

Implementation: What Happens after the TMDL (Total Maximum Daily Load) Is Developed?

Brian L. Benham, Extension Specialist and Assistant Professor, Biological Systems Engineering, and Director, Center for TMDL and Watershed Studies, Virginia Tech

Sara C. Zeckoski, Intern, Center for TMDL and Watershed Studies, Virginia Tech

What's a TMDL?

A *TMDL*, or total maximum daily load defines the total pollutant loading a water body can receive and still meet applicable *water quality standards*. (Italicized terms are defined in the boxes at the bottom of each page.) A TMDL equation is developed from a study that identifies the sources of a particular pollutant in a watershed, the pollutant contribution from each source, and the pollutant reduction required to attain and maintain water quality standards. In TMDL calculations, all identified sources of the particular pollutant are quantified, including both *point* and *nonpoint sources of pollution*. Because some TMDL calculations involve assumptions and professional judgment, TMDLs also include a *margin of safety* to account for uncertainty. (See *TMDLs [Total Maximum Daily Loads]: Terms and Definitions*, Virginia Cooperative Extension publication 442-550, <http://www.pubs.ext.vt.edu/442-550/442-550.html>.)

What happens after the TMDL is developed?

Developing a TMDL and the associated report are only the first steps in a process designed to restore water quality. The TMDL report quantifies the necessary reductions in pollutant loadings from each source category (e.g., pasture, cropland, urban land, point sources) that will be needed to achieve water quality standards, but the TMDL report does not describe how those reductions will be achieved. To translate reductions specified in the TMDL into changes in the watershed, a *TMDL Implementation Plan (IP)* is developed. This is the next step in the process of restoring water quality. In 1997, Virginia passed the Water Quality Monitoring, Information, and Restoration Act (*WQMIRA*), which requires the state to develop plans that will lead to water quality improvement and, ultimately, meeting water quality standards.

margin of safety (MOS) – a required component of the TMDL that accounts for the uncertainty in calculations of pollutant loading from point, nonpoint, and background sources.

nonpoint source (NPS) pollution – pollution originating from diffuse sources on and above the landscape. Examples include runoff from fields, storm-water runoff from urban landscapes, roadbed erosion in forestry, and atmospheric deposition.

point source pollution – pollution discharged at a specific location. Point source discharges are generally regulated through the Virginia Pollution Discharge Elimination System (VPDES) permitting procedures.

total maximum daily load (TMDL) – a pollution “budget” that defines the maximum amount of a particular pollutant a water body can assimilate without violating water quality standards. Mathematically, a TMDL is written as $TMDL = WLAs + LAs + MOS$. TMDLs include pollution from Waste Load Allocations (WLAs) (point sources) and Load Allocations (LAs) (nonpoint sources). In addition, the TMDL includes a margin of safety (MOS). A TMDL is developed for a specific pollutant and can be expressed in terms of mass per time, or other appropriate measure that relates to the water quality standard being violated.

TMDL implementation plan (IP) – a document required by Virginia statute detailing the set of pollution control measures needed to remediate an impaired water body.

water quality standards – a group of statements that constitute a regulation describing specific water quality requirements.

WQMIRA – the Water Quality Monitoring, Information, and Restoration Act of 1997 (§62.1-44.19:4 through 19:8 of the Code of Virginia).

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Produced by Communications and Marketing, College of Agriculture and Life Sciences, Virginia Polytechnic Institute and State University, 2009

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What kind of information is in a TMDL Implementation Plan?

A TMDL IP is essentially a watershed management plan or road map that describes and quantifies the suite of corrective actions to be implemented within a watershed and the time frame and resources that will be needed to implement those actions in order to restore water quality. Corrective actions include those practices or policies that reduce or prevent pollutants from reaching the impaired water body. Corrective actions can include: stream restoration, riparian buffers, livestock exclusion fencing, ordinances requiring pet owners to pick up after their animals, more rigorous enforcement of erosion and sediment control regulations, public education and outreach programs, and a myriad of other practices and policies. In some instances, corrective actions may be referred to as *best management practices (BMPs)*. While each TMDL is developed for a specific pollutant, a TMDL IP addresses all of the identified impairments of the water body and all of the related pollutant sources. An effective TMDL IP is one that watershed stakeholders can embrace and implement; putting the implementation plan to work and installing the needed corrective actions will improve water quality.

How can stakeholders participate in TMDL implementation?

Public involvement is a vital part of the TMDL implementation process. Every citizen and interested party in the watershed is encouraged to become involved in developing the TMDL IP. Public involvement ensures that the IP will be sensitive to local stakeholder concerns and will be integrated with other on-going water quality improvement efforts. When developing an IP, public participation can occur at several levels: attending public informational meetings, participating in an interest-centered focus or working group (e.g., urban, rural, commercial, etc.), and/or serving on the TMDL IP steering committee. The TMDL IP steering committee typically functions much like a board of directors, and includes representatives from each focus group. The success of the TMDL implementation effort rests with the watershed stakeholders. Stakeholder participation, in the form of implementing the corrective actions laid out in the TMDL IP, is what will ultimately restore water quality.

How does the TMDL implementation planning process work?

In Virginia, an initial informational public meeting is typically held to kick off the TMDL implementation planning process. At this initial public meeting, stakeholders are encouraged to sign up for one or more interest-centered focus groups and/or the TMDL IP steering committee. A TMDL IP resource team is commonly composed of a third-party contractor and/or staff from various state agencies, local governments, or watershed organizations. The team is tasked with providing the assistance, advice, and information needed by the focus groups and steering committee to aid them in developing the TMDL IP. The resource team is also responsible for drafting the TMDL IP document itself.

What happens in a Focus Group?

Focus groups are asked to perform specific tasks: identifying what corrective actions are needed/feasible from their perspectives, identifying ways to overcome obstacles to implementing the needed corrective actions, identifying funding partners, identifying existing programs and resources that might be relevant, and proposing additional programs that might support implementation of needed corrective actions.

What does the Steering Committee do?

The steering committee provides oversight for the TMDL IP development process, gathers information from focus groups, and synthesizes that information. The steering committee then makes decisions about the content and direction of the TMDL IP that balance the interests represented in the focus groups. Membership on this committee is typically comprised of stakeholders from the various focus groups, representatives from the state and local governments, and watershed interest groups that are involved in developing the TMDL IP. The steering committee's responsibilities include developing grant proposals to fund water quality improvement activities, overseeing citizen monitoring efforts to track water quality improvements, and working to ensure that an active, productive partnership designed to improve water quality is maintained between state and local governments and the stakeholders. The steering committee is responsible for investigating how the TMDL implementation effort can be integrated with existing or proposed water quality restoration efforts,

best management practices (BMPs) – reasonable and cost-effective means to reduce the likelihood of pollutants entering a water body. BMPs include riparian buffer strips, filter strips, nutrient management plans, conservation tillage, etc.

and ensuring that the TMDL IP is successfully integrated into these water quality restoration efforts.

What's happening with TMDL implementation in Virginia?

TMDL implementation efforts are currently occurring throughout Virginia in both rural and urban watersheds, with more TMDL implementation plans being completed all the time.

Examples of TMDL implementation efforts in rural watersheds include the North River watershed located in Rockingham County (Northwest Virginia), the Middle Fork Holston River watershed located in Washington County (Southwest Virginia), and the Blackwater River watershed located in Franklin County (Southwest Virginia). All include stream segments contaminated by *fecal coliform bacteria*. TMDL implementation began in these impaired watersheds in 2001, and water quality is improving. Data from these watersheds shows a decreasing trend in fecal coliform concentrations. Oversight and management for TMDL implementation in these watersheds is provided by local Soil and Water Conservation Districts (SWCDs). Land use in these watersheds is predominantly agriculture and forest, and livestock-exclusion stream fencing has been the primary corrective action implemented. Other corrective actions include encouraging septic tank maintenance, eliminating straight pipes, repairing and replacing failing septic systems, planting cover crops, implementing nutrient management, installing vegetative cover on critical areas, establishing forested riparian buffers, reforestation, and constructing animal waste management facilities.

Four Mile Run, located in Arlington and Fairfax counties in Northern Virginia is an example of TMDL implementation in an urban watershed. The Four Mile Run TMDL Implementation Plan was completed in 2004. The Four Mile Run fecal coliform TMDL was approved in 2002. The impairment was attributed primarily to urban nonpoint sources of fecal coliform. The Four Mile Run TMDL IP is focusing its implementation efforts using a three-pronged strategy: 1. Pollution Prevention – targeting bacteria reduction at the source by enacting pet waste ordinances, eliminating illicit sewer

fecal coliform bacteria – bacteria originating in the intestinal tract of warm-blooded animals and passing into the environment in feces. Fecal coliform bacteria are often used as an indicator of pathogens in water.

Essential Components of a TMDL Implementation Plan

Review of TMDL Development

The review should include a brief description of the impairment(s), watershed and pollutant source characteristics, and pollutant reduction or allocation scenarios.

Public Participation

This section of the IP should contain a description of the process used to engage stakeholders (mail campaigns, radio/television exposure, etc.) and the number, location, and attendance of working group, steering committee, and other public meetings.

Implementation Actions

This section contains descriptions and numbers of corrective actions needed to attain the source allocations in the TMDL, projected costs, and anticipated benefits. This section should also include a discussion of ordinance and policy changes recommended by stakeholders to improve water quality, and a description of needed education and outreach activities and those responsible for conducting those activities.

Measurable Goals and Milestones

Implementation milestones and goals to be achieved during implementation are described in this section of the IP. In addition, the type and extent of water quality monitoring required during implementation is included here.

Stakeholders' Roles and Responsibilities

In this section, the roles of various stakeholders, including federal, state, and local governments, local businesses, community organizations, and private citizens are described. These roles can include writing grant proposals to secure funding to implement corrective actions, being active in citizen monitoring groups, promoting public awareness through education and outreach, and supporting implementation efforts through local programs.

Integration with Other Watershed Plans

This portion of the IP details how implementation efforts will dovetail with other existing watershed management efforts and local comprehensive plans. One example is integrating corrective action implementation with activities associated with Municipal Separate Storm Sewer System (MS4) storm-water permits in urbanized areas.

discharges, etc.; 2. Mitigation measures – controlling or reducing the transport of bacteria through disinfection and the use of control measures that reduce stormwater volumes; and 3. Indirect Measures – education and outreach programs designed to inform the citizenry of water quality issues, and ultimately, to change behaviors and attitudes towards water quality. Partners in the Four Mile Run project include the following governmental agencies: Northern Virginia Regional Commission, Northern Virginia Regional Park Authority, City of Alexandria, City of Falls Church, Arlington County, Fairfax County, Virginia Department of Transportation, Virginia Department of Environmental Quality, and Virginia Department of Conservation and Recreation.

Conclusion

The purpose of a TMDL Implementation Plan is to provide a road map or strategy for improving water quality. If the TMDL process stops after the TMDL study is completed, pollutant sources will be identified and quantified; however, corrective actions to reduce the pollutant load from those sources to the point that water quality standards are reached likely will not be addressed. For water quality to improve, best management practices and other corrective actions must be implemented in a systematic approach. Implementing a well-thought-out TMDL Implementation Plan – one that incorporates the ideas, wisdom, and vision of local stakeholders – can result in improved water quality.

Acknowledgements

Reviewers:

Gene Yagow, Research Scientist, Biological Systems Engineering, Virginia Tech

Robert Brent, Valley Regional TMDL Coordinator, Virginia Department of Environmental Quality

Charles Lunsford, TMDL Program Manager, Virginia Department of Conservation and Recreation

Companion Virginia Cooperative Extension Publications

A Glossary of Water-Related Terms, Virginia Cooperative Extension publication 442-758, <http://pubs.ext.vt.edu/442-758/>

TMDLs (Total Maximum Daily Loads) - Terms and Definitions, Virginia Cooperative Extension publication 442-550, <http://pubs.ext.vt.edu/442-550/>

Microbial Source Tracking and the TMDL (Total Maximum Daily Loads) Process, Virginia Cooperative Extension publication 442-554, <http://pubs.ext.vt.edu/442-554/>

TMDLs (Total Maximum Daily Loads) for Bacteria Impairments, Virginia Cooperative Extension publication 442-555, <http://pubs.ext.vt.edu/442-555/>

TMDLs (Total Maximum Daily Loads) for Benthic Impairments, Virginia Cooperative Extension publication 442-556, <http://pubs.ext.vt.edu/442-556/>

For a complete listing of Virginia Cooperative Extension publications, fact sheets, and bulletins, please go to <http://www.ext.vt.edu/resources>.

References

Guidance Manual for Total Maximum Daily Load Implementation Plans.

<http://www.deq.state.va.us/tmdl/implans/ipguide.pdf>, Virginia Department of Environmental Quality, Richmond, Va., July 2003.

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