

State of Surface Water Protection: A Summary of Critical Environmental Statutes

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INTRODUCTION

Protection of surface water resources is vital to both public health and environmental quality in the United States. Surface waters supply potable water to approximately 200 million people in the United States (U.S. Environmental Protection Agency (EPA), 2004a), including the large metropolitan areas of New York City, Boston, Chicago, Atlanta, Dallas, Seattle, Los Angeles, and Washington, DC. Additional public health issues directly related to surface water quality include fish consumption and recreational use of rivers, streams, and lakes. Surface waters also supply valuable habitat for fish and amphibians, as well as many species of mammals, birds, and reptiles.

While surface water quality has improved in the United States over the past 30 years, the *2000 National Water Quality Inventory* (EPA, 2002a) found that approximately 39 percent of the U.S. rivers and stream miles evaluated were impaired and do not support the uses for which they are designated. These uses include support for aquatic life, suitable conditions for fish consumption, contact recreation, drinking water, industrial uses, and agriculture. Approximately 45 percent of the surface areas of assessed lakes, reservoirs and ponds are impaired (EPA, 2002a). While pathogens and siltation are

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identified as the leading causes of impairment in rivers and streams, nutrients and metal are the primary sources of impairment in lakes and ponds.

The primary nationwide laws for protecting surface water quality in the United States are the Safe Drinking Water Act (SDWA, codified at 42 USCA Secs. 300f et seq.) and the Clean Water Act (CWA, 33 USCA Secs. 1251 et seq.). This paper will summarize the statutory and regulatory framework for protecting water quality. It provides a brief history of the SDWA and the CWA, outlines the jurisdiction of the statutes, described the process of implementation and enforcement, and discusses the mechanisms of resource protection. While both statutes are critical, emphasis is placed on the CWA due to its primacy in regulating pollution discharges and protecting surface water quality. The paper concludes with a brief discussion of the implications of these statutes for urban and urbanizing watersheds.

THE SAFE DRINKING WATER ACT

The Safe Drinking Water Act (SDWA) regulates public drinking water systems in the United States. Established in 1974 (P.L. 93-523), it was significantly amended in 1986 (P.L. 99-339) and 1996 (P.L. 104-182). Although protection of public health is the focus of the SDWA, the protection of surface water resources that serve as water supplies is a secondary effect of the law and its implementing regulations. While there are many elements of the statute that apply to water distribution systems, water treatment, and groundwater supplies, the following discussion concentrates on those elements of the SDWA that apply to the protection of surface water supplies.

Jurisdiction

There are more than 170,000 public water systems in the United States. They are defined as those systems that provide drinking water to at least 15 service

connections or serve at least 25 people per day for at least 60 days of the year. These systems, which may be owned by state or local governments, water companies, or other entities, can further be subdivided into two types—community and non-community systems. There are approximately 55,000 community systems in the United States (EPA, 1999b), which serve a fairly constant year-round population. Most homes are served by community systems. Non-community systems serve facilities such as schools, hospitals, or state parks whose user population fluctuates during the year.

Resource Protection

Protection of public health is achieved under the SDWA through the identification of potential contaminants, development of maximum contaminant level goals (MCLGs) for those pollutants, namely the level or concentration of a contaminant below which there is no known or expected health risk. That in turn provides the basis for setting maximum contaminant levels (MCLs) for substances allowed in drinking water delivered to any user of a public water system. The MCL for a particular contaminant is usually higher than the MCLG due to limitations in either available treatment technology to remove the contaminant or costs associated with meeting the MCLG that make it infeasible (EPA, 2003a). In certain cases, when the EPA determines that it is not economically or technically feasible to establish a MCL or when there is no reliable or economical method of detecting a particular contaminant, a required treatment technique for contaminant removal may be established instead.

When initially enacted in 1974, the SDWA established standards for drinking water quality and focused on water treatment to meet those standards. While this approach safeguards public health, it focuses on the “end of the pipe” and does not address protection of the waters that are the source of the drinking water supply. Source water protection became a more prominent part of the SDWA with the passage

of the Safe Drinking Water Act Amendments of 1986 and 1996, cited earlier. The 1986 amendments expanded the list of drinking water contaminants to 83, including several disease-causing microbial contaminants or pathogens (EPA, 2003a).

The Surface Water Treatment Rule (SWTR), which resulted from the 1986 amendments and became effective December 31, 1990, requires water systems to filter and disinfect surface waters used for public water supply in order to reduce the levels of viruses and other microbes that cause waterborne disease. The regulations (40 CFR 141.17) allow a waiver from filtration for systems that meet specific criteria for source water quality and watershed conditions. One criteria for the waiver is that the public water system demonstrate the ability to “control all human activities which may have an adverse impact on the microbial water quality of the source water” (40 CFR 141.71(b)(2)(iii)). The public water system must also identify watershed characteristics or activities that may adversely affect source water quality (40 CFR 141.71(b)(2)(ii)).

Disinfection techniques to eliminate pathogens can also create disinfection by-products which may themselves pose health risks (Boorman, et al., 1999). As a result, EPA established the Interim Enhanced Surface Water Treatment Rule in 1998 and the Long Term 1 Enhanced Surface Water Treatment Rule in 2001. The former required that unfiltered systems that serve 10,000 or more persons expand their watershed control requirements to include the pathogen *Cryptosporidium* and that all public water supply systems, regardless of the size of the population served, conduct sanitary surveys. Sanitary surveys are a comprehensive inspection of a water system that includes identification of potential contamination of the surface water supply (EPA, 1999a). The latter rule expanded the watershed control requirements to all systems.

Implementation and Enforcement

EPA is responsible for implementing the SDWA, but states may apply for authority to administer the act, referred to as “state primacy.” As of 2004, all states and territories except Wyoming and the District of Columbia have primacy, but all are subject to the oversight of the EPA. Systems not in compliance with the SDWA and its regulations are subject to enforcement actions that may include levying fines, taking legal actions, and issuing administrative orders (EPA, 2004b). While public water systems are typically subject to these enforcement actions, they may be brought against any individual, corporation, company, association, partnership, or governmental agency violating SDWA regulations or creating a threat of contamination to a public water supply system (EPA, 2004b).

Box 1 -- The New York City Watershed Management Strategy

The New York City water supply provides an interesting example of how resource protection for an urban water supply benefits watersheds outside of the urban center. The Catskill/Delaware Water Supply System supplies 90 percent of the drinking water for New York City (EPA, 2002b). Located in upstate New York, land use in the over 1,000 acre watershed is mixed. A variety of potential pollution sources including wastewater treatment plants, agricultural operations, and on-site wastewater disposal or septic systems are present in the watershed (EPA, 2002c; National Research Council, 2000; Platt, Barten, and Pfeffer, 2000).

As discussed above, the Surface Water Treatment Rule specifies certain criteria under which water supply systems can avoid filtration if the water supply system can demonstrate particular source water quality and watershed conditions. In 1992, the New York City Department of Environmental Protection (NYCDEP) sought a waiver from filtration for the Catskill/Delaware water system. From 1992 to 1997, EPA granted a series of conditional filtration avoidance determinations (FADs), subject to submission of additional information on the watershed protection program for the system. In May 1997, a 5-year FAD was granted. In 2002, another FAD was granted to NYCDEP, subject to an expansion of watershed protection measures.

Meeting particular standards for microbial water quality in the drinking water delivered to the public is the goal of the SDWA and the SWTR. However, the NYC FAD process is an example of how resource protection, as opposed to “end of pipe” water treatment, results from the SDWA and SWTR. The FADs issued in 1997 and 2002 require a variety of watershed protection measures which provide direct and indirect benefits to surface water quality including septic system rehabilitation and replacement,

wastewater treatment plan upgrades, stream restoration, wetlands protection, stormwater control, and land acquisition (EPA, 2002c).

Almost all resource protection activities have a cost. Water quality sampling and analysis, restoration, and installation of BMPs are examples of activities requiring an initial capital cost and as well as on going maintenance-type costs, even if the maintenance consists only of assessing water quality status. Because potable water is a commodity, there is at least the potential for revenues associated with the sale of potable water to be utilized for resource protection. In the case of the NYC watershed, extensive watershed protection measures were actually a more desirable alternative than the cost associated with construction and on-going operation of a large water filtration plant.

THE CLEAN WATER ACT

The Clean Water Act (CWA), the primary federal statute for the protection of surface water resources in the United States, dates back to the 1948 Water Pollution Control Act (WPCA) (P.L. 80-845). Emphasizing human health concerns, the WPCA gave states the primary role in water quality protection and provided funding to local and state governments for water pollution control projects (EPA, undated). Over the following 20 years, additional laws expanded the federal role in water quality protection. While the Water Pollution Control Act Amendments of 1956 (P.L. 84-660) and the Federal Water Pollution Control Act Amendments of 1961 (P.L. 87-88) primarily provided funding for construction of local wastewater treatment plants, the Water Quality Act of 1965 (P.L. 89-234) was the first Federal statute to require states to develop water quality standards for interstate waters and determine pollutant loading that could be discharges to these waters without exceeding the specified water quality standards (EPA, undated).

However, lacking civil or criminal penalties for enforcement, many states failed to do so by the early 1970s.

The Federal Water Pollution Control Act (FWPCA) Amendments of 1972 marked the first step toward comprehensive Federal regulation of surface water quality. The FWPCA Amendments outlined specific goals for water quality in the United States and established programs for permitting discharges of pollutants into surface waters. The goals of the FWPCA were ambitious, including the elimination of discharge of pollutants into navigable waters by 1985, prohibition of discharge of toxic pollutants in toxic amounts, and fishable and swimmable waters by 1983. Control of toxic pollutants were addressed more fully in 1977 amendments which renamed the entire law the “Clean Water Act” (CWA). The CWA was further amended in 1987 (P.L. 100-4) to address nonpoint or diffuse sources of pollution (USFWS, 2004; Copeland, 1999).

The Clean Water Act establishes water quality standards (WQS) for “Waters of the United States,” defined broadly to include most rivers, lakes, estuaries, coastal waters and wetlands (EPA, 2003b). WQS have three components: (1) designated uses for the waterbody, (2) water quality criteria that specify quantitative measures of water quality, and (3) antidegradation measures expressed as a series of policies to maintain water quality.

The designated uses (DUs) of a waterbody are those uses that the state and Federal government have determined are appropriate for the surface water body. They may one or more of the following: water supply, aquatic habitat, water-based recreational use, fishing, agricultural water supply and industrial water supply (EPA, 2003b). The *2000 National Water Quality Inventory* (EPA, 2002a) mentioned in the introduction to this paper summarizes the status and impairment of waters subject to the CWA.

Water Quality Criteria (WQC) are expressed as levels of a particular pollutant, descriptions of waterbody conditions, or water quality characteristics that establish criteria for protection of a DU. The WQC may also apply to various types of organisms such as humans, aquatic life and wildlife (EPA, 2003b). A single waterbody with multiple DUs is subject to several WQC.

Antidegradation policies are intended to maintain the quality of waters meeting the requirements for a DU. There are three levels or tiers of antidegradation policies (EPA, 2003b). Tier 1, which applies to all waters regardless of use, provides a “floor” for water quality and states that no existing designated use of a waterbody should be lost if authority exists under the CWA to prevent that loss. Tier 2 is intended to prevent a decline of water quality from levels well above WQS to levels just meeting WQS. However, degradation is allowable if certain circumstances are demonstrated including application of available pollutant controls and economic and social considerations. Tier 3, the most stringent, applies only to waters designated as Outstanding National Resource Waters due to their location or ecological or recreational value.

Discharges into “waters of the United States” fall under two categories: point sources and non-point sources. Point sources of pollution are discrete discharges such as those associated with a wastewater treatment plant or a stormwater drainage system discharging to a river or stream. Nonpoint sources of pollution are diffuse. They include runoff from the land surface and even atmospheric deposition.

This paper now looks at two primary CWA programs— the National Pollutant Discharge Elimination System (NDPES) program and the Total Maximum Daily Load (TMDL) program.

Point Sources: The NPDES Program

Jurisdiction

Point sources subject to the NPDES program (CWA, Sec. 402) consist of pipes or other discrete, confined conveyances that discharge pollutants, including both wastewater discharges and stormwater. Wastewater discharges were the group of point sources initially under the jurisdiction of the CWA and NPDES program. Discharges from publicly-owned sewage treatment works (POTWs), industrial facilities, commercial establishments and large agricultural operations are examples of the wastewater discharges regulated by the NPDES program.

The Water Quality Act of 1987 expanded the NPDES program to include stormwater discharges, to be implemented in two phases. Phase I, developed by EPA in 1990, regulated stormwater discharges from large- and medium-sized municipal separate storm sewer systems (MS4s) in places with greater than 100,000 people and eleven categories of industrial activity, including construction activity that disturbs five or more acres of land (EPA, 1996). Although, called “municipal,” MS4s actually refer to any publicly owned or operated stormwater sewer system.

Starting in 1999, Phase II expanded the regulation of MS4s to include certain small systems based on location within an “urbanized area”¹ as defined by the U.S. Bureau of the Census and construction activities disturbing between one and five acres of land (EPA, 2000). While municipalities are the group most affected by the inclusion of MS4s under the NPDES program, the regulation of construction activities expands the CWA jurisdiction considerably, potentially affecting even single-family home construction.

¹ An urbanized area is defined as a land area comprising one or more places – central place(s) – and the adjacent densely settled surrounding area – urban fringe – that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile.

Resource Protection

The NPDES program is designed to maintain the WQS established under the CWA by regulating the discharge of pollutants into surface waters. Pollutants are broadly defined as any type of municipal, industrial, or agricultural waste discharged in water, but are generally grouped into three categories in the NPDES program: conventional, toxic, and non-conventional (EPA, undated). “Conventional” pollutants include five-day biochemical oxygen demand (BOD5), total suspended solids (TSS), pH, fecal coliform, and oil and grease (O&G) (CWA, Sec. 304(a)(4)). “Toxic” pollutants, also called priority pollutants, include over 100 substances pollutants or combinations that cause adverse effects in organisms and their offspring. Other substances that are neither conventional nor toxic pollutants are considered non-conventional pollutants (EPA, undated).

Implementation and Enforcement

The NPDES program is implemented through individual and general permits issued to discharges under the jurisdiction of the NPDES program. Individual permits are unique permits issued to a particular discharger and contain permit conditions specific to that discharger. General permits cover a larger number of similar dischargers that would require the same permit conditions. A general permit is a more efficient way to regulate discharges that are similar either due to the type of facility or nature of activity that generates the discharges.

Whether an individual or general permit, each NPDES permit includes “effluent limits,” namely measurable, numeric limits on the amount of particular pollutants that may be discharged into waters of the United States. Effluent limits may be either technology-based or water quality-based. The former are based on the type of facility

generating the discharge; they reflect the levels of particular pollutants that can be achieved using the most cost-effective pollution prevention and control techniques suitable for a specific facility type. Technology-based effluent limits are performance standards and do not specify the type of control techniques to be used. But they do require that existing discharges utilize the Best Available Technology Economically Achievable (BAT). New discharges must comply with New Source Performance Standards (NSPS), which are often more stringent than standards for existing discharges (EPA, 2003b).

Water quality-based effluent limits are based on the designated uses of the receiving water, using “back calculation” of effluent limits to protect those uses. Unlike technology-based effluent limits, water quality-based limits place less emphasis on available technology and economic considerations.

NPDES permits usually require monitoring and use of best management practices (BMPs). BMPs include specific structural controls or non-structural, operational activities for pollution prevention. Monitoring requirements typically specify the type of pollutants to be monitored, the frequency of monitoring, the sampling and analytical methods to be used, and requirements for monitoring reporting or record keeping. Discharges are monitored and, in some cases, receiving waters are required to be monitored as well.

As with the SDWA, EPA may delegate authority to enforce the CWA to states, territories, and tribes that have programs which meet or exceed federal standards. Currently, 46 states and territories have delegated authority (EPA, 2003d), and are responsible for issuing permits, conducting inspections and monitoring, and taking enforcement actions, subject of course to EPA oversight (EPA, 2003b).

Unpermitted discharges to waters of the United States, exceedance of effluent limitations in permitted discharges, and failure to comply with required monitoring and

reporting all violate the NPDES regulations. The NPDES program promotes voluntary compliance with assistance from EPA and the states, but a variety of enforcement actions are possible, including injunctions, fines for violations such as failure to report or exceeding permit limits, imprisonment for criminal violations that are repeated and willful violations, and supplemental environmental projects (SEPs). SEPs are an alternative to traditional fines that require the violator to spend more than the amount of the fine on relevant and beneficial environmental projects. Citizen lawsuits against violators are allowable, but EPA and any relevant state, territory or tribe must be notified 60 days prior to the action to allow the regulatory agencies to pursue enforcement (EPA, 2003b).

Nonpoint Sources: The TMDL Program

Jurisdiction

Section 303(d) of the CWA requires states, territories and tribes to develop lists of impaired waters that do not meet established water quality standards after point sources discharging to the water body have installed the minimum required levels of pollution control (EPA, 2003c). Once identified, these waters must be prioritized and Total Maximum Daily Loads (TMDLs) must be established for them. A TMDL is the maximum amount or load of a specific pollutant that a water body can receive from both point and nonpoint sources and still meet its water quality standard (EPA, 2003c).

While TMDLs for nonpoint sources have been part of the CWA since the 1972 amendments, point sources received the initial attention (NRC, 2001). Most states failed to implement the requirements to establish water quality standards for waters within their states until a series of citizen lawsuits in late 1980s and early 1990s required the states and EPA to comply with Section 303(d). As of 2003, there have been approximately 40 legal actions in 38 states forcing the states and EPA to develop lists of impaired waters and TMDLs for those waters (EPA, 2003c). EPA issued TMDL regulations in 1985 and

then in 1992. Proposed revisions to the TMDL regulations were developed in 1999 and a final rule published in July 2000. Congress blocked implementation of the rule and in 2003 EPA withdrew the controversial 2000 TMDL Rule. The TMDL program continues under the 1992 regulations and guidance issued by EPA in 1997. Houck (2002) provides a comprehensive review of the history of Section 303(d) and the evolution of the current TMDL program.

Resource Protection

The TMDL program relies on a water-quality based strategy to address impairments that remain despite point source controls. The underlying consequence is that the TMDL program must establish allowable loadings for nonpoint pollutants which are difficult to determine and to regulate. As discussed more fully in the section on implementation and enforcement of the program, Section 303(d) establishes requirements for identification of and development of TMDLs for impaired waters, but does not provide an implementation mechanism to control pollutant loading. Instead, existing regulatory programs such as the NPDES program must be used to implement TMDLs.

Implementation and Enforcement

Under the 1992 TMDL regulation, states, territories, and authorized tribes must develop lists of waters impaired or threatened by pollutants. These lists must be submitted to EPA every two years and must include a priority ranking for each impaired water based on the severity of impairment and the impaired use, the pollutant(s) causing impairment in each listed water, and identification of the waters targeted for TMDL development within the next two years (EPA, 2003c).

At this writing, about 10,000 TMDLs have been approved by EPA. But as of 2002, approximately 49,000 TMDLs were required (Bruninga, 2003). This number may actually underestimate the impaired waters and TMDLs required. According to the General Accounting Office (2000), states only monitor a fraction of U.S. waters and in many cases the data used in the assessment is incomplete or outdated (GAO, 2000). In 2003, EPA issued updated guidance for development of the 2004 lists, emphasizing the need for technically sound assessment methodologies and outlining minimum data requirements for water quality assessment (Regas, 2003). The guidance recommends classification of waters into one of five categories (Regas, 2003):

- Category 1 - All designated uses are met.
- Category 2 - Some of the uses are met but insufficient data exist to determine if remaining uses are met.
- Category 3 - Insufficient or no data exist to determine if any designated uses are met.
- Category 4 - Water is impaired but TMDL is not needed.
- Category 5 - Water is impaired and TMDL is needed.

Waters classified into Category 5 would require a TMDL. The core of a TMDL is the allocation of pollutant loads to achieve the applicable water quality standards, which can be expressed as:

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{MOS}$$

Where

WLA = waste load allocation (sum of point sources)

LA = load allocation (sum of nonpoint sources and natural background conditions)

MOS = margin of safety (to reflect uncertainty in the load calculations).

While the equation above is a simple sum, determination of the values associated with each variable is complex. Collection and interpretation of water quality data, development and implementation of water quality models, and estimation of effectiveness of pollution prevention and control techniques are all typically required to develop a TMDL.

Once a TMDL is approved, actual waste load allocation must rely on existing regulatory mechanisms and voluntary compliance to achieve water quality improvement. For point sources, use of water quality-based effluent limits under the NPDES permitting process may be applicable. Regulating nonpoint sources is more difficult from a technical and legal perspective. In fact, the authority of EPA to regulate nonpoint sources was in doubt until the Ninth Circuit Court of Appeals in *Pronsolino v. Nastri* (291 F.3d. 1123) affirmed EPA's assertion that the CWA gave authority to regulate nonpoint sources of pollution and establish TMDLs for waters impaired solely by nonpoint sources.

EPA recommends that states provide an implementation schedule for TMDLs and that implementation should occur within 8 to 13 years of a water body being listed (Perciasepe, 1997). In addition, a plan for implementing load allocations for nonpoint sources identified in the TMDL should be included. The plan should identify regulatory, non-regulatory, and incentive based methods to achieve load allocations, describe a public participation process and other watershed management programs that interface with nonpoint source pollution control.

Box 2 – The Buffalo Bayou TMDL

The development of the Buffalo Bayou watershed bacteria TMDL is an example of how diverse stakeholder involvement and extensive technical investigation combine in the TMDL process (TCEQ, 2004). The Buffalo Bayou watershed is a sizeable watershed in the Houston, Texas area. The process, which began in 2000, is anticipated to take six years. The stakeholder group consists of representatives from the City of Houston and other local governmental agencies, Federal government agencies, local citizens and non-governmental organizations. A public participation plan is part of the process and extensive technical investigations are on-going. These investigations consist of bacteria monitoring and source tracking and the development of a computer program to model the bacteria loading to the bayou. The TMDL is scheduled for submission to EPA in 2006.

Science Behind TMDLs

Much attention has been given to the quality of the science behind the development of TMDLs. A report by the National Research Council (2001) on the assessment of the scientific basis of the TMDL approach to water pollution reduction and the EPA report entitled *The Twenty Needs Report: How Research Can Improve the TMDL Program* (EPA, 2002d) examine the technical and scientific challenges of the TMDL strategy.

The NRC report, *Assessing the TMDL Approach to Water Quality Management*, was commissioned by Congress when the implementation of the 2000 TMDL Rule was suspended. While the report addresses the goals of the TMDL program and potential changes to the TMDL process, the primary focus of the report is on suggested changes

in the data and analytical methods used to conduct the TMDL process. The following recommendations are made regarding the program goals and process:

- Designated Uses (DUs) – DUs should be appropriate and subject to refinement. Attainment of DUs should be the primary measure of TMDL program success, not the number of TMDLs completed or approved.
- Method of Implementation – A cyclical TMDL process is recommended, one that assesses achievement of DUs and uses new information to revise TMDL plans. It should also include both pollutants and other stressors such as habitat modification. Scientific uncertainty should be acknowledged and the list of impaired waters (303(d) list) should be modified to consist of a preliminary list, for waterbodies where inadequate data or standards are lacking, and an action list.

Regarding the science used in the TMDL program, the NRC report recommends the following:

- Water Quality Standards – Assessment of DUs should include biological criteria as well as chemical and physical criteria. WQS should be measurable by reasonably obtainable monitoring data. USEPA guidance for states and tribes on implementation of narrative (i.e., non-numeric) standards is also recommended.
- Waterbody Assessment and Listing – Given the range of approaches employed by the states, a nationwide uniform approach to monitoring and data collection is recommended. In addition, the report cites the need for sufficient resources for states and tribes to conduct appropriate water quality monitoring.
- TMDL Development – A margin of safety (MOS) determination should be established through uncertainty analysis, not an arbitrary selection as is sometimes done in TMDL development. Modeling and monitoring should be used in conjunction to develop TMDL and environmental models. Post-

implementation monitoring should be conducted to assess TMDL model performance.

The USEPA *Twenty Needs* report summarizes science needs for the TMDL process identified by various stakeholders. The “twenty needs” can be grouped into three areas: (1) interactions between EPA offices regarding research; (2) needs related to TMDL development and implementation; and (3) the CWA impaired waters program.

The report identifies a need for EPA to assist TMDL practitioners and decision-makers through better technical support. Identified needs related to TMDL development and implementation echo those in the NRC report and also cite the need for more information on atmospheric deposition of pollutants and best management practices (BMP) effectiveness. The *Twenty Needs* report also reiterates the NRC report recommendations in the areas of monitoring, DU development, impaired water listing, and use of biological criteria in assessing water quality. In addition, the *Twenty Needs* report identifies the need for continued support for unimpaired waters to prevent degradation.

CONCLUSION

Successful implementation of the TMDL program has great potential to improve water quality conditions in urban areas of the United States. These waters, initially impacted by point source discharges from industry and POTWs, have seen significant improvements as a result of the NPDES program. The TMDL program is intended to address the persistent and difficult problem of nonpoint source pollution. The waters requiring TMDLs are those that remain below water quality standards even after the implementation of point source controls. Some waters will require more stringent controls on point sources, but most will require some reduction in nonpoint sources. Assessing the contribution of nonpoint sources, allocating an allowable load to them,

and regulating nonpoint source discharges are among the greatest challenges of the TMDL program from a technical standpoint. As pointed out in the 2000 GAO report, state information on water quality is often incomplete, leading to potentially flawed assessment of water quality and prioritization of TMDL development.

In addition to technical challenges, the costs associated with obtaining accurate and sufficient data and developing reliable estimates load allocation may be high. As a result, funding considerations inevitably come into play. Impaired waters for which funding can be obtained, through state allocation, local government funding or non-governmental organization activity, will have better opportunities for effective TMDL development.

Availability of adequate funding, coupled with comprehensive stakeholder involvement from the start of the TMDL process will improve the chances for successful implementation and actual pollutant loading reduction.

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