falls River* (ME DEP, May 1999)
- Revised tables from *Phased TMDL for the Salmon Falls River Watershed and Use Attainability Analysis for the Lower Salmon Falls River* (See Appendix A):
  Table 7. *Revised Ammonia Calculations*;
  Table 12. *Revised Phased TMDL for the Salmon Falls River - Applies in Summer*;
  Table 13. *Revised Recommended Permit Limits for Phase 1 of TMDL.*

Also included in the administrative record file are the following correspondence and other pertinent materials. The following is not intended to be a complete list of all documents in the file:

- *1995 Flow Data for Salmon Falls River Basin*, February 28, 1997 fax transmission of data report from ME DEP L&W.
- Letter of USGS comments on 7Q10 value for Berwick/Somersworth area, from Richard Fontaine, USGS to Paul Mitnik, ME DEP, dated April 3, 1997.
- Transmittal letter of draft report *A Phased TMDL for the Salmon Falls River Watershed*, to Steve Silva, EPA from Paul Mitnik, dated June 25, 1997.
- Letter of *EPA Review Comments on the Draft Report, A Phased TMDL for the Salmon Falls River Watershed, June 1997*, to Paul Mitnik, ME DEP from Stephen Silva, dated October 16, 1997.

- Letter informing EPA of public hearing on reclassification of Salmon Falls River, to Steve Silva, EPA, from Paul Mitnik, ME DEP, dated January 12, 1999.
- Transmittal letter of draft report, *A Phased TMDL for the Salmon Falls River Watershed, and Use Attainability Analysis for the Lower Salmon Falls River, January 1999*, dated January 25, 1999.
- Letter clarifying comment deadline for the Salmon Falls River TMDL and UAA, to Steve Silva, EPA, from Paul Mitnik, ME DEP, dated February 12, 1999.
- Letter of *EPA Review of Public Draft Salmon Falls River TMDL/UAA Report*, to Paul Mitnik, ME DEP from Stephen J. Silva, EPA, dated February 25, 1999.
- *Salmon Falls River Use attainability Analysis Responses to Public Comment* and cover letter dated March 1, 1999 (letter to Steve Silva, EPA, from Paul Mitnik, ME DEP)
- Letter of *EPA Review of Public Draft Salmon Falls River TMDL/UAA Report [1/25/99]*, to Paul Mitnik, ME DEP, from Stephen J. Silva, EPA, dated March 10, 1999.
- Memo re-submitting revised Tables 7, 12, and 13 as the final TMDL, to Jennie Bridge EPA, from Paul Mitnik, ME DEP, dated October 13, 1999.
- Memo concurring with re-.submitted Tables 7, 12, and 13 as the final TMDL, to Jennie Bridge, EPA, from Greg Comstock, NH DES, dated October 14, 1999.
- TMDL submittal letter to Carl DeLoi, EPA, from Paul Currier, NH DES, dated October 18, 1999.
- Memo documenting October 26, 1999 personal communication with Dave Courtemanch, ME DEP, on TMDL applicability to Salmon Falls River and Piscataqua River 303(d) listings in Maine, dated November 2, 1999.

The following review explains how the TMDL submission meets the statutory and regulatory requirements of TMDLs in accordance with § 303(d) of the Clean Water Act, and 40 CFR Part 130.

IMPAIRMENT/POLLUTANT: The water quality impairments to the lower Salmon Falls River include:

- Dissolved oxygen levels that do not meet Maine's minimum class B or C criteria in four impoundments for a total of 5.5 miles;
- Dissolved oxygen levels that do not meet NH's minimum class B criteria at Rollinsford Dam;
- Algae blooms in two impoundments and the upper estuary below point sources, and
- Conditions that fail to meet Maine's class B criteria for aquatic life below point sources.

The major causes of the impairments include:

- Phosphorus and BOD primarily from point source discharges, and the
- Presence of many dams.

TMDLs are proposed for ammonia-nitrogen, BOD, and total phosphorus.

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STATUTORY AND REGULATORY REQUIREMENTS OF TMDLs

Section 303(d) of the Clean Water Act and EPA's implementing regulations at 40 C.F.R. Part 130 describe the statutory and regulatory requirements of TMDLs. These requirements, which must be described in TMDLs both submitted by States and established by EPA, are described below.

1. Loading Capacity

EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards. 40 C.F.R. § 130.2(f). As described in EPA guidance, a TMDL describes the loading capacity of water for a particular pollutant.

Using a calibrated water quality model, the loading capacity has been presented for the Salmon Falls River as the TMDLs for total phosphorus (TP = 25.3 lb/day), biochemical oxygen demand (CBOD = 1,490 lb/day as Ultimate CBOD), and ammonia-nitrogen (NH3-N = 222 lb/day) at 7Q10 low flow conditions. The loading capacity has been defined for summer critical low flow conditions when algae blooms occur and high water temperatures contribute to low dissolved oxygen levels. By definition, TMDLs, are equal to the sum of the WLAs, LAs, and background loads (along with a margin of safety). Allowable pollutant loads for the Salmon Falls River (applying in summer) are presented for five dischargers (WLAs), background levels, and nonpoint source contributions (LAs). (See revised Table 12, 10/13/99 re-submission.) Improved dam operation is an essential component of implementing the TMDLs, since modeling predicts that water quality standards for dissolved oxygen in the lower impounded waters would fail to meet water quality standards, even if all point source discharges were removed. The loading capacity together with improved dam operation is predicted to result in attainment of water quality standards.

Assessment: EPA-New England concludes that the loading capacity has been appropriately set at a level necessary to attain applicable water quality standards. EPA believes that implementation of dam operational changes is essential to the success of these TMDLs in attaining water quality standards.

2. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources. 40 C.F.R. § 130.2(g).

Based on modeling analysis, the TMDLs clearly present the WLAs for the wastewater treatment facilities of Milton, NH, Berwick, ME, Somersworth, NH, Rollinsford, NH, and South Berwick, ME. (See revised Table 12, 10/13/99 re-submission.) The TMDL report also includes recommended permit limits for each of the five point sources to implement the TMDLs. (See revised Table 13, 10/13/99 re-submission.) The TMDLs include a reserve capacity of 5%, taken

from the point source load allocations, for future adjustments or future discharges.

Assessment: EPA-New England concludes that the WLAs of the TMDLs are acceptable and reasonable. The TMDLs identify point sources as the dominant source of pollutant loading to the river (close to 90% of the phosphorus load). The WLAs set pollutant loads for five communities discharging to the Salmon Falls river so that water quality standards will be met. Water quality modeling predicts compliance with water quality standards once treatment and dam operational changes are in place.

The following are the waste load allocations (WLAs) in terms of concentration limits for phosphorus, BOD5/TSS and ammonia:

2 larger plants @ 0.5 ppm TP, 15 ppm BOD5/TSS (weekly ave.), and 16 ppm ammonia;
2 smaller plants @1.0 ppm TP, 20 ppm BOD5/TSS (weekly ave.), and no ammonia limit;
Milton @ 2 lbs per day TP, 45 ppm BOD5/TSS (weekly ave.), and no ammonia limit.

The WLAs have been set based on an analysis of various treatment options for pollutant reductions. The WLAs reflect the minimum level of treatment that will result in dissolved oxygen standards being met except in the lower most portions of two impoundments (Table 11, page 24). This treatment level is reasonable because higher levels of treatment provide little improvement in water quality (in terms of miles of non-attainment, and % volume affected) at two to three times the cost (Table 16, page 37). Dam operational changes will be necessary to address the dissolved oxygen problems in the lower portions of the impoundments, since the water quality model predicts DO violations in the lower impounded waters even if all the WWTP dischargers were to be removed (zero discharge).

3. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background. 40 C.F.R. § 130.2(h). Load allocations may range from reasonably accurate estimates to gross allotments. 40 C.F.R. § 130.2(g).

Maine modeling shows that the dissolved oxygen problem is predominantly due to point source pollution and the presence of dams. Prediction that the TMDL will meet water quality standards is based on point source controls, and dam operational changes to improve waters in the lower portions of the impoundments. Although general recommendations for NPS controls are made (see Table 12 "Other Recommendations # 2), the analysis indicates that present NPS loading, excluding natural background, has very little impact on the dissolved oxygen problems in the Salmon Falls River. For this reason, the TMDL does not specify NPS load reductions to meet water quality standards.

Sediment oxygen demand (SOD) measured in the Salmon Falls River in June 1992 showed values considered to be average to moderately high (page 9, Feb. 94 report). SOD measured in 1995 showed lower values that were "not very high in three of the four points sampled in the

Lower Great Falls and Somersworth impoundments. [ME DEP] concluded that SOD is probably not a major factor in surface layer dissolved oxygen depletion in these impoundments, but still could be significant in deeper layers..." (page 4, May 1999 report). It is believed that the SOD is largely caused by the die-off of algae, and that the most effective way to address the SOD problem is through phosphorous control to reduce algae blooms.

The TMDL clearly presents load allocations for non-point sources of pollution. (See revised Table 12, 10/13/99 re-submission.) The NPS load upstream of Milton is assumed to be natural background; there is no information available indicating anthropogenic sources of pollution. It was not feasible to separate out natural from anthropogenic sources of the NPS load downstream of Milton, but the loads were quantified using tributary flow, and sediment oxygen demand (SOD) was included in the water quality model. A reserve capacity of 5% of the point source loads was split out and presented in Table 12 to account for future sources of pollution. EPA-New England views this reserve capacity as addressing both point and NPS future sources.

Assessment: EPA-New England concludes that load allocations are adequately specified in the TMDL. We agree that the NPS load above Milton is natural because the phosphorus levels are low, and that it was not feasible to distinguish natural from anthropogenic nonpoint sources within the non-attainment segment of the river.

4. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between effluent limitations and water quality. CWA 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1). EPA guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS.

The TMDLs for TP, BOD, and NH3-N include implicit margins of safety to account for any lack of knowledge concerning the relationship between effluent limitations and water quality. The ME DEP discusses the conservative assumptions made in the analysis on pages 30-31 of the 5/99 report. The TMDLs were developed for critical conditions that will occur infrequently (<1% probability; page 31). Under most conditions, dissolved oxygen will be higher than the worse case levels predicted by the model. The conservative assumptions include the following:

- Design conditions used to calculate the assimilative capacity were based on 7Q10;
- A high ambient water temperature, typically experienced infrequently, is assumed;
- Permitted waste loads are assumed to occur simultaneously with 7Q10 flow.
- Sediment Oxygen Demand (SOD) was assumed not to change, when it actually may be reduced, as the frequency, severity, and duration of algae blooms are reduced.

In addition to the implicit margin of safety provided by the TMDLs, additional protection will occur as long as the wastewater treatment plants operate at less than design flow: The phosphorus TMDL proposes that phosphorus limits in NPDES permits initially be concentration

limits rather than mass limits alone. Maximum loading can only occur when the WWTFs reach their design flows, yet the two largest dischargers, Berwick and Somersworth, are currently averaging 61% and 60% design capacity, respectively. Since the flow now experienced by the two largest treatment plants is much less than design flow, less phosphorus will be allowed to discharge with concentration limits than would be discharged with mass limits (based on 0.5 ppm TP at design flow). Follow-up monitoring will be conducted to re-assess the adequacy of the TMDL prior to these plants reaching design flow. If monitoring indicates that water quality does not respond to the pollutant reduction as predicted, the TMDL will be revised accordingly.

Assessment: EPA - New England concludes that the conservative design conditions and assumptions used provide for adequate MOS in the TMDLs. Furthermore, post-implementation monitoring will be used to assess the adequacy of the phosphorus TMDL prior to the dominant point sources reaching maximum loading; this monitoring plan serves to supplement the MOS.

5. Seasonal Variation

The statute and regulations require that a TMDL be established taking into account seasonal variations. CWA 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1).

The TMDL report discusses how seasonal variability was taken into account on page 31 of the 5/99 report.

- The WLAs for ammonia are calculated as summer and non-summer loads due to the seasonality of nitrogenous BOD decay (N-BOD decay is significantly reduced in the non-summer months.)
- The WLAs for BOD are established only for the summer months due to the fact that dissolved oxygen depletion from BOD decay in the Salmon Falls River is an issue only when water temperatures are high. These WLAs will result in lower water-quality-based effluent BOD limits in the summer and higher technology-based BOD limits in the non-summer months.
- The phosphorus WLAs are established only from May 1 to September 30, when eutrophication is an issue. In the non-summer months, the cooler water temperature and reduced light intensity greatly diminishes algae growth to the point where it is no longer an issue.
- Seasonal phosphorus budgets (treatments and non-treatment periods) were also calculated using ambient monitoring data collected from May to October 1995. These data were used to quantify the magnitude of point and nonpoint sources.

Assessment: EPA - New England concludes that seasonal variations have been adequately accounted for in the TMDLs. We agree that levels set for BOD and phosphorus for the summer months will be protective of water quality standards for the remaining portions of the year because (1) summer is the time when critical environmental conditions coincide with the most active life stages of aquatic life, and (2) environmental conditions more favorable to water

quality occur in the non-summer months. For example, in non-summer months, temperatures are lower, directly affecting dissolved oxygen, light intensity is reduced, and algal growth is significantly reduced. We agree that the levels set for ammonia for the summer months will be protective of water quality standards for toxicity for the remaining portions of the year because (1) summer is the time when critical environmental conditions result in dissolved oxygen criteria being a more limiting factor than toxicity, and (2) ammonia is less toxic in colder temperatures.

INFORMATION GENERALLY NECESSARY FOR EPA TO DETERMINE THE STATUTORY AND REGULATORY ADEQUACY OF TMDLS

Consistent with existing policy, the following information, although not statutory or regulatory requirements of TMDLs, will generally be necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations.

1. Submittal Letter

Each final TMDL submitted to EPA should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under § 303(d) of the Clean Water Act for EPA review and approval. The submittal letter should reference the waterbody as it is identified on the State's section 303(d) list, including the pollutant of concern and the priority ranking of the waterbody. This clearly establishes the State's intent to submit, and EPA's duty to review, the TMDL under the statute.

A May 19, 1999 submittal letter from Maine DEP accompanied the final TMDL package and explicitly states that the TMDL submission is "as required in section 303(d) of the Clean Water Act", and that the pollutant parameters included in the TMDLs are ammonia, BOD, and total phosphorus. Although not stated in the letter, the Salmon Falls River is on Maine's 1998 303(d) list due to the following pollutants: BOD, SOD, nutrients, toxics, and bacteria, scheduled for TMDL development "<2003" (priority ranking). Maine's May 19, 1999 submittal letter clearly establishes Maine's intent to submit, and EPA's duty to review, the TMDL under the statute.

Following discussions among EPA, Maine DEP, and NH DES, the TMDLs were changed to adjust the load allocations for Milton, NH (a small discharge located over 15 miles upstream of the non-attainment segment), and Tables 12 and 13 of the May 19 TMDL submission were revised accordingly; Table 7 winter ammonia calculations were also corrected. Maine re-submitted the tables to EPA as the final TMDLs for the Salmon Falls River on October 13, 1999, and New Hampshire concurred in a memo dated October 14, 1999.

The Salmon Falls River was listed on New Hampshire's 1998 303(d) list. The May 19, 1999 Salmon Falls submittal letter from ME DEP, and the final TMDL package together address the exceedence of the NH water quality standard for DO at Rollinsford Dam (file #85 on NH's 303(d) list). The Maine submittals fill the requirements of Section 303(d) of the Clean Water Act for the State of New Hampshire. On October 18, 1999, New Hampshire DES formally

submitted to EPA the revised Table 12 showing the TMDLs for the Salmon Falls River and requested approval of the TMDLs.

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal or EPA-established TMDL should include a description of the applicable State water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard is attained) should be identified. If the TMDL is based on a target other than a numeric water quality criterion, a description of the process used to derive the target should be included in the submittal.

Numeric (DO) and narrative (algae blooms/cultural eutrophication, aquatic life) water quality standards apply in both Maine and New Hampshire, but the TMDLs are tied to achieving the numeric criteria for dissolved oxygen. In this case, it is believed that attaining the numeric dissolved oxygen criteria will also result in attainment of the narrative water quality standards as well.

Since the Salmon Falls River and Piscataqua River estuary form the border between Maine and New Hampshire, the TMDL report recommended that the most stringent criteria of Maine and New Hampshire's class C and B, respectively, be adopted as goals for portions in attainment, as well as the non-attainment segment. (See revised Table page 13 of 5/99 report; See appendix B. *Water Quality Standards*.) Recommended numerical DO criteria are stated in terms of daily minimum, daily average, monthly average, and spawning times; aquatic life criteria are narrative.

A use attainability analysis (UAA) was submitted by Maine with the TMDLs because both the dissolved oxygen data in upper Salmon Falls river impoundments and predictions by the water quality model suggest that Maine's class B goal is unattainable for a 5.5 mile segment of the Salmon Falls River, from Berwick (route 9 bridge) to South Berwick (head of tide). On May 21, 1999, Maine passed an act to reclassify certain waters of the State (PL 1999 Chapter 277). Under 38 MRSA 467, the main stem of the Salmon Falls River, from the Route 9 bridge to tidewater, was reclassified from Class B to Class C, which has dissolved oxygen criterion not less than 5 ppm or 60% of saturation (daily minimum), whichever is higher, and Maine applies the EPA guidance criterion of 6.5 (monthly average) as a matter of policy. New Hampshire Class B dissolved oxygen criteria is not less than 5 ppm and at least 75% of saturation (daily average). Under the Clean Water Act, the NPDES permitting authority is required to take into consideration the water quality standards of both the state where the discharge is located and the neighboring state. In practice, the TMDL report's recommendation to use the most stringent of Maine and New Hampshire's Class C and B criteria, respectively, will be put into effect through the permitting process.

3. Description of Pollutant Sources

The TMDL submittal or EPA-established TMDL should include a description of the point, nonpoint, and natural background sources of the pollutant of concern, including the magnitude and location of the sources.

Under conditions of no phosphorus removal during the critical summer period in 1995, point sources contributed 86% of the BOD and 90% of the phosphorus input to the Salmon Falls, and nonpoint sources contributed 10-14% (Tables 5 and 6). "Point sources were at only 1/3 of their total design flow capacity in 1995. If percentage comparisons are made with point sources at design flow, the nonpoint contribution is reduced to 5% of the total phosphorus input to the river (figure 4)." (page 14 May 1999 report). The TMDL report includes descriptions of all the point sources contributing to the non-attainment segment, including magnitude and location of the sources. Information is provided showing the relative contribution of each source of phosphorus and BOD, the major contributors to the dissolved oxygen impairment (See Fig. 3 and 4, pages 17-18 of the 5/99 report for phosphorus at both current and design flows). Nonpoint sources and background sources for all pollutants are discussed, including magnitude and location by tributary/subwatershed (see page 19). A nutrient budget is presented for background, point sources, and nonpoint sources/tributaries in Tables 4 and 5 (see pages 15 and 16 of the 5/99 report).

4. Linking Water Quality and Pollutant Sources

The TMDL submittal or EPA-established TMDL should describe the rationale for the analytical method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. Supporting documentation for the analysis should also be included, including the basis for assumptions, strengths and weaknesses in the analytical process, results from water quality modeling, etc.

ME DEP quantified existing known sources of TP, BOD, and NH3-N to the Salmon Falls River from both Maine and New Hampshire, including point sources, nonpoint sources, and natural background. ME DEP modeled dissolved oxygen and algae growth (chlorophyl a) in the Salmon Falls/Piscataqua River to establish the cause and effect relationship between the numeric targets for DO water quality standards, and the identified sources of TP, BOD, and NH3-N. ME DEP also considered the effects of current loadings and projected reductions on the ability to attain the narrative standards (for aesthetics, toxics, and aquatic life, and cultural eutrophication) in both Maine and New Hampshire. The numeric targets used were a blend of the most stringent DO standards for Maine and New Hampshire (following Maine's adoption of a revised classification for a 5.5 mile segment of the river). (For more explanation, see page 7, Section 2. *Description of the Applicable Water Quality Standards and Numeric Water Quality Target*.)

A two dimensional hydrodynamic water quality model, WASP4, was used for the modeling analysis in this project. The modeling work was supported by extensive data collected during 1995 (bi-weekly surveys, May through October). Model documentation, including calibration and validation, sensitivity analyses, water quality data sets, model projections, basis for

assumptions, etc., are documented in the 1994 WLA report, the April 1996 Data Report and the 1999 final TMDL Report.

ME DEP acknowledges that the complex and dynamic nature of physical, chemical, and biological parameters within the Salmon Falls River make any modeling analysis inexact. We concur with Maine that there is considerable uncertainty associated with the model predictions, and that the model results in this study are more credible when considering attainment/non-attainment of classification criteria, but less credible when considering predictions of dissolved oxygen levels to the nearest 0.1 ppm. (See page 33 item #2 in par. 3).

EPA agrees that the technical approach used by Maine is reasonable and sufficient for establishing TMDLs to address dissolved oxygen and aesthetic impairments in the Salmon Falls River. Maine used the EPA supported WASP model and followed an approach consistent with EPA guidance. Furthermore, in-depth reviews by the State of New Hampshire, as well as technical input from an independent technical expert were provided during model development.

Both data and the water quality model indicate that DO criteria will be difficult to meet in bottom waters of a deep hole in a very small portion of the estuary, approximately 1 mile below head of tide (page 12 of May 1999 report). EPA agrees with ME DEP that the non-attainment in the Hamilton House deep hole in bottom waters is a natural phenomenon, and that the TMDLs do not have to result in standards being met in the deep hole.

EPA expects that implementation of the TMDLs will result in the impoundments as a whole meeting existing and designated uses. Surface waters will meet water quality standards; there may be difficulty meeting DO criteria in the bottom most waters of two impoundments (14% in S. Berwick impoundment and 9% in Rollinsford impoundment), but this is not expected to affect attainment of existing and designated uses. EPA believes that the proposal to implement dam operational controls is a reasonable measure to address the potential inability to meet DO criteria in the bottom of two impoundments. Recent studies from Gulf Island Pond in Maine have indicated that dam operational changes are an effective way to improve DO in the bottom levels of impoundments.

5. Monitoring Plan for TMDLs Developed Under the Phased Approach

EPA's 1991 document, *Guidance for Water Quality-Based Decisions: The TMDL Process* (EPA 440/4-91-001), calls for a monitoring plan when a TMDL is developed under the phased approach. The guidance provides that a TMDL developed under the phased approach also needs to provide assurances that nonpoint source control measures will achieve expected load reductions. The phased approach is appropriate when a TMDL involves both point and nonpoint sources and the point source WLA is based on a LA for which nonpoint source controls need to be implemented. Therefore, EPA's guidance provides that a TMDL developed under the phased approach is to include a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of water quality standards.

These TMDLs do not rely on nonpoint source reductions to achieve water quality standards in the non-attainment segment (see page 10, Item 6 *Implementation Plans*). Maine has submitted phased TMDLs due to the uncertainties involved in the water quality modeling. The monitoring plan is presented on page 32 of the 5/99 report. Annual monitoring includes both early morning grab sampling twice per month from June to September for DO, temperature, TP, PO4-P, chlorophyl a, NH3-N, NO2+NO3-N at six sites from the Route 9 bridge downstream to the Hamilton House site; continuous summer monitoring for DO, temperature at 2 meter depth is specified above the Rollinsford dam.

6. Implementation Plans

In August 8, 1997, Bob Perciasepe issued a memorandum, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)," that directs Regions to work in partnership with States to achieve nonpoint source load allocations established for 303(d)-listed waters impaired solely or primarily by nonpoint sources. To this end, the memorandum asks that Regions assist States in developing implementation plans that include reasonable assurances that the nonpoint source load allocations established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved; a public participation process; and recognition of other relevant watershed management processes. Although implementation plans are not approved by EPA, they may help establish the basis for EPA's approval of TMDLs.

Prediction that the TMDLs will meet water quality standards is based on point source controls, and dam operational changes to improve waters in the lower portions of the impoundments. The TMDLs identify point sources as responsible for close to 90% of the phosphorus load, and for significant portions of the BOD and ammonia loads as well, in the Salmon Falls River. The reductions in TP, BOD, NH3-N point source loadings will be controlled through NPDES permits issued by EPA, and through wastewater discharge licenses issued by the ME DEP that are consistent with the NPDES permits.

Although recommendations for NPS controls are made in the TMDL (see Table 12 "Other Recommendations # 2), the TMDL does not rely on NPS controls to meet water quality standards in the non-attainment segment. As WWTPs implement phosphorus controls, and then approach design capacity, the NPS contribution of phosphorus will assume a greater role. In recognition of potential impact of future growth on NPS, and due to concerns about meeting objectives for minimizing algae in tidal waters with only point source controls, the TMDL recommends NPS reductions via implementation of BMPs in the Great Works River watershed as a priority, and throughout the Salmon Falls watershed, where feasible.

Since the water quality model predicts some noncompliance with dissolved oxygen criteria in lower level impounded waters, even if all discharges to the river were removed, dam operational changes are an essential part of TMDL implementation to improve dissolved oxygen levels in and below the impoundments. ME DEP recommends simultaneous top and bottom releases from Lower Great Falls, Rollinsford, and South Berwick Dams during low flow periods to minimize

stratification of the bottom layers.

7. Reasonable Assurances

EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources. In a water impaired by both point and nonpoint sources, where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur, reasonable assurance is required in order for the TMDL to be approvable.

In a water impaired by solely by nonpoint sources, however, reasonable assurances are not required in order for a TMDL to be approvable. For such nonpoint source-only waters, States are encouraged to provide reasonable assurances regarding achievement of load allocations in the implementation plans described in section 6, above. As described in the August 8, 1997 Perciasepe memorandum, such reasonable assurances should be included in State implementation plans and "may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs."

The point sources in the Salmon Falls River are not given less stringent wasteload allocations based on any assumption that nonpoint source load reductions will occur. However, the WLAs are somewhat less stringent than the maximum reductions that could be imposed; an additional 0.7 mile (approximately) of bottom waters (6% volume) in the Rollinsford impoundment is predicted not to meet the minimum DO criterion as a result (although existing and designated uses are expected to be met in the impoundment as a whole). EPA believes that the State's decision to rely on dam operational controls to achieve the DO criterion in the bottom of the impoundments is reasonable given the high costs associated with requiring additional point source reductions and the likelihood that dam operational controls will be needed in any case (modeling predicts that the DO criterion would not be completely met in bottom waters even with the point source discharges eliminated altogether).

In addition, EPA believes the State has offered reasonable assurance that dam operational controls will occur. CHI, operator of the pertinent dams, has indicated in writing its willingness to participate on a voluntary basis and investigate operational changes to reduce thermal stratification in bottom layers of impoundments for the purpose of improving dissolved oxygen levels in and below the impoundments. If CHI withdraws its voluntary participation, EPA will petition FERC to reopen the dam licenses and include the necessary requirements to address the water quality issues in the Salmon Falls River.

8. Public Participation

EPA policy is that there should be full and meaningful public participation in the TMDL development process. Each State should therefore provide for public participation consistent with its own public participation requirements. In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval should describe the State's public participation process, including a summary of significant comments and the State's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA shall publish a notice

seeking public comment. 40 C.F.R. § 130.7(d)(2).

Inadequate public participation is not a basis for disapproving a TMDL; however, where EPA determines that a State has not provided adequate public participation, EPA may defer its approval action until adequate public participation has occurred, either by the State or by EPA.

ME DEP issued public notice of the February 10, 1999 hearing (at 1 p.m. at the South Berwick town office at 180 Main Street) in a letter to interested parties dated January 12, 1999, and via television, radio stations, and newspapers, including the following New Hampshire papers: Foster Daily Democrat (Dover), and the Portsmouth Herald. ME DEP also sent copies of the draft TMDLs and UAA document to interested parties in both Maine and New Hampshire with a cover letter dated January 25, 1999. Written responses to public comment were provided on the draft TMDL/UAA report (Feb 1999), and the Final TMDL/UAA report (May, 1999).

EPA - New England concludes that ME DEP has done an adequate job of involving the public during the development of the TMDLs for both Maine and New Hampshire, provided adequate opportunities for the public to comment on the TMDLs, and provided reasonable responses to the public comments.

Appendix A. Revised Tables:

Table 12. *Revised Phased TMDL for the Salmon Falls River*

Table 13. *Revised Recommended Permit Limits for Phase 1 of TMDL*

Table 7. *Revised Ammonia Calculations*

Table 12. Revised: **Phased TMDL for the Salmon Falls River - Applies in Summer**					
Phase 1 of TMDL	Design Flow (mgd)	NH3 (lb/day)	Ultimate CBOD (lb/day)	BOD5 (lb/day)	Total Phosphorus (TP) (lb/day)
Natural Background NPS (upstream of Milton)	16.4	3	424	N/A	1.2
Milton, NH	0.1	See note a.	See note a.	See note a.	2 [b]
Tributary NPS (from Milton to Lower Great Falls dam)	2.1	0.2	56	N/A	0.4
Allowable Loads at Lower Great Falls (LGF) Dam [c],[d]	18.6	3.2	480		3
Berwick, ME	1.1	65	429	131	4.4
Somersworth, NH	2.4	143	225	285	9.5
Rollinsford, NH	0.15	18	38	24	1.2
Tributary NPS (Lower Great Falls Dam to the S. Berwick Dam)	0.3	0.1	1	N/A	0.1
South Berwick, ME	0.6	71	228	95	4.8
Great Works River	9.8	N/A	N/A	N/A	2.4
Reserve Capacity (~ 5% of Point Source Loads)		16	50	28	1.3
Total = TMDL [d]		316	1451		26.7

Other Recommendations

1. Include performance based TSS in point source limits. Require effluent DO limits of no less than 6.5 ppm for the Berwick and Somersworth WWTFs.
2. Non-Point sources - Implement BMPs on Great Works River Watershed as a priority. Implement BMPs throughout Salmon Falls Watershed, where feasible.
3. Implement simultaneous top and bottom releases from dams, where feasible, during low flow periods to minimize stratification of the bottom layers with emphasis on the Lower Great Falls, Rollinsford, and South Berwick Dams.
4. Ensure dams are operated at run-of-river during low flow periods.
5. Where possible, minimize water withdrawals during low flow conditions.
6. Re-evaluate TMDL after five years. If non-compliance of water quality standards continues to occur, modify the TMDL.

Notes:

a)Milton loadings for NH3 and Ultimate CBOD (UCBOD) are not shown because data suggest that Milton's impact for these pollutants at the LGF dam is relatively insignificant. This is due to the high dilution at Milton (165:1), its distance from the LGF dam (over 15 miles) and the assimilation of NH3 and UCBOD, which are non-conservative substances.

b) The TP loading for Milton is primarily based on holding current loadings to prevent possible localized excursions of DO water quality standards just downstream of the WWTF. Including a future reserve of 0.2 lb/day, the total TP load at this location is approximately 2.2 lb/day.

c) Loadings are based on the average of measured values in the LGF impoundment. To prevent possible excursions of DO downstream of the LGF dam (which was the primary focus of modeling efforts for this study) it is important to maintain loadings at or below those shown during summer low flow conditions. For NH3 and UCBOD, measured concentrations were fairly consistent from upstream of Milton to the LGF dam and are believed to be primarily due to natural sources. For reasons stated in note a) however, the river can actually handle higher loadings of NH3 and UCBOD than shown in the upper portions of the river as long as they do not cause violations of local DO standards or significantly impact the loadings shown at the LGF impoundment. The loading shown for TP accounts for losses of upstream TP due to uptake and settling.

d) The primary focus of modeling for this study was from the LGF dam downstream. Consequently the TMDL shown is equal to the sum of the allowable loads at the LGF dam (which does not include upstream loads which do not reach the LGF dam due to assimilation or settlement) and all loads downstream of the dam. If the upstream assimilated or settled loads were included, the TMDL would be higher.

Table 13. Revised: **Recommended Permit Limits for Phase 1 of TMDL**

A. Mass Limits

	Summer					Winter
	Total Phosphorus* (lb/day) Mo. Ave.	BOD5 / TSS (lb/day) Mo. Ave.	BOD5 / TSS (lb/day) Wk. Ave.	BOD5 / TSS (lb/day) Daily Max	Ammonia (lb/day) Wk. Ave.	Ammonia (lb/day) Mo. Ave.
Milton, NH	2.0	25	37.6	41.7	none	none
Berwick, ME	4.4	87	131	146	65	147**
Somersworth, NH	9.5	190	285	317	143	321**
Rollinsford, NH	1.2	16	24	27	none	none
S. Berwick, ME	4.8	63	95	106	none	none
Limits Apply	5/1 - 9/30	6/1 - 9/30				10/1 - 5/31

B. Concentration Limits

	Summer					Winter
	Total Phosphorus (ppm) Mo. Ave.	DO (ppm) Daily Min.	BOD5 / TSS (ppm) Mo. Ave.	BOD5 / TSS (ppm) Wk. Ave.	BOD5 / TSS (ppm) Daily Max	Ammonia (ppm) Mo. Ave.
Milton, NH	none	none	30	45	50	none
Berwick, ME	0.5	$\geq$ 6.5	10	15	17	16**
Somersworth, NH	0.5	$\geq$ 6.5	10	15	17	16**
Rollinsford, NH	1.0	none	14	20	22	none
S. Berwick, ME	1.0	none	14	20	22	none
Limits Apply	5/1 - 9/30	6/1 - 9/30				10/1 - 5/31

** These winter limits are based on the most stringent state standard currently in effect in ME and NH: ME's use of the 1992 EPA chronic AWQC of 2.7 ppm NH3 @ pH 7, temp. 10C. Both states intend to adopt EPA's revised chronic ammonia criteria in 1999. The EPA ammonia criteria were last updated in July 1998, and are scheduled for another revision in July 1999. By the time NPDES permits are written, the standards in effect may be different from those in this table, and permit limits will need to be recalculated.

Table 7. Revised **Ammonia Calculations***			
Winter: Using **Old** EPA Chronic AWQC of **2.7 ppm NH3** @ pH 7, temp.10C			
	Conc. (ppm)	Flow (mgd)	Mass (lb/d)
Natural Background NPS	0.02	18.5	3
Berwick, ME	16	1.1	147
Somersworth, NH	16	2.4	321
Reserve (below Ber. & Som.)			24
Total (below Ber. & Som.)	2.7	22	495
* Note: The purpose of the winter table is to calculate loads and concentration limits for Berwick and Somersworth using the old EPA chronic toxicity criteria.			

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Appendix B. Water Quality Standards:
WQS relevant to Lower Salmon Falls River - 5.5 mile segment from Berwick, ME to head of tide.

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Salmon Falls UAA/TMDL - **Water Quality Standards**
Relevant to Lower Salmon Falls River - 5.5 mile segment from Berwick, ME to head of tide.

Use/Criterion	ME Class C	NH Class B	ME class C/NH class B
Designated Uses	Drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation; navigation; and as habitat for fish and other aquatic life.	Fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies.	Drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation; navigation; and as habitat for fish and other aquatic life.
DO: - Daily minimum - Daily Average - Monthly Average - Fish spawning (10/1 to 5/14) - Extent	 >5 ppm and 60% of sat. N/A >6.5 ppm 7-day mean >9.5 ppm 1-day min.>8.0 ppm Entire water column	 >5 ppm >75% of saturation N/A 7-day mean >9.5 ppm 1-day min.>8.0 ppm Top 25% depth of therm strat. lakes & impound. DO below "as naturally occurs."[6]	 >5 ppm and 60% of sat >75% of saturation >6.5 ppm 7-day mean >9.5 ppm 1-day min.>8.0 ppm Entire water column

Use/Criterion	ME class C	NH class B	ME class C/NH class B
Aquatic Life	May cause some changes to aquatic life; support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.	No waste discharge inimical to aquatic life or to maintenance of aquatic life.	May cause some changes to aquatic life; support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.
Phosphorous/ Chlorophyll a	meet designated uses <10-20 ppb[5.]	< concentration that would impair any designated use. Treat discharges which encourage cultural eutrophication.	meet designated uses <10-20 ppb[5.] Treat discharges which encourage cultural eutrophication.
Bacteria - E. coli - geometric mean - instantaneous	142 per 100 ml. 949 per 100 ml.	126 per 100 ml. 406 per 100 ml.	126 per 100 ml. 406 per 100 ml.
Ph	6.0 - 8.5	6.5 - 8.0	6.5 - 8.0 (Not in UAA)
Ammonia toxicity (@pH 7) - summer extent - sum conc@25C - wntr conc@10C	6/1 - 9/30 1.23 ppm as NH3[1.] 2.7 ppm as NH3	6/1 - 10/31 2.5 ppm as NH3[2.] N/A[4.]	6/1 - 10/31 1.23 ppm as NH3[3.] 2.7 ppm as NH3[3.]
Metals or other parameters			The more stringent of criteria that would apply to ME class C or NH class B.

1. ME adopted EPA toxicity criteria by reference and DEP uses the most recent criteria in practice. Legally, the "old" EPA ammonia criteria (1992) are in effect until ME adopts the new EPA criteria. In summer, the Salmon Falls is limited by the effect of ammonia on dissolved oxygen, not on toxicity.
2. NH intends to adopt new EPA criteria in 1999, but currently has their own criteria, applicable only 6/1 - 10/31.
3. Technically/legally, the "old" EPA,, ammonia criteria are in effect (Table 7 was revised using the "old" EPA criteria).
4. The current NH ammonia toxicity criteria apply only in summer; a narrative standard exists which results in the new EPA ammonia criteria (3.08 ppm as N, or 3.75 ppm as NH3) being applied in permits in winter when necessary.
5. Policy, not regulation.
6. NH DES interprets "as naturally occurs" below the 25% depth "to mean as would occur naturally taking into account the presence of the impoundment." (Jan 5, 1999 letter from Gregg Comstock, NH DES to Paul Mitnik, ME DEP.) EPA understands that NH DES also interprets that dissolved oxygen can be depressed because of impoundments as long as dissolved oxygen is maintained at a level adequate to support existing and designated uses of the water quality classification (personal communication, Bill Beckwith, EPA, 11/17/99).

References:
Maine: 38 MRSA 464 - 465.
New Hampshire: Env-Ws 430 (Sept. 30, 1996), RSA 485-A:8 (bacteria criteria; description of class B waters).