TMDL: Choride - Beaver Brook, Derry and Londonderry, NH
Date of Review: January 14, 2009

REVIEW ELEMENTS OF TMDLs

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. § 130 describe the statutory and regulatory requirements for approvable TMDLs. The following information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation.

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

The TMDL analytical document must identify the waterbody as it appears on the State/Tribe's 303(d) list, the pollutant of concern and the priority ranking of the waterbody. The TMDL submittal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and location of the sources. Where it is possible to separate natural background from nonpoint sources, a description of the natural background must be provided, including the magnitude and location of the source(s). Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources; (3) present and future growth trends, if taken into consideration in preparing the TMDL; and, (4) explanation and analytical basis for expressing the TMDL through *surrogate measures*, if applicable. *Surrogate measures* are parameters such as percent fines and turbidity for sediment impairments, or chlorophyl *a* and phosphorus loadings for excess algae.

A. Description of Waterbody

The impaired reach of Beaver Brook is approximately 4.86 miles in length and encompasses a single assessment unit (NHRIV700061203-16). The watershed area is approximately 30.33 square miles. More detailed information, including land use, is provided on page 1 of the TMDL report.

B. Pollutant of Concern

The TMDL report identifies chloride as the pollutant of concern (page 1).

C. Pollutant Sources

The report describes the sources of chloride and the relative contribution of each source to the receiving water. Sources of chloride include atmospheric deposition (1%), water softeners (2%), food waste (1%), state roads (10%), municipal roads (37%), private roads (5%), and parking lots (44%).

D. Priority Ranking

Beaver Brook was listed on New Hampshire's 2006 303(d) list as being impaired for chloride. TMDL development was a high priority for the State of New Hampshire.

Assessment: EPA concludes that the TMDL document satisfies the requirements of the above category.

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

The TMDL submittal must include a description of the applicable State/Tribe water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard is attained) must be identified. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, usually site specific, must be developed from a narrative criterion and a description of the process used to derive the target must be included in the submittal.

The TMDL document includes a description of the applicable water quality standards including designated uses, the numeric water quality criterion, and the antidegradation policy (page 3).

Beaver Brook is a Class B waterbody. The numeric water quality criterion for chloride applicable to this Class is a concentration not-to-exceed 860 mg/L for acute exposures or 230 mg/L for chronic exposures. Acute aquatic life criteria are based on an average concentration over a one-hour period, and chronic criteria are based on an average concentration over a period of four days. The frequency of violations for either acute or chronic criteria should not be more than once every three years.

Monitoring data for Beaver Brook revealed exceedences of both the acute and the chronic water quality criterion. The chronic criterion was chosen as the target for this TMDL because the concentration is lower than the acute criterion and thus represents a more conservative target.

Assessment: EPA concludes that the TMDL document satisfies the requirements of the above category.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

As described in EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. 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)). The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. § 130.2(I)). The TMDL submittal must identify the waterbody's loading capacity for the applicable pollutant and describe the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In most instances, this method will be a water quality model. Supporting documentation for the TMDL analysis must also be contained in the submittal, including the basis for assumptions, strengths and weaknesses in the analytical process, results from water quality modeling, etc. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation.

In many circumstances, a *critical condition* must be described and related to physical conditions in the waterbody as part of the analysis of loading capacity (40 C.F.R. § 130.7©)(1)). The critical condition can be thought of as the "worst case" scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. *Critical conditions* are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. *Critical conditions* are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards.

The loading capacity in this TMDL is presented in three ways: 1) as a load duration curve, 2) a percent reduction, and 3) as annual allowable loadings. The load duration curve represents the primary expression of the TMDL, and is depicted as a graph where at any given stream flow an allowable loading of chloride can be determined (see Figure 5). In EPA's opinion, the two alternative expressions of the TMDL are very important for two principal reasons: 1) to facilitate implementation, as the load duration curve may be perceived as difficult to interpret, and 2) to ensure that chloride loading that takes place during deicing activities does not have a delayed impact on the stream later in the year, during low-flow conditions, via the groundwater pathway.

EPA agrees that the load-duration approach is an acceptable way of determining daily loads in stormwater TMDLs, especially because of the dynamic nature of pollutant loadings and waterbody flows. In an EPA memorandum from Assistant Administrator Benjamin H. Grumbles, dated November 15, 2006, it is stated that "In situations where pollutant loads, waterbody flows, or other environmental factors are highly dynamic, it may be appropriate for TMDLs and associated allocations to be expressed as functions of controlling factors such as water body flow. For example, a load-duration curve approach to expressing a TMDL and associated allocations might be appropriate, provided it clearly identifies the allowable daily pollutant load for any given day as a function of the flow occurring that day." A more recent guidance document (EPA, 2007),

entitled "An Approach for Using Load Duration Curves in the Development of TMDLs" was used by the NHDES to develop the TMDL for Beaver Brook. This EPA guidance document includes a specific example for chloride.

It is important to note that the load-duration approach may not be appropriate in all circumstances, such as where the impairment is due to continuous discharges from municipal or industrial facilities. In the case of this TMDL, the impairment is due to pollutant loadings from intermittent stormwater events (including snow melt runoff), and aquatic life are less frequently exposed to the pollutant of concern. This "recovery time" is a critical link in the maintenance of biological integrity.

As previously mentioned, this TMDL was also expressed as both a percent reduction and annual allowable loadings. The percent reduction in chloride loading to Beaver Brook that would result in meeting water quality standards was calculated to be 28% (page 15); this estimate was based upon monitoring data for FY05, which had the largest salt import for the period of FY04-FY07. In FY04 and FY05, salt imports were 10,084 and 12,641 tons/year, respectively. Water quality violations were reported during this time-period. In FY06 and FY07, salt imports were 10,432 and 6,380 tons/year, respectively. There were no water quality violations during this time-period. The NHDES surmised that the apparent threshold for water quality criteria violations must be where the two ranges overlap. So, the NHDES reduced the FY04 salt import estimate (10,084) by 10% to derive an allowable annual load of 9,069 tons/year (Table 6). Given the available salt loading estimates and continuous instream monitoring over the past few years, the EPA concurs that this is a reasonable starting point. The NHDES intends to use future continuous monitoring and salt application load tracking to refine these estimates if necessary. Ultimate compliance with water quality standards and the TMDL will be achieved when monitoring indicates that instream chloride criteria are met.

Since 96% of the salt imports to the watershed are from deicing activities, it is important to discuss the timing of the salt loadings and the exceedences of water quality criteria, which can occur during summertime low-flow periods. Although monitoring data has not shown this to be the case in Beaver Brook, it has been documented in other I-93 watersheds. Since chloride is a soluble pollutant, it has the propensity to move readily through the soil and into groundwater. Groundwater is not a source of chloride, but rather a pathway to the stream. Chloride from salt applied during the winter months may be stored in groundwater and released later in the year. It is important to continue monitoring in Beaver Brook throughout the year, in order to detect such a problem should it occur in the future.

Critical conditions have been adequately addressed because allowable loadings are presented for the entire range of stream flows and for all seasons.

Assessment: EPA concludes that the NHDES met the statutory and regulatory requirements of a TMDL, including daily loads, and also expressing the TMDL using two alternative approaches. EPA is approving the Load Duration Curve and the two alternative approaches and believes that all three are necessary to ensure that water quality standards will be attained in Beaver Brook. In

EPA's opinion, the alternative expression of the allocations as percent reductions and annual allowable loadings are important to ensure that salt applied during the winter for deicing activities does not result in exceedences of water quality standards later in the year, during low-flow conditions, and also to facilitate implementation. Throughout the TMDL development process, the NHDES utilized the best available data and information.

4. 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(g)). Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. § 130.2(g)). Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.

If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero load allocation, the LA must be expressed as zero. If the TMDL recommends a zero LA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero LA implies an allocation only to point sources will result in attainment of the applicable water quality standard, and all nonpoint and background sources will be removed.

The NHDES utilized the percent jurisdictional area approach, as described on page 8 of EPA's Load Duration Curve guidance (EPA 2007), to proportion the load and wasteload allocations. In this approach, the chloride load from the land area outside of the MS4 boundary is categorized as the load allocation, and the chloride load from the land area inside of this boundary is categorized as the wasteload allocation. Because 34% of the watershed is outside the MS4 boundary, the LA would be 34% of the loading capacity. Any nonpoint source discharges or non-regulated point source discharges within the MS4 boundary are included in the wasteload allocation, as explained below.

Assessment: EPA requested additional information from NHDES to better understand the percentage of sources that should be subject to load allocations and wasteload allocations. First, the State clarified in a phone conversation with EPA on October 15, 2008 that the TMDL should not be read to require that 34% of the necessary reductions be achieved by nonpoint sources and non-regulated point sources, and 66% of the necessary reductions be achieved by regulated point sources. Rather, the TMDL requires across-the-board reductions based on activity type. Second, as discussed in more detail below, the State's analysis revealed that more of the load is generated from within the urbanized area, and less from outside the urbanized area, than the percent jurisdictional area approach would suggest. The State also provided reasonable assurance that reductions from non-regulated sources would be achieved; this is discussed further below in the wasteload allocation section, as is the basis for EPA's approval of the load and wasteload allocations.

5. 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(h)). If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero. If the TMDL recommends a zero WLA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero WLA implies an allocation only to nonpoint sources and background will result in attainment of the applicable water quality standard, and all point sources will be removed.

In preparing the wasteload allocations, it is not necessary that each individual point source be assigned a portion of the allocation of pollutant loading capacity. When the source is a minor discharger of the pollutant of concern or if the source is contained within an aggregated general permit, an aggregated WLA can be assigned to the group of facilities. But it is necessary to allocate the loading capacity among individual point sources as necessary to meet the water quality standard.

The TMDL submittal should also discuss whether a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. In such cases, the State/Tribe will need to demonstrate reasonable assurance that the nonpoint source reductions will occur within a reasonable time.

The NHDES established the wasteload allocation to be 66% of the loading capacity. The allocation was determined by the percent of land area that is inside the MS4 boundary, following an example provided in EPA's guidance (2007). The stormwater discharges within the MS4 boundary were included in the wasteload allocation because EPA interprets 40 C.F.R. 130.2(h) to require that allocations for point source discharges subject to the requirement for a NPDES permit must be included in the wasteload allocation portion of the TMDL. There are also some areas within the MS4 boundary that generate nonpoint source runoff and there may be point sources of stormwater not subject to NPDES regulation. Discharges from nonpoint sources and from point sources not regulated by the NPDES program normally receive load allocations rather than wasteload allocations. In the case of stormwater, however, where it is often difficult to identify and distinguish between discharges subject to NPDES and those that are not, EPA has stated that it is permissible to include all stormwater discharges from a particular land area, in this case the MS4 jurisdiction, in the wasteload allocation portion of the TMDL. For Beaver Brook, adequate data are not available to separate out the parcels that generate stormwater that is not subject to the NPDES. Therefore, the wasteload allocations may include runoff from NPDES regulated stormwater point sources, runoff from nonpoint sources, and runoff from non-NPDES regulated point sources such as commercial areas and small construction sites (under an acre).

As previously noted in the loading capacity section, the NHDES expressed the TMDL as a load duration curve, and also in two alternative ways, as a percent reduction and as annual loadings allocated among source categories (see pages 15-16 and Table 6). For deicing activities, the necessary reductions and associated loadings were distributed among parking lots and state,

municipal, and private roads. To facilitate implementation, separate allocations were given for individual towns. For the remaining sources (i.e., water softeners, food waste, and atmospheric deposition), the allocations were set at the existing condition. An allocation of zero was given to salt piles, as all salt piles should be covered to avoid runoff from rain events. Finally, it is important to note that 96% of the total salt load in this watershed is from deicing activities.

Assessment: As noted above, EPA requested additional information from NHDES to better understand the percentage of sources that should be subject to load allocations and wasteload allocations. This request was prompted by a concern about whether the wasteload allocations were sufficiently stringent and whether there was reasonable assurance that the nonpoint source load reductions would occur. Again, the State clarified that the TMDL requires across-the-board reductions based on activity type, rather than based on a 34%/66% split between LAs and WLAs.

The State's analysis revealed that 93% of parking lots and 86% of roadway lane miles are within the urbanized area and thus potentially subject to controls under the MS4 permit. See NHDES memorandum dated October 15, 2008, "Identification of Chloride Sources Relative to Urbanized Areas" (compare to overall load percentages in Figure 4, page 12 of the TMDL). In addition, while only portions of I-93 and other state roads are within the MS4 boundary and therefore subject to the MS4 permit, the NHDOT intends to apply chloride reduction requirements to the entire stretch of each road, not just to the areas subject to the permit. Id. Thus, approximately 86% of the loading to the watershed is expected to be controlled through the MS4 permit or through extension of required reductions to all of the state roads.

For the remaining sources that are not within the urbanized area or subject to the MS4 permit, NHDES has provided reasonable assurance that the necessary reductions will occur. Specifically, as a result of an appropriation through the Federal Highway Administration for development and implementation of several TMDLs, including the Beaver Brook TMDL, $2.5 million is available to assist the TMDL communities to reduce road salt and assist in compliance with the TMDLs. A Salt Reduction Workgroup has been formed to develop salt reduction guidelines. Federal funds are available to develop a Salt Reduction Plan and to assist in implementation activities, which can address loadings from private roads and parking lots as well as from municipal sources. A condition of receiving federal funds is the adoption of a municipal resolution, and NHDES expects to receive resolutions from all the TMDL communities in the near future; to date, two of the five communities, including Chester, have adopted such a resolution. In addition, in the unlikely event that a source fails to implement salt reductions either pursuant to the MS4 permit or the Salt Reduction Plan, NHDES has indicated that it can and will exercise its enforcement authority pursuant to RSA 485-A:12 to require abatement of pollution that is contributing to water quality standards violations.

EPA is approving the wasteload and load allocations as presented in Table 6, which reflects the overall 28% load reduction and the further allocations assigned by source type. The NHDES has indicated that the allocations among the different types of sources may change as a result of the Salt Reduction Workgroup effort that is currently underway. Such a redistribution is permissible

provided that the overall allocations are not exceeded. The NHDES has stated in responses to public comments that any changes to the allocations would be subject to public notice and comment.

6. 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 load and wasteload allocations and water quality (CWA § 303(d)(1)©), 40 C.F.R. § 130.7©)(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. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

The NHDES set the TMDL at 90% of the water quality target, thus providing a 10% margin-of-safety. This MOS is incorporated in all three expressions of the TMDL – the Load Duration Curve, the percent reduction, and annual allowable loadings.

Assessment: EPA concludes that the margin-of-safety is adequately set at 10% for several reasons: 1) since the Load Duration Curve is a straight conversion of the State's water quality criterion into allowable loadings based upon daily stream flow, there is very little uncertainty as to whether the criteria will be met; and 2) with respect to the alternative TMDL expressions, the percent reduction and the allowable annual loadings, a 10% MOS is a reasonable starting point given that the estimates are based on QA approved continuous monitoring data. We also note that if followup monitoring identifies that greater reductions are necessary, the TMDL will be revised.

7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The method chosen for including seasonal variations in the TMDL must be described (CWA § 303(d)(1)©), 40 C.F.R. § 130.7©)(1)).

Seasonal variation has been adequately addressed because allowable loadings are presented for the entire range of stream flows and for all seasons.

Assessment: EPA concludes that the TMDL document satisfies the requirements of the above category.

8. 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), and EPA's 2006 guidance, Clarification Regarding "Phased" Total Maximum Daily Loads, recommend a monitoring plan when a TMDL is developed using the phased approach. The guidance indicates that a State may use the phased approach for situations where TMDLs need to be developed despite significant data uncertainty and where the State expects that the loading capacity and allocation scheme will be revised in the near future. EPA's guidance provides that a TMDL developed under the phased approach should include, in addition to the other TMDL elements, a monitoring plan that describes the additional data to be collected and a scheduled timeframe for revision of the TMDL.

Because this TMDL is not a "phased" TMDL, a monitoring plan is not required. Nevertheless, in order to assess the progress in obtaining the TMDL's water quality goals, the NHDES has included a preliminary monitoring plan in the TMDL report. The EPA encourages the NHDES to work with the Salt Reduction Workgroup to ensure that an appropriate monitoring plan is put into place and that further reductions in salt loading, if necessary, are determined in a reasonable period of time.

9. Implementation Plans

On August 8, 1997, Bob Perciasepe (EPA Assistant Administrator for the Office of Water) issued a memorandum, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)," that directs Regions to work in partnership with States/Tribes 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/Tribes 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. The memorandum also includes a discussion of renewed focus on the public participation process and recognition of other relevant watershed management processes used in the TMDL process. Although implementation plans are not approved by EPA, they help establish the basis for EPA's approval of TMDLs.

An implementation plan is presently under development by means of convening a stakeholder group known as the "Salt Reduction Workgroup." The goal of the workgroup is to have a draft plan ready for public comment in 2009.

10. 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 that the nonpoint source reductions will happen must be explained in order for the TMDL to be approvable. This information is necessary for EPA to determine that the load and wasteload allocations will achieve water quality standards.

In a water impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable. However, for such nonpoint source-only waters, States/Tribes are strongly encouraged to provide reasonable assurances regarding achievement of load allocations in the implementation plans described in section 9, above. As described in the August 8, 1997 Perciasepe memorandum, such reasonable assurances should be included in State/Tribe implementation plans and "may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs."

As discussed above, reasonable assurance that non-regulated point source and nonpoint source load reductions will occur include the following:

First, for reasons of both safety and efficiency, NHDOT will apply the same road salt reductions to roads outside the MS4 boundary that it is required to apply within the MS4. In addition, the combination of federal funds availability, adoption of a municipal resolution by Chester and anticipated adoption by the other communities, establishment of the Salt Reduction Workgroup, and ongoing efforts to develop a salt reduction implementation plan to achieve necessary reductions, provides the necessary assurance that non-regulated point source and nonpoint source reductions will occur. Further assurance exists in that enforcement remedies are available in the event the required reductions do not occur. Among other things, the implementation plan is expected to require owners of property on which salt is applied to track and report the amount applied. This will be evaluated against allowable allocations to determine compliance with State Law RSA 485-A:12. Pursuant to that law, NHDES can require persons responsible for sources of pollution that lower the quality of waters below the minimum requirements of the classification so established, to abate such pollution, and it has indicated that it intends to do so.

11. Public Participation

EPA policy is that there must be full and meaningful public participation in the TMDL development process. Each State/Tribe must, therefore, provide for public participation consistent with its own continuing planning process and public participation requirements (40 C.F.R. § 130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval must describe the State/Tribe's public participation process, including a summary of significant comments and the State/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. § 130.7(d)(2)).

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

A public comment period was held on Jan 2, 2008 through Feb 8, 2008. The TMDL report was posted on the NHDES website and the Rebuilding I-93 website. A letter announcing the release of

the report was distributed to 132 stakeholders. The NHDES received comments from five organizations and/or individuals. Responses to comments are provided in the TMDL report.

Assessment: EPA concludes that the NHDES did a reasonable job addressing the public comments and has also gone a step beyond to engage stakeholders in the "Salt Reduction Workgroup." This workgroup will play a vital role in ensuring that the recommendations in the TMDL are implemented.

12. Submittal Letter

A submittal letter should be included with the TMDL analytical document, and should specify whether the TMDL is being submitted for a *technical review* or is a *final submittal*. Each final TMDL submitted to EPA must be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final submittal, should contain such information as the name and location of the waterbody, the pollutant(s) of concern, and the priority ranking of the waterbody.

A submittal letter was included with the TMDL report indicating that this is a final TMDL being submitted to EPA for review and approval.

References

U.S. EPA. 2007. An Approach for Using Load Duration Curves in the Development of TMDLs. USEPA, Office of Wetlands, Oceans and Watersheds, Washington, D.C.

U.S. EPA. 2006. Establishing TMDL "Daily" Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. v. EPA, et al., No. 05-5015, (April 25, 2006) and Implications, for NPDES Permits. Nov 15, 2006 Memo from Benjamin H. Grumbles, Assistant Administrator, U.S. EPA, Washington, D.C.