



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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Decision Rationale
Total Maximum Daily Loads for Selected Streams in
the North Branch/Potomac River Watershed,
West Virginia

Signed

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I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) to be developed for those waterbodies identified as impaired by a state where technology-based and other controls did not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety (MOS), which may be discharged to a water quality-limited waterbody.

This document will set forth the U.S. Environmental Protection Agency's (EPA's) rationale for approving the TMDLs for metals (dissolved aluminum and total iron), pH, and biological impairments on selected waterbodies in the North Branch/Potomac River watershed. The TMDLs were developed to address impairment of water quality as identified in West Virginia's 1996, 1998, 2002, and 2004 Section 303(d) lists of impaired waters. EPA's rationale is based on the determination that the TMDLs meet the following eight regulatory conditions pursuant to 40 CFR §130.

- 1) The TMDLs are designed to implement applicable water quality standards.
- 2) The TMDLs include a total allowable load as well as individual waste load allocations (WLAs) and load allocations (LAs).
- 3) The TMDLs consider the impacts of background pollutant contributions.
- 4) The TMDLs consider critical environmental conditions.
- 5) The TMDLs consider seasonal environmental variations.
- 6) The TMDLs include a margin of safety.
- 7) There is reasonable assurance that the TMDLs can be met.
- 8) The TMDLs have been subject to public participation.

From this point forward, all references in this approval rationale are found in West Virginia's TMDL Report *TMDLs for Selected Streams in the North Branch/Potomac River Watershed, West Virginia*, unless otherwise noted.

II. Summary

Table 3-3 presents the waterbodies and impairments for which TMDLs have been developed for the North Branch/Potomac River watershed by the West Virginia Department of Environmental Protection (WVDEP). The 19 waterbodies were identified on West Virginia's 2004 Section 303(d) list for some combination of metals (dissolved aluminum and total iron), pH, and biological impairments. These TMDLs represent 19 of the 24-listed segments in the North Branch/Potomac River watershed. The remaining 5 segments were not included because they were newly listed waters. All waters and impairments excluded from TMDL development

in this effort will remain on West Virginia's Section 303(d) list and will have TMDLs developed in 2010 or 2015 in accordance with West Virginia's Watershed Management Framework.

On January 9, 2006, EPA approved a revision to West Virginia's water quality standards regulations modifying the chronic aquatic life dissolved aluminum criterion for warm water fisheries from 87 $\mu\text{g/L}$ to 750 $\mu\text{g/L}$. This approved revision does not change the dissolved aluminum water quality criteria for troutwaters. These TMDLs were scheduled to be submitted and approved by December 31, 2005. With EPA's pending criteria approval, West Virginia decided to revise the draft TMDLs and held a second comment period. The revised dissolved aluminum TMDLs were presented in the *Aluminum TMDL Addendum for Selected Streams in the North Branch/Potomac River Watershed, West Virginia* (Aluminum TMDL Addendum). All seventeen waterbodies listed for the previously applicable criteria (87 $\mu\text{g/L}$) were also impaired for the currently effective criteria (750 $\mu\text{g/L}$).

The West Virginia 2004 Section 303(d) list included fifteen waters in North Branch/Potomac River watershed identified as manganese impaired. On June 29, 2005, EPA approved a revision to West Virginia's water quality standards regulations that altered the zone of applicability of the manganese water quality criterion for the public water supply designated use. The criterion is now applicable only in the five-mile zone upstream of known public or private water supply intakes used for human consumption. The revision necessitated WVDEP's identification of intakes and reevaluation of prior impairment decisions. After reevaluation, the criterion was determined to not be applicable to any section of any of the waters that were previously identified as impaired relative to manganese. As such, manganese TMDLs are not presented and these fifteen waters will be delisted relative to manganese on the 2006 Section 303(d) list.

The TMDL is a written plan and analysis established to ensure that a waterbody will attain and maintain water quality standards. The TMDL is a scientifically-based strategy which considers current and foreseeable conditions, the best available data, and accounts for uncertainty with the inclusion of a MOS value. Conditions, available data, and the understanding of the natural processes can change more than anticipated by the MOS. The option is always available to refine the TMDLs for re-submittal to EPA for approval.

The subwatershed appendices provide additional details relative to their respective impaired waters and the applicable TMDLs (sum of wasteload allocations + sum of load allocations + margin of safety). Section 6 of each subwatershed appendix presents applicable TMDLs for aluminum, iron, or sediment, as appropriate. Allocation spreadsheets also provide applicable TMDLs, wasteload allocations to individual point sources and load allocations to categories of nonpoint sources. A Technical Report provides descriptions of the detailed technical approaches used throughout the TMDL development process. West Virginia developed an interactive ArcExplorer geographic information system (GIS) project that shows the spatial relationships between source assessment data and subwatershed TMDL allocations for selected streams in the North Branch/Potomac River watershed. The TMDLs are presented as average annual loads because they were developed to meet TMDL endpoints under a range of

conditions observed throughout the year. The loads are in pounds per year or counts per year which may be divided by 365 days per year to express the TMDLs in pounds per day or counts per day. Tables attached to this decision rationale have daily TMDLs calculated by EPA by dividing West Virginia's annual loads in pounds per year or counts per year by 365 days per year to express the TMDLs as average daily loads in pounds per day or counts per day.

III. Background

The North Branch/Potomac River watershed encompasses nearly 583 square miles and is located in the eastern panhandle of West Virginia and extends northward into western Maryland and southern Pennsylvania (Figure 3-1). The study area covered in this report includes 67 square miles in Mineral, Grant, and Tucker Counties. Major tributaries of the study area include Piney Swamp Run, Abram Creek, Buffalo Creek, and Elk Run. Cities and towns in the vicinity of the study area are Keyser, Gorman, Mount Storm, and Thomas. The North Branch/Potomac River watershed is dominated by forest land uses (75.0%), with some pasture and grassland (20.1%), barren/mining land (2.3%), and urban/residential (1.6%) (Table 3-1).

West Virginia conducted extensive water quality monitoring from July 2002 through June 2003 in the North Branch/Potomac River watershed. The results of this effort were used to confirm the listing of waterbodies not meeting applicable water quality criteria and to identify impaired waterbodies that were not previously listed. Table 1 of the Aluminum TMDL Addendum presents the impaired waters for which dissolved aluminum TMDLs were developed under the currently effective criterion. TMDLs were developed for the impaired waterbodies in six subwatersheds (Figure 3-2): Abram Creek, Little Buffalo Creek, Elk Run/Deakin Run, Slaughterhouse Run, Montgomery Run, and Piney Swamp Run. Table 3-3 presents the 19 impaired waters for which TMDLs are developed. The TMDLs were developed for some combination of metals (dissolved aluminum and total iron), pH, and biological impairment including 63 TMDLs (waterbody/pollutant combinations). The six subwatersheds were further divided into 46 subwatersheds for modeling purposes (Figure 6-1). The subwatershed delineation provided a basis for georeferencing pertinent source information and monitoring data, and for presenting TMDLs.

These TMDLs were developed by West Virginia and approved by EPA consistent with the requirements of the 1997 TMDL lawsuit consent decree and settlement agreement for the case OVEC Inc., et al., v. Browner, et al. The 1997 consent decree requires that West Virginia, or EPA if West Virginia fails to, develop TMDLs for acid mine drainage (AMD) impaired waters (including tributaries in the North Branch/Potomac River watershed) were scheduled for completion by March 30, 2008. There is also an interim deadline of 350 mine drainage TMDLs by March 30, 2006 which has been met. The establishment of the North Branch/Potomac River watershed TMDLs helps to meet the March 30, 2008 deadline for completion of all mine drainage TMDLs.

WVDEP recently assumed responsibility for the TMDL Program and utilized the Watershed Management Framework cycle approach for TMDL development. The framework

divides the state into 32 major watersheds and operates on a five-year, five-step process. The watersheds are divided into five hydrologic groups (A - E). Each group is assessed once every five years and waters are placed on the 303(d) list of impaired waters, as necessary. The TMDL process begins in the first year of the cycle with pre-TMDL sampling and public meetings in the affected watersheds. The data is compiled and TMDL development begins in year two of the cycle. In the third year, TMDL development continues and the TMDL is drafted. The TMDL is finalized in the fourth year. In the fifth year of the cycle, TMDL implementation is initiated through the National Pollutant Discharge Elimination System (NPDES) permitting process and efforts toward limiting nonpoint source loading. Throughout the TMDL development process, there are numerous opportunities for public participation and input. The North Branch/Potomac River watershed is in hydrologic group B and is one of the first TMDLs developed by WVDEP. West Virginia's TMDL process is described in Section 2.1 of the TMDL report.

Computational Procedures

Section 4 of the TMDL Report discusses metals and pH source assessment while Section 5 describes biological impairments and stressor identification methods. Sources for metals and pH in the North Branch/Potomac River watershed are: point sources, including mining, non-mining, and construction stormwater permits; and unpermitted sources of mine drainage from abandoned mine lands (AMLs) and bond forfeiture sites; as well as sediment sources including forestry, oil and gas, roads, agriculture, and other land disturbance activities. Stressor identification indicated that biological impairments were caused by metals toxicity, pH toxicity, and sedimentation. The Technical Report has expanded details of the source assessment and biological stressor identification discussed in Sections 4 and 5.

Biological integrity/impairment is based on a rating of the stream's benthic macroinvertebrate community using the multimetric West Virginia Stream Condition Index (WVSCI). Biological impairments were addressed by developing TMDLs for specific stressors. West Virginia utilized a stressor identification process to determine the primary causes of biologically-impaired streams including metals toxicity, pH toxicity, sedimentation, organic enrichment, and ionic toxicity. Stressor identification was followed by stream-specific determinations of the pollutants for which TMDLs must be developed. Metals toxicity and pH toxicity biological stressors were identified in waters that also had violations of the iron, aluminum, or pH numeric aquatic life protection water quality criteria. Where the stressor identification process indicated sedimentation as a causative stressor, sediment TMDLs were developed. It is expected that implementation of those pollutant-specific TMDLs would address the biological impairment.

Section 6 describes the modeling processes employed during TMDL development. A variety of modeling tools were used to develop the metals and pH TMDLs, including the Mining Data System (MDAS), and Dynamic Equilibrium In-Stream Chemical Reactions model (DESC-R). Sediment TMDLs were modeled using the Generalized Watershed Loading Functions (GWLF) and a stream routing model (Tetra Tech Stream Module). Further details are provided in the Technical Report.

MDAS was used to represent the source-response linkage in the North Branch/Potomac River watershed TMDL study area for total aluminum and iron. MDAS is a comprehensive data management and modeling system that is capable of representing loads from nonpoint and point sources in the watershed and simulating in-stream processes. MDAS is used to simulate watershed hydrology and pollution transport, as well as stream hydraulics and in-stream water quality. It is capable of simulating different flow regimes and pollutant loading variations. Metals are modeled in MDAS in total recoverable form. Therefore, it was necessary to link MDAS with DESC-R to appropriately address dissolved aluminum TMDLs in the North Branch/Potomac River watershed. TMDLs for pH impairments were developed using a surrogate approach in which it was assumed that reducing instream metals (iron and aluminum) concentrations to meet water quality criteria (or TMDL endpoints) would result in meeting the water quality standard for pH. This assumption was verified by applying the DESC-R model. West Virginia's numeric and water quality criteria and an explicit MOS were used to identify the TMDL endpoints.

Sediment TMDLs were developed under a reference watershed approach and the GWLF watershed-loading model integrated with the Tetra Tech Stream Module that examined stream bank erosion and deposition processes. GWLF is a continuous-simulation model that simulates runoff and sediment loadings contributed by each modeled subwatershed. Load reductions for sediment-impaired waters were based on the sediment loading present in the unimpaired reference watershed. This approach is based on selecting a non-impaired watershed that shares similar land use, ecoregion, and geomorphologic characteristics with the impaired watershed. Stream conditions in the reference watershed are assumed to represent the conditions needed for the impaired stream to attain its designated uses. Given these parameters and a non-impaired WVSCI score, the Johnnycake Run in the Abram Creek watershed was selected as the reference watershed (Figure 6-2). Sediment loading rates were determined for impaired and reference watersheds. Both point and nonpoint sources were considered in the analysis and numeric endpoints were based on the calculated sediment loading from the reference watershed. Sediment load reductions necessary to meet these endpoints were then determined. TMDL allocation scenarios were developed based on an analysis of the degree to which contributing sources could be reasonable reduced.

EPA has determined that these TMDLs are consistent with statutory and regulatory requirements and EPA's policy and guidance. EPA's rationale for establishing these TMDLs is set forth according to the regulatory requirements listed below.

1. *The TMDLs are designed to implement the applicable water quality standards.*

The applicable numeric water quality criteria are shown in Table 2-1. The applicable designated uses for all the waters subject to this report are aquatic life protection, water contact recreation, and public water supply. Most of the waters are designated as warmwater fisheries.

Johnny Cake Run and Wycroff Run are the only streams in the North Branch/Potomac River watershed considered troutwaters. For the pollutants causing the impaired waters of this report, West Virginia numeric water quality criteria for warmwater fisheries and troutwaters vary with respect to iron and aluminum, and Johnny Cake Run and Wycroff Run are not impaired pursuant to the troutwater iron or aluminum criteria.

As discussed previously, EPA's approval of the revised chronic aquatic life dissolved aluminum criterion for warm water fisheries from 87 $\mu\text{g/L}$ to 750 $\mu\text{g/L}$ required TMDL revisions to meet the currently applicable criteria. The Aluminum TMDL Addendum provides additional information regarding the approved dissolved aluminum criteria change and its impact on TMDL development in the North Branch/Potomac River watershed.

All West Virginia waters are subject to the narrative criteria in Section 3 of the Standards. That section, titled *Conditions Not Allowed in State Waters*, contains various provision relative to water quality. The narrative water quality criterion at 46 CSR 1 - 3.2.i prohibits the presence of wastes in state waters that cause or contribute to significant adverse impacts on the chemical, physical, hydrologic, and biological components of aquatic ecosystems. This provision is the basis for the "biological impairment" determinations. Biological impairment signifies a stressed aquatic community. WVDEP determines each stream's biological integrity based on a rating of the stream's benthic macroinvertebrate community using the multimetric WVSCI.

2. *The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.*

A TMDL is the total amount of a pollutant that can be assimilated by the receiving water while still achieving water quality standards. TMDLs can be expressed in terms of mass per time or by other appropriate measures. TMDLs are comprised of the sum of individual WLAs for point sources, LAs for non-point sources, and natural background levels. In addition, the TMDL must include an MOS, either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving stream. Conceptually, this definition is denoted by the following equation:

$$\text{TMDL} = \text{Summation of WLAs} + \text{Summation of LAs} + \text{MOS}$$

For purposes of these TMDLs only, waste load allocations are given to NPDES-permitted discharge points and load allocations are given to discharges from activities that do not have an associated NPDES permit, such as mine forfeiture sites and AMLs (including tunnel discharges, seeps, and surface runoff). The decision to assign load allocations to these sources does not reflect any determination by WVDEP or EPA as to whether there are, in fact, unpermitted point source discharges. In addition, by establishing these TMDLs with mine drainage discharges treated as load allocations, WVDEP and EPA are not determining that these discharges are exempt from NPDES permitting requirements.

Section 5 of each subwatershed appendix presents applicable TMDLs for aluminum, iron or sediment, as appropriate. Allocation spreadsheets also provide applicable TMDLs, wasteload allocations to individual point sources and load allocations to categories of unpermitted sources. The Metals and pH Allocation Spreadsheet presents the detailed metal TMDLs, LAs, WLAs, and pH results. The Sediment Allocation Spreadsheet presents the detailed sediment TMDLs, LAs, WLAs for non-mining permits, WLAs for mining permits, and MS4 WLAs. The TMDLs are presented as average annual loads because they were developed to meet TMDL endpoints under a range of conditions observed throughout the year.

Sources for metals and pH in the North Branch/Potomac River watershed are: point sources, including mining, non-mining, and construction stormwater permits; and unpermitted sources, including mine drainage from AMLs and bond forfeiture sites, as well as sediment sources including forestry, oil and gas, roads, agriculture, and other land disturbance activities. There are a total of 12 mining-related NPDES permits with 22 associated outlets in the six subwatersheds. A complete list of the permits and outlets is provided in the appendices of the Technical Report. Figure 4-1 illustrates the locations of these sources. Two non-mining NPDES permitted outlets in the watershed have effluent limits for metals and pH. These permitted non-mining sources were given WLAs based on their current permit limits. WVDEP issued a general NPDES permit to regulate stormwater flowing into streams from discharges associated with construction activities. There are no construction stormwater permits in the watersheds addressed by this report. Load allocations for metals were assigned to AMLs, bond forfeiture sites, and sediment sources including forestry, oil and gas, roads, agriculture, and other land disturbance areas.

A sediment TMDL was developed in one stream to address biological impairments in the Unnamed Tributary of Abram Creek. There were no permitted mining, non-mining, or MS4 point sources within this watershed. Sediment sources include mining, forestry, oil and gas, roads, agriculture, and other land disturbance activities. Sediment load allocations were assigned to grasslands, barren land areas, harvested forest, residential areas, roads, in-stream processes including bank erosion and deposition, and other nonpoint sources.

The TMDL considers silviculture or timbering operations and land disturbances associated with oil and gas wells as nonpoint sources. Some silviculture activities are considered point sources (See C.F.R. 122.27). Land clearing activity that is not associated with an ongoing, commercial silviculture operation may be construction activity that requires a stormwater permit and may be a point source. The decision to assign load allocations to these sources and to discharges from oil and gas wells does not reflect any determination by WVDEP or EPA as to whether there are, in fact, unpermitted point source discharges. In addition, by establishing these TMDLs with silviculture and oil and gas well discharges treated as load allocations, WVDEP and EPA are not determining that these discharges are exempt from NPDES permitting requirements.

The TMDL development methodologies prescribe allocations that achieve water quality criteria throughout the watershed. Various provisions attempt equity between categories of

sources and the targeting of pollutant reductions from the most problematic sources. Nonpoint source reductions did not result in loading contributions less than the natural conditions, and point source allocations were not more stringent than numeric water quality criteria.

3. *The TMDLs consider the impacts of background pollutant contributions.*

The TMDL considers the impact of background pollutant contributions by considering loadings from background sources like wildlife. MDAS also considers background pollutant contributions by modeling all land uses.

4. *The TMDLs consider critical environmental conditions.*

Critical conditions were considered while considering seasonal variations, by running the daily simulation model for several years, from 1987 to 1992 for MDAS and from 1974 to 1982 for GWLF.

5. *The TMDLs consider seasonal environmental variations.*

See Requirement 4 above.

6. *The TMDLs include a margin of safety (MOS).*

The CWA and Federal regulations require TMDLs to include an MOS to take into account any lack of knowledge concerning the relationship between effluent limitations and water quality. EPA guidance suggests two approaches to satisfy the MOS requirement. First, it can be met implicitly by using conservative model assumptions to develop the allocations. Alternately, it can be met explicitly by allocating a portion of the allowable load to the MOS.

An explicit MOS of five percent was included to counter uncertainty in the modeling process (Section 6.3.1). West Virginia also set the modeling endpoints to 95 percent of the water quality standards as an additional MOS. West Virginia did not include a discussion regarding an implicit MOS but did use conservative model assumptions (such as assuming all point sources continually discharge at permit limits) to develop the allocations.

7. *There is reasonable assurance that the proposed TMDLs can be met.*

Section 9 addresses reasonable assurance. There are four primary programs in effect which provide reasonable assurance that the TMDLs will be implemented. Section 9.1 discusses permit reissuance by WVDEP's Division of Water and Waste Management scheduled to be in July 2006 for non-mining facilities and in January 2007 for mining facilities. Section 9.2 discusses the Watershed Management Framework Process. Section 9.3 discusses the duties of the Office of Abandoned Mine Lands and Reclamation while Section 9.4 discusses special reclamation projects. Adequate funding for reclaiming abandoned mine lands is an issue to be addressed.

Section 10 discusses monitoring activities including NPDES compliance, nonpoint source project monitoring, and TMDL effectiveness monitoring.

Section 7 discusses the future growth and water quality trading in the North Branch/Potomac River watershed TMDL. For metals and pH, a new facility could be permitted in the watershed, provided that effluent limitations are based upon the achievement of water quality standards end-of-pipe for the pollutants of concern in the TMDL. For metals and pH, remining (under an NPDES permit) could occur in AMLs without a specific allocation to the new permittee provided that the requirements of existing state remining regulations are met. Remining activities, if conducted pursuant to Section 301(p) of the CWA, will not worsen water quality criteria and, in some instances, may result in improved water quality in abandoned mining areas. For sediment, new mining or non-mining point sources may be permitted in the sediment-impaired watersheds with the implementation of applicable technology-based TSS requirements. Construction stormwater permits are allowed specific future growth including a minimum of 10 acres or 0.5 percent of the area in the West Virginia portions of the sediment-impaired watersheds that are reserved for future construction stormwater permits.

8. *The TMDLs have been subject to public participation.*

Section 8 describes the public participation which included two meetings to present information on fundamental TMDL concepts and to present West Virginia's proposed TMDL allocation strategies, a 30-day public comment period, and a final public informational meeting. The 30-day public comment period was held from August 12, 2005 to September 12, 2005 with a public meeting held on August 22, 2005 in at the Mineral County Health Department in Keyser, West Virginia. West Virginia received comments from Upper Potomac River Commission, NewPage Corporation, and EPA Region III. A responsiveness summary is included as part of this TMDL in Section 8.3.

Due to the approval of the revised chronic warmwater dissolved aluminum criterion, West Virginia revised the dissolved aluminum TMDLs. An additional 30-day public comment period was held from July 13, 2006 to August 11, 2006. West Virginia received comments from EPA Region III which were appropriately addressed. A responsiveness summary is included in the Aluminum TMDL Addendum.