TMDL Decision Document

TMDL: Northeast Regional Mercury TMDL

Status: Final

Date of U.S. EPA Decision: December 20, 2007

Impairment/Pollutant: Mercury

Background: The seven northeast states (CT, ME, MA, NH, NY, RI and VT) issued a draft TMDL on April 11, 2007. A public comment period was held from April 11, 2007 to June 8, 2007. The states submitted the final TMDL to EPA with a letter dated October 24, 2007. Because the states span two different EPA regions, EPA Region 1 is making the approval decision on the portion of the TMDL that applies to waters in the six New England states (CT, ME, MA, NH, RI and VT) and EPA Region 2 is making the approval decision on the portion that applies to waters in New York State.

TMDL REVIEW ELEMENTS

1. Description of Waterbody, Pollutant of Concern, Pollutant Sources and Priority Ranking

Identification of Waters

The TMDL is for inland waters within the seven states (CT, ME, MA, NH, NY, RI and VT) impaired by mercury primarily from atmospheric deposition. Waters included in the TMDL are listed or described for each state in Appendix A of the TMDL. Connecticut, Maine, and New Hampshire all have statewide fish consumption advisories, and use this as a basis for listing all freshwaters on their respective Section 303(d) lists as impaired due to mercury. All freshwaters in these three states are therefore included in the TMDL, except for certain waters known to have significant mercury contributions from local sources identified in Appendix A. Massachusetts, Rhode Island and Vermont also have statewide advisories, but only list waters on their Section 303(d) lists that have been assessed and found to be impaired. New York does not have a statewide advisory, but has identified a large number of waters as impaired for fish consumption due to atmospheric deposition of mercury. The names and ID numbers for each water in Massachusetts, Rhode Island, Vermont and New York included in the TMDL are listed in Appendix A. Table 5-1 in the TMDL report indicates the number of waters and river miles included in the TMDL for each state.

Pollutant of Concern

The pollutant of concern is mercury. Mercury is a multimedia global pollutant. Mercury is

emitted to the air, transported and then deposited to the soil and beds of rivers, lakes and streams, where a number of biological and chemical processes occur in the soils, waterbodies, and sediments that cause mercury to react with organic materials to form methylmercury, a highly toxic form of mercury. Methylmercury builds up, or bioaccumulates, in the bodies of animals, so fish at the top of the aquatic food chain are likely to contain higher mercury concentrations than fish lower on the food chain. Humans and wildlife are exposed to unsafe levels of methylmercury by eating contaminated fish.

Pollutant Sources

Sources considered by the states in the development of this TMDL include atmospheric mercury deposition, municipal wastewater treatment plants, non-municipal wastewater discharges, and stormwater. The states identified 97.9% of the total mercury load as coming from atmospheric deposition. Both natural and anthropogenic sources contribute to the atmospheric deposition mercury load. The TMDL document identifies natural sources as contributing 25% to the atmospheric deposition mercury load, while the remaining 75% is from worldwide anthropogenic sources.

Specific point sources identified by the states as contributing to the mercury load to waters covered by the TMDL are listed in Appendix C of the TMDL report. These sources include publicly owned treatment works (POTWs), and discharges from industries such as pulp and paper mills, chlor-alkali plants, and manufacturers of lighting equipment, chemicals, and metals.

For the purpose of describing the sources of pollutant loads and estimating the 1998 (baseline) total source load, the states considered the mercury loading from stormwater to be included in the estimate of loading from atmospheric deposition. This is because the vast majority (if not all) of the mercury in stormwater originates from atmospheric deposition. More information on how stormwater is addressed in the TMDL document is provided in the Wasteload Allocation section below (Section 5).

Priority Ranking

Priority ranking is addressed on page 12 of the TMDL document. While the priority given to mercury-impaired segments on Section 303(d) lists varies among the seven states, all states have demonstrated that restoring mercury-impaired waters is a high priority through their regionally coordinated actions to reduce mercury sources to the environment over the last decade. The states consider the mercury TMDL a continuation of this priority work.

Key Assumptions Made in TMDL Development

The northeast mercury TMDL takes a regional approach to mercury-impaired waters. Some key assumptions in the approach help to provide the basis for a TMDL encompassing a large number of mercury-impaired waterbodies in seven states. To support the regional scope of the TMDL, a statistical analysis (analysis of covariance) was conducted to examine the variation in fish mercury concentrations across the states. Such an analysis was conducted to show that the fish tissue concentration is not biased toward one state, and ultimately, that a regional approach is appropriate. In comments on the draft TMDL, EPA commented that the states should include

more information in the TMDL document to demonstrate that the regional approach is appropriate. EPA and several commenters also suggested that the states consider whether there may be areas that differ significantly from the rest of the region in terms of fish tissue concentrations, local sources, or other factors, and if so, to consider separating the single regional TMDL into sub-regions or separate TMDLs. Table 4-1 was subsequently added to the final TMDL. This table shows key results of the analysis and illustrates that fish tissue mercury concentrations did not vary significantly by state when length is accounted for.

The states also assumed that the mercury levels in fish would be reduced in proportion to the reductions in mercury deposition, based on the following supporting assumptions described in Section 5.5 of the TMDL document:

a. A reduction in emissions results in a proportional reduction in the rate of deposition.
b. A reduction in deposition results in a proportional reduction in mercury loading to waterbodies.
c. Within a given waterbody, a reduction in mercury loading in the water results in a proportional reduction in mercury concentrations in fish tissue.

These assumptions are consistent with the assumptions of several steady state ecosystem scale models used in the U.S. EPA Mercury Maps report (U.S. EPA, 2001a), including the Mercury Cycling Model and the IEM-2M Watershed Model. When atmospheric deposition is the main source of mercury to a given waterbody, at steady state (i.e., over long timeframes) these models predict a linear response between changes in deposition, ambient concentrations in water and sediments, and fish mercury levels. Using the relationships presented in these models and the Mercury Maps report, the northeast states derived a relationship between a baseline deposition value, a target fish tissue concentration, and a baseline fish tissue concentration (see equations on p. 17 of the TMDL document). The methodology used by the northeast states to establish the TMDL, i.e., using a fish tissue mercury concentration reduction factor to establish the loading capacity, relies on the principle of proportionality used in these equations and the U.S. EPA models.

Assessment: EPA concludes that the TMDL document adequately describes the waterbodies, pollutant of concern, pollutant sources, and priority ranking. EPA finds that the states' use of proportionality is consistent with assumptions contained in EPA mercury studies, and the states' use of this assumption in the establishment of the TMDL is reasonable given the current absence of more precise modeling (at a large spatial scale) of the link between mercury emissions and fish tissue concentrations. Finally, EPA believes that the analysis showing that fish mercury concentrations are comparable across the region supports the states' conclusion that the regional approach is appropriate. In addition, because the TMDL focuses only on those waters where atmospheric deposition is the predominant source and excludes waters that are known to have significant contributions from local sources, and because the northeast states have efforts underway to address mercury on a region-wide basis, EPA finds that using a regional approach for developing the TMDL in this case is reasonable.

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

Numeric and Narrative Mercury Standards

Section 3 of the TMDL Report describes the applicable water quality standards for the seven states. The water quality standards for Maine and Massachusetts include a methylmercury fish tissue criterion of 0.2 and 0.3 ppm, respectively, for human health protection. The remaining states (Connecticut, New Hampshire, New York, Rhode Island and Vermont) have human health water column criteria for total mercury that consider exposure to mercury through consumption of water and organisms as well as consumption of organisms only (the latter criteria are included in Table 3-1 of TMDL Report). Each state also has water column mercury criteria for the protection of aquatic biota (and New York also has a water column criterion for the protection of wildlife), but human health concerns generally result in more stringent controls.

In addition to their water quality standards programs, the states issue fish consumption advisories. Fish tissue values are used for developing the consumption advisories. New Hampshire, Rhode Island and Vermont use a fish tissue concentration value of 0.3 ppm, while Connecticut has a value of 0.1. In developing the TMDL, these states used the above consumption advisory fish tissue concentrations as the TMDL targets. Connecticut's target is based on the establishment of a 0.1 ppm fish tissue concentration by the Connecticut Department of Public Health (See Appendix B of the TMDL Report). The 0.3 ppm value used by New Hampshire, Rhode Island and Vermont is U.S. EPA's recommended fish tissue criterion for methylmercury (U.S. EPA, 2001b). New York chose to use the U.S. EPA's recommended criterion of 0.3 ppm as its TMDL target as well. The states indicated in the response to comments on the draft TMDL document that use of these fish tissue targets in the TMDL is appropriate, in part, because attainment of these targets will protect designated uses (fish consumption).

Since the states have varying fish tissue target values the TMDL is calculated to meet targets of 0.1 ppm (CT), 0.2 ppm (ME) and 0.3 ppm (MA, NH, NY, RI, VT).

Linking Fish Tissue Concentrations to Standards

Since Connecticut, New Hampshire, New York, Rhode Island and Vermont have water column criteria for mercury, it is necessary to determine whether or not the fish tissue targets will also assure that the numeric water column criteria are met for these states. The TMDL Report makes this comparison using a bioaccumulation factor (BAF) to directly relate the target concentration of mercury in fish tissue, expressed as mg/kg or ppm, to the expected concentration in the water column, expressed as ug/L. The TMDL Report indicates that a reasonable BAF for this regional area is in the range of 1,534,940/L to 2,046,585/L. Using the highest fish tissue concentration target of 0.3 ppm and the range of BAFs yields water column concentrations of 0.0001 to 0.0002 ug/L. These concentrations are lower than all of the state water column criteria, which range

from 0.0007 to 0.15 ug/L. Therefore, these calculations demonstrate that the water quality standards will be met when the fish tissue concentration targets are achieved.

Assessment: EPA finds that the TMDL Report adequately describes the applicable water quality standards and relevant criteria of each state. EPA believes that the TMDL Report provides a reasonable justification for the use of the state-specific fish tissue values of 0.1, 0.2 and 0.3 ppm as the water quality targets for the TMDL. EPA agrees that the TMDL Report adequately explains why it is reasonable to use these fish tissue values as the water quality target for the respective states, by indicating that the values have either been adopted as State water quality criteria or can be used to assure that applicable numeric water column criteria and designated uses will be met.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

Overview of TMDL Methodology

The states determined the loading capacity for the region using the following steps: 1) determination of the existing point and nonpoint source loads, which are summed to determine the total existing source load; 2) calculation of the reduction factor needed to achieve the target fish tissue concentration; and 3) calculation of the allowable mercury load by applying the reduction factor to the total source load. As described further below, the reduction factor is based on the reductions needed to achieve the fish tissue target of 0.3 ppm in each state, except for ME and CT, where the fish tissue targets are 0.2 ppm and 0.1 ppm respectively. The year 1998 was selected as the baseline for determining needed reductions. This year was chosen because the bulk of the fish tissue data used in the TMDL are centered around 1998, and it is prior to the enactment of significant mercury reduction requirements in the region.

Total Source Load

The Total Source Load (TSL) is the sum of the existing point and nonpoint source loads for the entire region. The total point source load is 141 kg/yr and the total nonpoint source load is 6,506 kg/yr, giving a total source load of 6,647 kg/yr. Section 7.2 of the TMDL report describes the calculation of the total source load, and is summarized below.

Point Source Load

The existing point source load was calculated by multiplying the median effluent concentration of NPDES permitted discharges by the sum of the design flows of each NPDES discharge. As shown in Table 6-3, the median concentration used to calculate the point source load is 7.7 ng/l, and the sum of the design flow is 13,322 MGD. Multiplying the median concentration by the sum of the design flows gives an existing point source load of 141 kg/year.

To determine the median concentrations and design flows, the states used available point source monitoring data from 1998 to 2005. Only data using EPA method 1631 were used, except for Rhode Island, which had data comparable to those using method 1631. Data from facilities with multiple samples were averaged to calculate a mean mercury concentration for each facility. For NH, which had no facility effluent data, and CT, which had data using another mercury

analytical method, the regional means and median concentrations were used to estimate the loadings from facilities in these states. Appendix C of the TMDL report lists the mean mercury concentrations at NPDES-permitted facilities used in calculating the baseline point source load. Facilities that discharge primarily cooling water are not expected to discharge mercury and were not included in the point source loading estimate. Facilities that discharge to coastal waters were also excluded from the total point source loading estimates, since the TMDL is for freshwater only; however, concentration data from coastal facilities was used in calculating the median and mean effluent concentrations. As discussed further in the WLA section of this decision document, the contributions from stormwater are not known but are expected to be predominantly from atmospheric sources, and were not used in calculating the median and mean point source effluent concentrations. Stormwater contributions were assumed to be included in the nonpoint source loadings for the purpose of this calculation and to avoid double-counting.

Nonpoint Source Load

The nonpoint source loading is considered to consist exclusively of loadings of mercury attributed to atmospheric deposition. The TMDL report indicates that other potential sources such as land application of municipal sewage are insignificant. The loading from atmospheric deposition is calculated as the sum of natural and anthropogenic mercury deposition.

Anthropogenic atmospheric deposition to the northeast region was determined using the Regional Modeling System for Aerosols and Deposition (REMSAD). Two model runs were conducted using 1998 and 2002 emissions inventories for the northeast region (defined for this TMDL as the New England states and New York). The contributions from global sources were obtained from the global GEOS-CHEM model, which was also used to determine the boundary conditions for the REMSAD model runs. The total modeled deposition includes the contribution from northeast states, the rest of the U.S., and global sources. Natural sources were not included in the modeled atmospheric deposition estimates, but were estimated as described below. As shown in Table 6-2, the total modeled anthropogenic deposition is 4,879 kg/yr for 1998 and 2,914 kg/yr for 2002.

As discussed in Sections 6.2 and 7.2, the TMDL assumes that deposition is 75% from anthropogenic sources and 25% from natural sources based on paeleolimnological studies in the northeast. The studies found that background or natural mercury deposition in the northeast ranged from 15 to 25% of the deposition in 2000, and such estimates are consistent with other published studies. The states chose to use the 25% level to be conservative. By combining the total modeled anthropogenic loads for 1998 (4,879 kg/yr) and the 25% from natural sources (1,627 kg/yr), the total nonpoint source load was calculated to be 6,506 kg/yr (see p. 28 of the TMDL document).

Reduction Factor

The reduction factor is the percent reduction needed to achieve the fish tissue target of 0.3 ppm for the 90th percentile of standardized length smallmouth bass. In Maine and Connecticut, the targets are 0.2 ppm and 0.1 ppm, respectively, for the 90th percentile standard length smallmouth bass. The existing fish tissue concentration was determined to be 1.14 ppm for the 90th

percentile standardized length smallmouth bass. Based on the existing fish tissue concentration and the target concentration, the reduction factor was calculated to be 0.74 for the target of 0.3 ppm; 0.82 for the 0.2 ppm target, and 0.91 for the 0.1 ppm target. To account for uncertainty, the reduction factor is also shown for the 80th percentile standard length smallmouth bass.

The existing fish tissue concentration was determined using a fish tissue database compiled by the Northeastern Ecosystem Research Consortium. The database contains fish tissue data collected from 1980 or later; however, the specific data used in developing the TMDL was primarily from the mid-1990s to early 2000s. To be included in the dataset, data needed to meet certain quality assurance and other screening criteria described in Section 4.1 of the TMDL document. The data base included data from all states covered by the TMDL except Rhode Island; thus, additional fish tissue data from Rhode Island were obtained for the TMDL. For the regional TMDL, data were analyzed for 13 species of fish. The number of samples analyzed by species and state, and the arithmetic mean concentration for each species across all 7 states, are shown in Table 4-1 of the TMDL report.

To account for differences in mercury concentrations due to fish age and length, mercury concentrations were calculated for a standard size fish. The states chose to use a 32 cm smallmouth bass as the standard size fish. Use of a standard size fish allows for a comparison of mercury concentrations across different waterbodies and sampling years. As described in Section 5.3 of the TMDL report, a statistical analysis was conducted in order to adjust fish mercury concentrations in the dataset in terms of the standard size fish. The smallmouth bass was chosen as the target species, as it accumulates mercury most efficiently, and is distributed throughout the region. In addition, smallmouth bass are sampled uniformly across the states compared to other species, and, as a top predator fish, are also relatively high in mercury. Other fish considered as the target species were high in mercury but not sampled uniformly, or, conversely, were sampled widely but had lower mercury concentrations.

The TMDL report describes how the choice of the 90th percentile standard length smallmouth bass as the target concentration is adequately protective. The 90th percentile value of 1.14 ppm for smallmouth bass is equivalent to the 96th percentile concentration for all fish species. Thus, at least 96 percent of fish are expected to meet the fish tissue target. Because of uncertainty related to a variety of factors affecting reduction estimates, the TMDL report also shows the existing and target concentrations for the 80th percentile standard length smallmouth bass. However, to be conservative the states ultimately selected the 90th percentile for the TMDL reduction target, as noted above.

Loading Capacity

The loading capacity was calculated by multiplying the total source load by the applicable reduction factor using the 90th percentile fish tissue targets. For the states with a target of 0.3 ppm, the loading capacity is 1,750 kg/yr or 4.8 kg/day; for Maine (with a target of 0.2 ppm) the loading capacity is 1,167 kg/yr or 3.2 kg/day; for Connecticut (with a target of 0.1 ppm) the loading capacity is 583 kg/yr or 1.6 kg/day. Section 7.4 of the TMDL document presents the loading capacity as annual loads and Section 8.0 presents the daily loads.

Critical Conditions
The TMDL report notes in sections 4.2 and 7.8 that there are some factors, such as water chemistry and water level fluctuations in combination with enhanced deposition of acid forming precursors and enhanced mercury deposition, that make conditions more favorable for mercury accumulation in fish. However, the report explains that these are not short-term critical conditions, but rather factors that contribute to greater accumulation of mercury in fish over long periods of time. Therefore, there are no critical times or hydrologic conditions of concern, but rather critical areas (referred to as sensitive areas in the TMDL report) where these factors have produced elevated fish tissue concentrations in comparison to background regional levels. Specific geographic areas that may be more sensitive are identified in the TMDL report. The degree to which these areas will respond to mercury reductions is unknown. Because these areas are more sensitive, it is possible that they may experience a more rapid decrease in fish tissue concentrations than surrounding areas. The TMDL report indicates that these areas will be closely monitored during the implementation period. Depending on whether or not these sensitive areas respond sufficiently to reductions in mercury loadings, the states will determine whether additional reductions are needed.

Table A-1 in Appendix A identifies waters (noted with an asterisk) that are excluded from this regional TMDL. Twenty of these waters are located in northeastern Massachusetts and have elevated fish tissue concentrations as a result of high levels of localized atmospheric deposition. Appendix A also lists a few waters in Connecticut and New Hampshire that are excluded from the TMDL due to the presence of local sources.

Assessment: EPA finds that the Mercury TMDL submitted by the states adequately identifies the loading capacity and accounts for critical conditions. The states' overall methodology of calculating the loading capacity by applying a reduction factor to the total source load is acceptable. The assumptions regarding use of a reduction factor are explained further in Section 1. The use of 1998 as the baseline for determining needed reductions is also reasonable given the clustering of fish tissue data around this year and given that the effects of the mercury reduction requirements initiated by the states after 1998 may not yet be fully realized.

The approaches for determining the total point source loads, total nonpoint source loads, and total source loads are acceptable. The use of median effluent concentrations and design flows is appropriate for determining the total point source load. EPA believes that it is reasonable to use the regional median and mean effluent concentrations to calculate loadings from the sources in NH and CT for which facility-specific data are not available, as the median can reasonably be expected to reflect the range of effluent concentrations in these states. Based on the consideration that the nonpoint source load is from atmospheric deposition, combining the contributions from anthropogenic and natural sources of deposition is appropriate for determining the total nonpoint source load. REMSAD and GEOSCHEM models are peer-reviewed models that are reasonable for use in estimating atmospheric deposition from anthropogenic sources, while use of published paleolimnological studies to estimate deposition

from natural sources is also acceptable. [a]

The states' choice of smallmouth bass as the target species is reasonable based on its high mercury concentration and the presence of the species throughout the region. Use of a standard length fish is an appropriate approach for taking into account variations in mercury due to fish age and length, and the use of the 90th percentile standard length fish ensures that 96% of all fish will meet the target. EPA believes that using the 90th percentile smallmouth bass, or 96% of all fish, is adequately protective given the expected variability of fish tissue response to mercury reductions (i.e., some fish will likely show greater improvements than expected and others may show lesser improvements), the analytical uncertainties, and the fact that most fish data may not yet reflect the results of significant mercury reductions in the region.

EPA also concludes that the TMDL has considered critical conditions. A small number of waters in Massachusetts, Connecticut, and Southeastern New Hampshire that have high levels of fish tissue concentrations as a result of local sources have been excluded from the TMDL. EPA believes that it is appropriate to address such waters separately from the regional TMDL, as they may not achieve water quality standards based on the regional TMDL calculation. Other potentially sensitive areas included in the TMDL have been identified and will be monitored and evaluated. EPA believes that including these sensitive waters in the TMDL is appropriate, as these waters are expected to achieve water quality standards under this TMDL given their greater sensitivity to changes in mercury loadings. However, the states indicate that they may modify their approach to these waters depending on how these waters respond to mercury reductions.

4. Load Allocations (LAs)

Based on the 0.3 ppm target concentration for the 90th percentile standard length fish, the load allocation for the northeast region is 4.69 kg/day. For the Maine target of 0.2 ppm and the Connecticut target of 0.1 ppm, the load allocations are 3.13 kg/day, and 1.56 kg/day, respectively. The load allocations are gross allotments for all of the nonpoint sources collectively (predominantly atmospheric deposition) and apply on a region-wide basis.

To determine the load allocations, the states first determined the loading capacity for each target concentration by applying the appropriate reduction factor to the total source load. As described in Section 7.3 of the TMDL, the reduction factors are 0.74, 0.82, and 0.91 for the targets 0.3 ppm, 0.2 ppm, and 0.1 ppm respectively. The WLA was set at 2.1% of the loading capacity, as described further below. The LA was determined by subtracting the WLA of 2.1% from the loading capacity for each target concentration, based on the TMDL equation: Loading Capacity = WLA + LA + MOS. Because this TMDL uses an implicit MOS rather than an explicit MOS (as described in Section 7.7 below) the value for MOS in this equation is zero,

[a] EPA notes that other approaches and models, such as the Community Multi-Scale CMAQ, are available for estimating atmospheric deposition. EPA guidance does not specify that a particular model or models should be used in TMDLs.

The final allocations being approved are the daily loads for the 90th percentile standard length smallmouth bass, as shown in Section 8 of the TMDL document. For the states with a target of 0.3 ppm, the LA is 4.69 kg/day.[b] For Maine the LA is 3.13 kg/day, and for Connecticut the LA is 1.56 kg/day.

Consistent with the definition of load allocation at 40 CFR 130.2(g), the TMDL document separates out the contributions from natural sources to the load allocation. Natural sources are estimated to contribute as much as 25% of the load allocations, and anthropogenic sources are assumed to contribute the remaining 75% of the load allocations. The TMDL document indicates that reduction efforts will focus on the anthropogenic portion of the load allocations.

Assessment: EPA finds that the load allocations are adequately specified at levels that, when combined with the wasteload allocations, establish TMDLs at the levels necessary to attain and maintain water quality standards. As described above, a TMDL is established to meet the target of 0.3 ppm in each state except for ME and CT, where TMDLs are established at levels necessary to meet 0.2 ppm and 0.1 ppm respectively. As defined at 40 CFR 130.2(d), the load allocation may be a gross allocation depending on the available data and approach for determining the loading. The predominant nonpoint source of mercury to the waters included in the TMDL is atmospheric deposition. Given that, and that the relative contribution from atmospheric sources is considered to be similar across the waterbodies included in the TMDL, a gross allocation is reasonable.

Section 7.6.2 of the TMDL document describes the in-region and out-of-region contributions to the anthropogenic deposition loads, identifies reductions from the in-region vs. out-of-region sources that could meet the load allocations, and suggests the level of reductions that should be achieved in each of three phases of implementation. The information on in-region vs. out-of-region contributions and phases of reductions, although reviewed by EPA, is not considered part of the approved load allocations. EPA considers the specifics regarding where or how necessary reductions will be achieved, while important information, to be part of implementation, and therefore these provisions are not being approved or disapproved in this decision.

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[b] The daily WLA and LA can be derived from equations in the TMDL as follows: For the group of states other than ME and CT, the loading capacity is [WLA (38 kg/yr) + LA (1,712 kg/yr)]/365 = 4.8 kg/day. For ME and CT, the loading capacities are, respectively: (25 kg/yr + 1,141 kg/yr)/365 = 3.2 kg/day; and (13 kg/yr + 571 kg/yr)/365 = 1.6 kg/day. Based on these equations, it follows that the LA for the group of states other than ME and CT is 4.8 kg/day – (38 kg/yr/365) = 4.69 kg/day, and the LAs for ME and CT are respectively: 3.2 kg/day – (25 kg/yr/365) = 3.13 kg/day; and 1.6 kg/day – (13 kg/yr/365) = 1.56 kg/day. Although EPA is approving the daily loads, the TMDL report also includes an annual expression of the WLA and LA. In addition, the TMDL report includes both a daily load and annual load expression for the 80th percentile and the 90th percentile standard length fish.

5. Wasteload Allocations (WLAs)

The wasteload allocations are described in Section 8 of the TMDL document, and work out to 0.104 kg/day for the states with a fish tissue target of 0.3 ppm, 0.07 kg/day for Maine (which has a fish tissue target of 0.2 ppm) and 0.04 kg/day for Connecticut (which has a fish tissue target of 0.1 ppm). The states did not assign wasteload allocations to individual point sources; rather, the states established a gross wasteload allocation for each of the three reduction targets. This aggregate approach was taken due to the specific circumstances of this TMDL, including that the total wasteload allocation represents a very small fraction (only 2.1%) of the total allocation to the northeast states, the overwhelming majority (97.9%) of the mercury load is from widespread atmospheric sources, and waters significantly impacted by point sources have been excluded from the TMDL (and will be addressed through other means).

The wasteload allocations were set at 2.1%, which is the percentage of the baseline total source load estimated to be from point sources. The TMDL document explains that this was done because substantial reductions have already been achieved at these point sources, and the remaining loads spread among the approximately 3000 facilities are extremely small. Given that almost all of the total source load is coming from nonpoint source atmospheric deposition, the states chose to focus reduction efforts on the nonpoint source portion of the source load and to ensure that point sources remain small. In addition, the TMDL document states that the ongoing implementation of mercury minimization plans together with other region-wide mercury reduction efforts will help ensure that these discharges will continue to decrease and will have no reasonable potential to cause or contribute to an exceedence of water quality standards. The TMDL document also states that each permit will be analyzed, as appropriate, to prevent any localized exceedences of the wasteload allocation, and that all new or increased discharges will be required to stay below the regional wasteload allocation.

The 2.1% WLAs also apply to mercury contributions from regulated stormwater. The regulated stormwater portion of the WLAs include both mercury from atmospheric sources and mercury from any local sources within the watershed. The TMDL document notes that implementation of the atmospheric portion will be accomplished using the same strategy and approach as is outlined for implementation of the load allocation. The local watershed sources (which are extremely small, when present), will be addressed through stormwater management practices and ongoing local source reduction efforts. Because the magnitude of the non-atmospheric component is so small, both the atmospheric and non-atmospheric components are combined into the aggregate WLAs.

The TMDL does not set aside an allocation for future growth. This is because the Northeast states have agreed to a goal of virtual elimination of mercury and have passed a variety of laws to phase out in-region mercury sources. Mercury amounts generated by the northeast states have steadily declined since 1998. To the extent that new or increased discharges might occur, the states have indicated that these discharges will be required to stay below the regional wasteload allocation, as indicated above. Accordingly, no reserve capacity is believed to be needed.

Assessment: In most circumstances, EPA would expect TMDLs to include individual wasteload allocations for each facility with an NPDES-permitted discharge per 40 C.F.R. § 130.2(h) and EPA guidance. However, the use of aggregate WLAs is acceptable in this case because the total discharge from these facilities makes up such a small percentage of the overall source load (2.1%), is spread among an unusually large number of sources (approximately 3000), and the TMDL document indicates that all regulated point source discharges will be analyzed to prevent any localized exceedences of water quality standards and to ensure that the aggregate WLAs are met. By including these statements, the TMDL document indicates how the aggregate WLA would be implemented at the individual point source level, consistent with 40 C.F.R. § 130.2(h).

Regulated stormwater (i.e., stormwater discharges subject to NPDES permit programs such as the Phase I and II stormwater programs and the construction permit program) is appropriately included in the WLAs. The small size of the WLAs is reasonable given that nearly all of the mercury in stormwater originates from atmospheric sources and will be addressed at its source via the implementation strategies developed for the load allocations, and that any stormwater mercury not from atmospheric sources (typically minute amounts) will be addressed through local source reduction efforts and stormwater management practices. It is also reasonable to combine the atmospheric and local mercury contributions to stormwater into aggregate WLAs, because of the insignificance of the local components.

Given that mercury levels in the northeast states have been declining over the last 10 years and are expected to continue to decline, it is reasonable that no allocations are set aside for future growth.

EPA concludes that the wasteload allocations are adequately specified in the TMDL at levels sufficient (when combined with the load allocation) to attain and maintain water quality standards, and that future growth is adequately addressed. EPA finds that the use of a gross WLA is acceptable in this circumstance because, 1) the point source discharges are a very small percentage of the total source load, 2) this small portion of the load is spread among an unusually large number of sources (approximately 3000), and the TMDL document includes statements indicating that all discharges will be managed consistent with the aggregate WLA.

6. Margin of Safety (MOS)

The TMDL Report identifies several conservative assumptions that provide an implicit MOS for the TMDL. These factors include:

- The assumption that 25% of atmospheric sources of mercury are natural. According to the TMDL Report, this load can be as low as 15%. The data is based on sediment cores taken from rural locations where the contributions from natural sources are likely to be higher. The Northeast Regional Mercury TMDL includes more urbanized areas and would therefore have a lower range of contribution from natural sources;
- The percent reduction for the TMDL does not account for additional reductions in methylmercury that may occur as a result of the implementation of ongoing state and

federal programs to reduce sulfur emissions. Reductions in sulfur deposition and sulfate-reducing bacterial activity will decrease the rate of mercury methylation.

Assessment: EPA concludes that the Northeast Regional Mercury TMDL includes an adequate MOS.

7. Seasonal Variation

Seasonal variation is discussed in Section 7.8 of the TMDL Report which notes that while "mercury deposition and concentrations in water may vary due to seasonal differences in wind patterns" this does not result in seasonal differences in concentrations in fish because mercury bioaccumulates in fish over their life spans.

Assessment: EPA concludes that the TMDL has accounted for seasonal variation. Although there may be seasonal variation in mercury methylation, this variation does not have a significant impact on fish tissue concentrations over the life span of a fish. The TMDL fish tissue target is based on the protection of human health. TMDLs developed using human health criteria are generally based on long-term exposures.

8. Monitoring Plan

The TMDL report discusses monitoring in several sections of the document, including Sections 4.1, 4.2 and 9 and the Response to Comments. The report indicates that existing state programs for the monitoring of mercury concentrations in fish tissue will continue as the TMDL is implemented, to monitor progress towards attainment of the TMDL targets. While smallmouth bass concentrations will be used as the primary indicator to judge whether TMDL goals are being met, mercury concentrations will continue to be measured in a wide variety of other fish species, including perch and trout, providing funding continues to be available. The TMDL report also notes that sensitive areas with elevated mercury concentrations will be monitored especially closely to determine whether they are responding adequately to implementation measures.

Assessment: EPA concludes that the TMDL report adequately describes plans for future monitoring to track effectiveness of the TMDL, although EPA is not approving these recommendations for monitoring through this decision.

9. Implementation Plans

Section 9 of the TMDL document includes a detailed implementation plan and a state-by-state compilation of mercury control programs. The TMDL uses an adaptive implementation approach which includes three phases. Phase I (1998-2003) and II (2003-2010) goals rely on the reductions from agreements made through the regional Mercury Action Plan (MAP) agreed to by

the Conference of the New England Governors and Eastern Canadian Premiers (NEG-ECP). The MAP goals include: 50% reduction of regional mercury emissions by 2003; 75% reduction by 2010. The regional Mercury Task Force (MTF) includes representatives from the New England states and Eastern Canadian provinces and reports on the progress towards meeting the goals of the MAP. Phase III (beyond 2010) of the implementation plan does not include a specific goal but does include a re-evaluation of emission reductions, deposition and fish tissue concentrations in order to establish additional mercury reductions programs to achieve standards.

The TMDL document describes the legislation in each of the states requiring stringent reductions in mercury from coal-fired utilities (Table 9-1), and that the states have chosen not to participate in the cap-and-trade approach allowed under the Clean Air Mercury Rule (CAMR). The TMDL document also describes efforts in each of the states to reduce mercury in other air sources and products containing mercury, as well as regional efforts. The next phase of the MAP will be to focus on reductions from four other categories: sewage sludge incinerators (SSIs); municipal waste combustors (MWCs); area sources; and residential heating/commercial and industrial oil combustion. Through the NEG-ECP MTF process, the New England states have committed to the virtual elimination of mercury.

New York is not a member of NEG-ECP, but has been participating in the regional mercury study and in the development of the MAP. The State has established its own Mercury Task Force and participates in several regional efforts. Similar to the New England states, New York has enacted legislation to control use of mercury in products, require installation of amalgam separators and has set emissions limits for MWCs.

Although point sources are considered insignificant, further reductions in wastewater concentrations are anticipated based on legislation in all states which requires the installation of amalgam separators, household products legislation, and several other pollutant minimization efforts that vary by state.

The TMDL document indicates that the Northeast states are already addressing all mercury sources within their control and that greater reductions are needed from out-of-region sources. The adaptive implementation approach will monitor the implementation of regional and national controls and the response in fish tissue concentrations and if needed, the reduction goals will be modified.

Assessment: While, the TMDL document includes a detailed discussion of implementation activities and outlines the mercury reduction efforts in each state, EPA is taking no action on the implementation plan. The TMDL includes statements summarizing the states' position regarding the adequacy of CAMR and the recommendation for a Maximum Achievable Control Technology (MACT) standard. As conveyed in our comments on the draft TMDL, EPA considers these statements to be part of implementation rather than part of the TMDL calculation and therefore is not commenting or taking action on them. EPA notes, however, that the Agency does not believe anything in the TMDL document provides new or additional authority to regulate the sources of atmospheric deposition.

10. Reasonable Assurances

Section 10 of the TMDL document provides discussion of reasonable assurances based on activities at the state, regional, national, and international levels. In considering reasonable assurance, EPA took into account both the discussion in Section 10, as well as the discussion in Sections 7 and 9 of the TMDL document regarding activities to achieve the wasteload allocation.

The New England states have demonstrated a commitment to the reduction of mercury through regional and state-specific efforts. Under the New England Governors-Eastern Canadian Premiers Mercury Task Force (NEG-ECP), the New England states have adopted a regional Mercury Action Plan with a goal of virtual elimination. Although not a member of the NEG-ECP, New York State also has programs demonstrating a commitment to mercury reduction. The states have adopted strict emission limits on MWCs and municipal waste incinerators, resulting in respective reductions in emissions of 87% and 96.6% for these two sectors. Emission reductions have been achieved in other sectors as well, as shown in Table 10-1. To date, there has been a 70% reduction in regional mercury emissions between 1998 and 2002, and a 74% reduction in deposition. The five states with coal-fired utilities have adopted legislation requiring reductions in emissions from coal-fired utilities, and additional efforts are planned to reduce emissions from other sectors. Given the existing requirements and the states' progress in significantly reducing mercury emissions, EPA believes that the states will continue to implement mercury reduction programs at the state and regional levels. Such programs will in turn enable progress toward achieving the load allocation.

As described in Sections 2.5 and 7.5 of the TMDL document, point sources are considered to be insignificant. Point sources contribute 2.1% of the total source load, and therefore the WLA is set at 2.1% of the TMDL. As each of the states has requirements to install dental amalgam separators as well as mercury products legislation, the point sources are expected to decline even further. State-specific programs include efforts to address use, recycling, and disposal of mercury-containing products. Mercury minimization plans will also be implemented to reduce mercury discharges. The states will conduct analyses on a permit by permit basis to prevent exceedances of the WLA on a site-specific basis. EPA believes that the states' efforts to reduce mercury entering the waste stream, together with analyses at the permit stage as appropriate, will ensure that the WLA is not exceeded.

The states point out that reductions needed to achieve the TMDL must come not only from sources within the northeast region but also from sources outside the region. The states identify national and international programs focused on reducing mercury. Such efforts will also contribute toward achieving the load allocation. National programs include the Clean Air Mercury Rule (CAMR) and the National Vehicle Switch Recovery Program, while international efforts include programs under the Commission on Environmental Cooperation and United Nations Environment Program. As described in Section 9, the TMDL document includes statements summarizing the states' position regarding the adequacy of CAMR and the recommendation for a Maximum Achievable Control Technology (MACT) standard.

Assessment: EPA believes that the TMDL adequately quantifies the water quality problem due to mercury in the waters covered by the TMDL and identifies the load reductions needed in order for those waters to achieve water quality standards. The TMDL describes comprehensive ongoing and planned state, national and international activities designed to achieve substantial reductions from sources described in the load allocation. In addition, and most importantly, existing point source contributions are an insignificant part of the total source load. In light of these factors, EPA concludes that the TMDL's wasteload allocation is reasonable. As noted above and in the previous section, EPA views the statements regarding the adequacy of CAMR and the recommendation for a MACT standard to be part of implementation and therefore is not commenting or taking action on these statements.

11. Public Participation

Section 11 of the TMDL document describes the public participation process. Each of the seven states conducted public participation in accordance with its own procedures. The New England Interstate Water Pollution Control Commission (NEIWPCC) and each of the states posted the TMDL on their websites. Six of the seven states published notice of the TMDL in local newspapers, and a total of eight public meetings were conducted during April and May 2007. Several states also issued press releases, and a few notified groups likely to have an interest in the TMDL. Specific activities conducted by each state are summarized in Table 11-1.

The draft TMDL was released for public comment April 11, 2007 for a 59-day comment period. Comments on the draft TMDL were provided to NEIWPCC and the states from 14 different groups. Where appropriate, the TMDL document was revised in response to public comments. The responses to comments are included in Appendix E of the TMDL.

Assessment: In reviewing the TMDL document, EPA reviewed the public comments and the states' responses. EPA finds that the states' public participation actions satisfy the requirement in 40 CFR 130.7(c)(1)(ii) that TMDLs be subject to public review in accordance with state procedures. In addition, EPA concludes that the states adequately responded to public comments.

12. Submittal Letter

Assessment: A letter to EPA dated October 24, 2007 and signed by the Commissioners of the environmental departments of CT, MA, ME, NH, NY and RI, and the Secretary of the Vermont Agency of Natural Resources, indicates that the TMDL document is being submitted under Section 303(d) of the Clean Water Act for review and approval.

References

U.S. EPA, 2001a. *Mercury Maps, A Quantitative Spatial Link Between Air Deposition and Fish Tissue.* EPA-823-R-01-009. U.S. Environmental Protection Agency, Office of Water, Washington, D.C.

U.S. EPA, 2001b. *Water Quality Criterion for the Protection of Human Health: Methylmercury,* January 2001, EPA-823-R-01-001. U.S. Environmental Protection Agency, Office of Science and Technology, Office of Water, Washington, D.C.