Decision Rationale
Total Maximum Daily Loads for Selected Streams
in the Upper Ohio North Watershed, West Virginia

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), that may be discharged to a water quality-limited waterbody.

This document will set forth the Environmental Protection Agency's (EPA's) rationale for approving the TMDLs for metals (dissolved aluminum, total iron, and total manganese), pH, fecal coliform bacteria, and biological impairments on selected waterbodies in the Upper Ohio North watershed. The TMDL was developed to address impairment of water quality as identified in West Virginia's 1996, 1998, 2002, and 2004 Section 303(d) list 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 Upper Ohio North Watershed, West Virginia.*

II. Summary

Table 3-3 presents the waterbodies and impairments for which TMDLs have been developed for the Upper Ohio North watershed by the West Virginia Department of Environmental Protection (WVDEP). The 26 waterbodies were identified on West Virginia's 2004 Section 303(d) list for some combination of metals (dissolved aluminum, total iron, and total manganese), pH, fecal coliform bacteria, and biological impairments. These TMDLs represent the 26 of the 32-listed segments in the Upper Ohio North watershed. The remaining six segments are newly listed waters and will have TMDLs developed in 2009 or 2014 in

accordance with West Virginia's Management Framework.

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, manganese, fecal coliform bacteria, or sediment, as appropriate. Allocation spreadsheets also provide applicable TMDLs, wasteload allocations to individual point sources and load allocations to categories of nonpoint sources. 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 Upper Ohio North 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.

III. Background

The Upper Ohio North watershed is located in the northern panhandle of West Virginia, eastern Ohio, and western Pennsylvania (Figure 3-1). The entire watershed encompasses 1,980 square miles. The area of study in this TMDL is the portion of the watershed located in the northern panhandle of West Virginia and western Pennsylvania, which encompasses 240 square miles in Hancock and Brooke counties in West Virginia and Beaver and Washington counties in Pennsylvania. Major tributaries in the study area include Kings Creek, Harmon Creek, Cross Creek, and Tomlinson Run. The Upper Ohio North watershed is dominated by forest land uses with other important land uses including pasture and grassland, cropland, and urban/residential (Table 3-1).

West Virginia conducted extensive water quality monitoring from July 2001 through June 2002 in the Upper Ohio North 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. TMDLs were developed for these impaired waterbodies in six subwatersheds (Figure 3-2): Allegheny Steel Run, Cross Creek, Deep Gut Run, Harmon Creek, Kings Creek, and Tomlinson Run. Table 3-3 presents the 26 impaired waters for which TMDLs are developed. The TMDLs were developed for some combination of metals (dissolved aluminum, total iron, and total manganese), pH, fecal coliform bacteria, and biological impairment including 46 TMDLs (waterbody/pollutant combinations). The six

subwatersheds were further divided into 110 subwatersheds for modeling purposes (Figure 7-1). 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, develops TMDLs for 44 priority waters included on West Virginia's 1996 Section 303(d) list by September 30, 2002. Under the consent decree, TMDLs for acid mine drainage (AMD) impaired waters (including tributaries in the Upper Ohio North 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 Upper Ohio North 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 Upper Ohio North watershed is in hydrologic group A 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

Sections 4 and 5 of the TMDL Report discusses metals, pH, and fecal coliform bacteria source assessment while Section 6 describes biological impairments and stressor identification methods. Sources for metals and pH in the Upper Ohio North watershed include unpermitted sources of mine drainage; as well as sediment sources including forestry, oil and gas, roads, agriculture, and other land disturbance activities. Fecal coliform bacteria sources include point sources, including individual sources covered under the NPDES program such as wastewater treatment plants, combined sewer overflows (CSOs), municipal separate storm sewers (MS4s), and general sewage permits; and unpermitted sources, including on-site treatment systems, stormwater runoff, agriculture, and natural background (wildlife). Stressor identification indicated that biological impairments were caused by metals toxicity, pH toxicity, sedimentation or organic enrichment. The Technical Report has expanded details of the source assessment and

biological stressor identification discussed in Sections 4, 5, and 6.

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, and organic enrichment. 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. Where organic enrichment was identified as a biological stressor, the waters also demonstrated violations of the numeric criteria for fecal coliform bacteria. It was determined that implementation of fecal coliform TMDLs would require the elimination of the majority of the existing fecal coliform sources and thereby reduce the organic and nutrient loading causing biological impairment. The TMDLs prescribe 100 % fecal coliform reduction for all existing straight pipe, failing septic systems, and CSOs. In the Upper Ohio North watershed, secondary fecal coliform impacts have been attributed to agricultural land uses in certain subwatersheds. The implementation of agriculture best management practices (BMPs) to address fecal coliform (i.e. restricting livestock access, creation of riparian buffers zones, etc.) would substantially reduce organic and nutrient loadings.

Section 7 describes the modeling processes employed during TMDL development. A variety of modeling tools were used to develop the metals, pH and fecal coliform TMDLs, including the Mining Data System (MDAS), Dynamic Equilibrium In-Stream Chemical Reactions model (DESC-R), and the Fecal Coliform Loading Estimation Spreadsheet (FCLES). 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 Upper Ohio North watershed TMDL study area for total aluminum, manganese, iron, and fecal coliform. 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 Deep Gut Run 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. FCLES is a Microsoft Excel spreadsheet tool used to quantify nonpoint source bacteria accumulation rates based on watershed-specific information. Inputs to FCLES may be generated manually or by using various functions of the watershed characterization system. Output from FCLES is used as input to MDAS. FCLES estimates the monthly accumulation rate of fecal coliform on four landuses (cropland, forest, built-up, and pastureland) and the direct input of fecal coliform to streams from grazing agricultural animals and failing septic systems. 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 North Fork of Kings Creek was selected as the reference watershed. 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. North Fork of Kings Creek is the only stream in the Upper Ohio North watershed considered a troutwater. For the pollutants causing the impaired waters of this report, West Virginia numeric water quality criteria for warmwater fisheries and troutwaters vary only with respect to iron, and North Fork of Kings Creek is not impaired pursuant to the troutwater iron criterion.

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:

TMDL = Summation of WLAs + Summation of LAs + 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, abandoned mine lands (AMLs) (including tunnel discharges, seeps, and surface runoff), failing septic systems, and straight pipes. 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, failing septic systems, and straight pipes treated as load allocations, WVDEP and EPA are not determining that these discharges are exempt from NPDES permitting requirements.

Section 6 of each subwatershed appendix presents applicable TMDLs for aluminum, iron, manganese, fecal coliform bacteria, 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 present the detailed metal TMDLs, LAs, WLAs, and pH results. The Fecal Coliform Bacteria Allocation Spreadsheet presents detailed fecal coliform TMDLs, LAs, WLAs, and MS4 WLAs. The Sediment Allocation Spreadsheet presents the detailed sediment TMDLs, LAs, WLAs for non-mining permits and WLAs for mining permits. 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.

West Virginia assigned a gross load (expressed as a load allocation) to sources located in the Pennsylvania portion of the impaired subwatersheds that accounts for loadings from both point and nonpoint sources in Pennsylvania. The gross load is a subset of the total load allocation assigned to each subwatershed shared by West Virginia and Pennsylvania. The

TMDLs do not prescribe specific load or wasteload allocations for the contributing area of Pennsylvania. Instead, they allow Pennsylvania and its stakeholders to determine the appropriate source reductions.

Sources for metals and pH in the Upper Ohio North watershed include unpermitted sources of mine drainage, as well as sediment sources including forestry, oil and gas, roads, agriculture, and other land disturbance activities. There are no point sources in the six selected subwatersheds specifically permitted to discharge metals. The sediment-related metals loading of the three construction stormwater permits in Alexanders Run was incorporated into the model as a background component. The small area associated with those permits was insignificant in relation to the iron and manganese impairments. The TMDL does not prescribe pollutant reduction from the existing construction stormwater sources. 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.

Fecal coliform bacteria sources are: point sources, including individual NPDES permits for wastewater treatment plants, CSOs, MS4s, and general sewage permits; and unpermitted sources, including on-site treatment systems, stormwater runoff, agriculture, and natural background (wildlife). Fecal coliform bacteria TMDLs will affect 19 permits including four home aeration units (HAUs), two publicly-owned treatment works (POTWs), and 13 privately-owned sewage treatment plants ("package plants"). The TMDLs allowed fecal coliform NPDES permits to remain at 200 counts/100 mL (monthly average) and 400 counts/100 mL (daily maximum). The City of Weirton in Kings Creek and Harmon Creek watersheds and the City of Follansbee in the Allegheny Steel Run watershed are the designated MS4s municipalities within the six subwatersheds in the TMDL which were given WLAs for fecal coliform bacteria. There are two CSO outfalls associated with the City of Follansbee waste water treatment plant. There are no sanitary sewer outfalls (SSOs) within the TMDL study area. Load allocations were assigned to pasturelands, croplands, failing septic systems and straight pipes, residential areas, and wildlife. Fecal coliform reductions will require elimination of illicit discharges, straight pipes, leaking septic systems, and CSOs. In the Upper Ohio North watershed, secondary fecal coliform impacts have been attributed to agricultural land uses in certain subwatersheds. The implementation of agriculture BMPs to address fecal coliform (i.e. restricting livestock access, creation of riparian buffers zones, etc.) would substantially reduce organic and nutrient loadings.

Sediment TMDLs were developed in four streams to address biological impairments. There are no mining-related point sources in the Upper Ohio North subwatersheds addressed by the TMDL. Sediment sources include forestry, oil and gas, roads, agriculture, and other land disturbance activities. Within the sediment-impaired watersheds, there are sources that have industrial stormwater and sewage permits. WLAs for the industrial stormwater permits were based on the 100 mg/L total suspended solids (TSS) benchmark value. WLAs for sewage treatment facilities were based on the 30 mg/L monthly average TSS effluent limitations contained in their permits. Under this TMDL, these permits are not required pollutant reductions and are authorized to continue operation under existing permit conditions. Sediment load

allocations were assigned to pasturelands, croplands, 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 1976 to 1978 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 suggest 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 by setting the modeling endpoints to 95 percent of the water quality standards, Section 7.31. 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 10 addresses reasonable assurance. There are four primary programs in effect which provide reasonable assurance that the TMDLs will be implemented. Section 10.1 discusses permit reissuance by WVDEP's Division of Water and Waste Management during July 1, 2005 to June 30, 2006. Section 10.2 discusses the Watershed Management Framework Process. Section 10.3 discusses ongoing public sewer projects in Cross Creek, Harmon Creek, and Tomlinson Run/Deep Gut Run. Section 10.4 discusses the duties of the Office of Abandoned Mine Lands and Reclamation. Adequate funding for reclaiming AMLs is an issue to be addressed.

Section 11 discusses monitoring activities including NPDES compliance, nonpoint source project monitoring, and TMDL effectiveness monitoring.

Section 8 discusses the future growth and water quality trading in the Upper Ohio North River watershed TMDL. For metals, pH and fecal coliform bacteria, 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 9 describes the public participation which included an informational TMDL 101 meeting, two meetings to present West Virginia's proposed TMDL allocation strategies, a 30-day public comment period, and a final public informational meeting. West Virginia received two comment letters from EPA Region III and West Virginia Division of Forestry. A responsiveness summary is included as part of this TMDL in Section 9.3.