



Fact Sheet

Commonwealth of Pennsylvania • Department of Environmental Protection

WATERSHED MANAGEMENT AND TMDLS

INTRODUCTION

The Commonwealth manages many different water quality programs that have traditionally regulated well-defined sources of water pollution, such as discharges from sewage treatment plants and industrial facilities. Over the past several years, the Department of Environmental Protection (DEP) has focused on watershed management techniques and processes that take a comprehensive approach to water pollution control to address polluted runoff or nonpoint source pollution, as well as point sources of pollution.

Using the watershed approach requires selection or definition of watershed size, and begins with a comprehensive assessment of water quality problems in the watershed. Pennsylvania has already begun this effort with its Unassessed Waters Initiative, which will assess over 83,000 miles of surface waters. After water quality problems are identified, a planning process occurs to develop strategies that can successfully address and correct water pollution problems in the watershed. Pennsylvania is using this process, in conjunction with federal Clean Water Act requirements, for establishing total maximum pollutant loadings, or TMDLs, to clean up polluted streams so that they meet water quality standards. Water quality standards are the combination of water uses, such as water supply, recreation and aquatic life, to be protected and the water quality criteria necessary to protect them.

TMDLs can be considered to be a watershed budget for pollutants, representing the total amount of pollutants that can be assimilated by a stream without causing impairment or water standards to be exceeded. The maximum allowable amount of a specific pollutant is allocated to all sources in the watershed, including point sources discharges from sewage treatment plants and industrial wastewater facilities (wasteload allocations) and polluted runoff from the land (load allocation). A margin of safety is also provided to account for uncertainty in the loading calculations. The TMDL process allocates the amount of pollutants that can be discharged into a waterway from each category of pollutant source. The TMDL does not specify how discharges must attain particular load reduction.

TMDLs to Implementation

Point source waste load allocations are implemented through existing state regulations under the National

Pollutant Discharge Elimination System (NPDES) permit program. These permits set limits on the amount of pollutants that can be discharged. Nonpoint source load allocations are implemented through a combination of federal, state, and local programs which include regulatory, nonregulatory and voluntary efforts. The Commonwealth's Erosion and Sediment Pollution Control Program, established by the Commonwealth's Clean Streams Law and the Chapter 102 Erosion Control regulations, is one example of a nonpoint regulatory program. Planning and implementation of practices and measures are required to minimize soil erosion from all earthmoving activities, including farming, construction and timber harvesting. Municipal ordinances that address zoning, land use and stormwater runoff are examples of local programs that reduce polluted runoff.

Restoring Waters Impaired by Polluted Runoff

Pennsylvania's TMDL program for nonpoint source impaired waters uses a watershed approach that focuses on implementation of remedial efforts that will restore and maintain healthy waterways. A phased approach, detailed in a restoration plan, concentrates on identifying sources of impairment and implementing corrective work based on best available data and information. Additional monitoring and data collection will occur to track progress and better characterize pollutant sources, loadings and the effectiveness of measures. Additional remedial work will be scheduled if initial measures have not restored waters to meet designated uses.

TMDL Statutory and Regulatory Requirements – § 303(d) Clean Water Act and 40 C.F.R. § 130.7

Clean Water Act Section 303(d) establishes the Total Maximum Daily Load (TMDL) program. The purpose of the TMDL program is to identify sources of pollution and allocate pollutant loads in places where water quality goals are not being achieved. The requirements of the TMDL program under the Act and EPA's implementing regulations at 40 C.F.R. S 130.7 are described below.

- States must develop lists of waters for which technology-based or other required pollution controls are not stringent enough to meet water quality standards.

- States must establish priority rankings for waters on the lists based on severity of pollution and uses to be made of the water bodies, such as recreation or fishing.
- States must target those waters for which TMDLs will be developed over the next two years.
- States must submit lists of waters to EPA every two years by April 1 of even numbered years.
- States must develop TMDLs. TMDLs specify a pollutant budget that must be achieved to meet state water quality standards and allocates pollutant loads among pollution sources in a watershed, e.g., point and nonpoint sources.
- EPA must approve or disapprove State lists and TMDLs within 30 days of final submission, and EPA must establish lists of waters and TMDLs when EPA disapproves.

Approach to TMDLs

DEP believes there is significant environmental benefit in using TMDLs to define the goal of reducing water pollution in a watershed. Although TMDLs have been a requirement in the federal Clean Water Act and part of the federal regulations for several years, developing TMDLs is a relatively new task. The tools developed by EPA and its consultants to carry out the requirements have been mainly theoretical and involve enormous commitments of resources. Mathematical models developed for TMDLs require large amounts of data that rely on huge sampling efforts. The monetary and human resources to use these tools cannot be relied upon to meet the accelerated schedules and vast numbers of TMDLs that must be done.

DEP's TMDL Methods

DEP, therefore, has sought to adapt means to develop TMDLs that take into account resource constraints and, at the same time, fulfill our commitment to protecting our valuable water. DEP believes that TMDLs must be developed on a watershed basis to provide a full picture of and solution to water quality problems.

Watershed-based activities can only be affected when local citizens take ownership of their watershed. DEP strongly solicits and supports full public participation in the TMDL process. Watershed coordinators in each of the regional offices keep citizens and organized watershed groups fully informed of TMDL activities. Early in the TMDL process, informal communications with people in the watershed allow for their submission of data or other information about the watershed that can be used by DEP in developing the TMDL. Later, a formal public comment period and informational public meeting are held by DEP to present, discuss and, if necessary, amend each draft TMDL. The ultimate goal of the process is for citizens to understand the dynamics

and needs of their watershed and then take the lead in "fixing" them. The fixes involve developing implementation plans for the TMDLs, defining the actions to be taken to meet the TMDL goals and achieving the goals.

TMDLs must be developed for several categories:

- point sources (permitted sewage and industrial discharges);
- nonpoint sources (agriculture and urban runoff);
- lakes;
- abandoned mine drainage (also called acid mine drainage or AMD);
- specific bioaccumulative chemicals (PCBs and chlordane that contaminate fish, resulting in fish advisories limiting or banning the number of fish that a person can safely consume); and
- complex situations (combinations of different types).

Point source TMDL development is very similar to developing water quality-based effluent limitations for water discharge permits. The TMDL is developed to meet water quality standards for the critical period during the summer, when streams are at low flow and the effluent makes up a greater percentage of the water. This method assures that under less severe conditions, water quality will also be protected. DEP has carried out this same type of analysis using several well-established modeling tools for many years under the National Pollutant Discharge Elimination System (NPDES) program. Under this program, DEP calculates limits on the amount of pollutants that sewage and industrial facilities may discharge and still protect water quality. New tools were not needed for these types of TMDLs and most have been completed. By regulation, the TMDLs are implemented through DEP's issuance and enforcement of permits.

Nonpoint sources are not subject to the same regulatory requirements as point sources. Furthermore, the critical period for nonpoint or runoff sources is not during low flow conditions, but when rainfall washes pollutants across the land and into the streams. For these reasons, the tools that determine TMDLs for point sources do not work for nonpoint sources. DEP has developed a reference watershed approach to develop nonpoint source TMDLs. This method compares an unimpaired watershed of similar size, geology and land use distribution to the impaired watershed. Geographic Information Systems (GIS) technology is employed in the characterization of land use, background pollutant concentrations in soil and groundwater and other physical and chemical properties of each watershed. Computer simulation models are then used to estimate the loading rates in each watershed and to determine the load reductions of pollutants needed to correct the impairment. A load allocation is assigned to each

contributing source, and those sources identified as the causes of impairment are given prescribed reductions. The TMDL sets the stage for citizens to define a plan to correct the impairments. DEP will support their efforts to develop the plan and, through **GROWING GREENER** grants, will provide funds to put practices in place to correct the problems. For nonpoint source TMDLs, the input of local citizens replaces the regulated implementation procedures for point source TMDLs.

Lakes have characteristics that differentiate TMDLs from other waters. Lakes are not free-flowing like streams, but are contained waters that trap pollutants for long periods. Most lake impairments are from high nutrient or sediment loads. Wherever possible, lake TMDLs are developed with the information in the lake study reports that were sponsored by local watershed groups or other local interests. Target acceptable pollutant loads are set at the level of a watershed largely unaffected by human-induced impacts. Load allocations are given to the pollutant sources using the same methods as nonpoint source TMDLs. Other indicators of water quality are also considered in the evaluation of a lake. One indicator is the Trophic Status Index (TSI), which refers to the degree of nutrient enrichment in the lake. Nutrient enrichment causes growths of algae that consume oxygen and interfere with the health of the aquatic organisms in the lake. The TSI is affected by factors such as lake volume, water residence time and nutrient loads to the lake. After target loads are set, the TSI is evaluated under reduced nutrient load conditions to assure that the pollutant reductions will bring the TSI into an acceptable range. Implementation of lake TMDLs is best accomplished through local participation.

The overall goal of a PCB/chlordane TMDL is to achieve the fishable/swimmable goal of the Clean Water Act. Fish consumption advisories are issued when fish samples exceed certain triggers. For PCBs, the advisory is based on protection of human consumers from neurological effects. A Federal Drug Administration (FDA) action level determines when an advisory for chlordane is issued. Advisories cause the water to be listed as impaired and make TMDLs necessary. The method used for PCB/chlordane TMDLs is to translate the fish tissue concentration into a water column concentration by using a bioconcentration factor. Bioconcentration factors are mathematical expressions that account for fish accumulating the pollutants in their bodies. Accumulation is based on pollutants in the sediment being ingested by small organisms, which are then consumed by larger organisms, small fish and larger fish, each time magnifying the amount of pollutant that is introduced into tissue of the consumer. The TMDL defines how much the loading of pollutant must decrease in order to meet the water quality standard. Meeting the water quality standard in the water means the fish living in the water will be acceptable to consume.

Acid mine drainage (AMD) from abandoned surface and underground coal mines is a leading source of impairment to Pennsylvania waters. AMD can seriously degrade the aquatic habitat and the quality of water supplies because of toxicity, corrosion, incrustation and other effects from dissolved constituents. The TMDL analysis of AMD streams uses a statistical method of determining the instream allowable loading rate at the point of interest in the stream. Discharges that are permitted or have a responsible party are point sources, and make up the wasteload allocation portion of the TMDL. Nonpoint sources are all other sources and constitute the load allocation. AMD impaired watersheds are evaluated for aluminum, iron, manganese and pH using statistics and Monte Carlo (probability) simulations to model existing conditions, to determine required reductions and to calculate allowable concentrations. When the reductions are met, the water quality standards will be met.

Complex TMDLs draw on the procedures for all the TMDL types previously discussed.

Steps in the TMDL Process

The goal of a TMDL report is to provide detailed technical and scientific documentation that identifies the water quality impairment and the causes of impairment. The TMDL provides all the references used; an explanation of all assumptions; and a precise description of the procedures used. The TMDL must also be understandable to the non-technical citizens, who will be instrumental in its implementation. The following summarizes the steps in Pennsylvania's TMDL process:

- DEP assesses waters of the Commonwealth and solicits data from the public to determine waters which do not meet water quality standards
- Impaired waters are included on Section 303(d) list of impaired waters following public comment period
- Listed waters are scheduled for TMDL development
- DEP develops the TMDL by determining reduction goals for pollutants to meet water quality standards. The specific TMDL steps are:
 1. Data on the watershed are gathered from DEP resources and interested parties
 2. The data are entered onto spreadsheets, and locations of sampling points are mapped for further consideration
 3. All sources of point and nonpoint source pollutant loadings are located
 4. Current loading rates and TMDL endpoints are established using the various methods and models developed by DEP

5. The draft TMDL, addressing all elements required by EPA, is prepared
6. The draft TMDL is made available for public comment and a public informational meeting is scheduled
7. DEP responds to the comments and prepares the final TMDL
8. TMDL is submitted to EPA for approval
9. EPA approves or disapproves the TMDL and establishes a replacement TMDL within 30 days

- Local watershed groups and citizens develop implementation plan for TMDL with DEP assistance

Local groups sponsor remediation activities to meet implementation plan with **GROWING GREENER** grants and other funding sources available through DEP and other agencies.

For more information, contact:

PA Department of Environmental Protection
Bureau of Water Supply and Wastewater Management
P.O. Box 8467
Harrisburg, PA 17105-8467
(717) 787-9637

This fact sheet and related environmental information are available electronically via Internet. For more information, visit us through the PA PowerPort at <http://www.state.pa.us> or visit DEP directly at <http://www.dep.state.pa.us> (directLINK "Water Quality Assessment and Standards").



www.GreenWorks.tv - A web space dedicated to helping you learn how to protect and improve the environment. The site features the largest collection of environmental videos available on the Internet and is produced by the nonprofit Environmental Fund for Pennsylvania, with financial support from the Pennsylvania Department of Environmental Protection, 877-PA-GREEN.