United States
Environmental Protection
Agency

Office of Water Regulations
and Standards
Washington, D.C. 20460

Water

EPA

Guidance for the Implementation of Section 303(d)/Total Maximum Daily Loads

Draft 05/17/90

Guidance for the Implementation of Section 303(d)/Total Maximum Daily Loads

Draft
May 1990

Assessment and Watershed Protection Division
U.S. Environmental Protection Agency
Washington, D.C. 20460

This guidance will be reviewed and revised periodically to reflect changes in EPA's strategy for the implementation of water quality-based controls, to inlcude new information, or to clarify/update the text. Comments are invited and will be considered in these revisions. Comments or inquiries should be directed to :

Monitoring Branch
Monitoring and Data Support Division (WH-553)
U.S. Environmental Protection Agency
401 M St. SW
Washington, D.C. 20460

Attention: Ed Drabkowski

Letter of Transmittal

GUIDANCE FOR THE IMPLEMENTATION OF SECTION 303(d)/TOTAL MAXIMUM DAILY LOADS

	Page
EXECUTIVE SUMMARY	i
CHAPTER 1 -- INTRODUCTION	1
Purpose of Guidance	2
Summary of Section 303(d) Requirements	2
Regulatory Definitions	2
Requirements	3
Definitions for EPA Tracking	4
Statement of Policy	5
Roles of EPA and States	7
CHAPTER 2 -- SECTION 303(d) AND THE WATER QUALITY-BASED STANDARDS TO PERMITS PROCESS	9
Standards-to-Permits Process	9
Identify and Prioritize Waters Needing Water Quality-based Controls	9
Review & Revise/Reaffirm Water Quality Standards	13
Develop Water Quality-based Controls	14
Implement Controls	15
Assess Result of Controls	15
Geographical Approach	16
CHAPTER 3 -- DEVELOPING TMDLs/WLAs/LAs	19
Technical Considerations	19
TMDL Process	19
Mathematical Models	20
Multiple Discharges	22
Allocation of Loads	23
Allocation Trading	24
Persistent and/or Highly Bioaccumulative Pollutants	24
Use of Two-number Criteria	25
Sediment Issues	26
Control Measures	26
Incorporating TMDLs/WLAs/LAs into permits	27
Nonpoint source controls - BMP Effectiveness Strategy	30
Phased Approach for TMDLs	31
CHAPTER 4 -- IMPLEMENTATION	35
EPA/State Agreements	35
State Responsibilities	35
Development of Schedules and Timing	35
TMDL, WLA, and LA Development	36
Continuing Planning Process	38
Water Quality Management Planning	38
Public Notice and Participation	38
Reporting	39
Specific Requirements	39

	Page
EPA Responsibilities	40
TMDL Review and Approval	40
Tracking	42
Program Audits	42
Technical Assistance and Training	43
Guidance Documents and Reports	43
EPA Headquarters Responsibilities	43
EPA Regional Responsibilities	44
APPENDIX A SCREENING CATEGORIES	45
APPENDIX B RELATIONSHIP TO OTHER PROGRAMS	**47**
Monitoring Program	47
Section 304(l) -- Impaired Waters	47
Section 319 -- Nonpoint Source Program	47
Section 305(b) -- Water Quality Assessment	48
EPA Criteria and Standards	48
Marine and Estuarine Waters	49
Groundwater	49
NPDES Permits and Individual Control Strategies	49
APPENDIX C RELATIONSHIP TO OTHER GUIDANCE	51
Monitoring Guidance	51
Wasteload Allocation Technical Guidance	51
Cooperative Monitoring	51
Technical Support Document for Water Quality-based Toxics Control	52
Permit Writers Guidance	52
Nonpoint Source Guidance	53
Antidegradation and Antibacksliding	53
APPENDIX D SUMMARY OF AVAILABLE MATHEMATICAL MODELS	54
APPENDIX E GENERAL OUTLINE EPA/STATE AGREEMENT FOR DEVELOPMENT OF TMDLs, WLAs, and LAs	**59**
APPENDIX F EXAMPLE TRANSMITTAL LETTERS	60
LIST OF ACRONYMS	**65**
SELECTED OFFICES, DIVISIONS, BRANCHES, AND SECTIONS WITHIN EPA	**66**

EXECUTIVE SUMMARY

This guidance document focuses on the Clean Water Act requirements under section 303(d) for the setting of total maximum daily loads (TMDLs) for waters where effluent limitations are not stringent enough to meet State water quality standards. The responsibility for overseeing the implementation of section 303(d) by the States is with the EPA Regional offices and the EPA Headquarters' Office of Water Regulations and Standards.. This guidance is intended for the use of State and EPA program managers to implement section 303(d) requirements. Technical guidance is referenced and available for technical personnel responsible for developing TMDLs.

Total maximum daily loads include wasteload allocations (WLAs) for point source dischargers and load allocations (LAs) for nonpoint source discharges. TMDLs represent the cumulative allowable loading to a waterbody.

EPA's surface water quality strategy is to ensure that current levels of controls on traditional point source dischargers are in place and are maintained. Where these traditional controls are not sufficient and baseline controls for non-traditional controls (i.e., best management practices for nonpoint sources, combined sewer overflows, and stormwater discharges) are not yet in place, States should implement specific available practical controls for the non-traditional sources causing the most serious impacts. If additional controls are still needed to meet water quality standards, site-specific TMDLs would be developed.

Section 303(d) Process

The implementation of section 303(d) can be described by a five-stepped process generally known as the "Water Quality-based Standards to Permits" process. The steps in this process are: 1) identify and prioritize waters needing water quality-based controls, 2) review and revise or reaffirm water quality standards, 3) develop water quality-based controls (TMDLs, WLAs, LAs), 4) implement controls, and 5) assess results of controls.

EPA encourages the States to develop TMDLs in geographically targeted areas. Water quality management on a broader geographic scale promotes efficient use of resources and effective management. Several States are developing their programs following this concept.

Developing TMDLs/WLAs/LAs

After identifying needing water qulatiy-based controls, the TMDL process has four steps: 1) selecting the pollutant to consider, 2) estimating the pollutant loading, 3) predicting pollutant concentrations, and 4) allocating pollutant loads to meet water quality standards.

To aid in developing a TMDL, mathematical models have been developed for predicting characteristics of both point and nonpoint source pollutants. Each model has a particular characteristic that makes it suitable for application based on four categories: temporal/spatial characteristics; specific constituents; processes simulated; and transport processes. Other considerations that must be decided include model selection based on its application to the situation, appropriateness, and practical constraints.

Models provide the necessary information to enable the allocation of loadings among pollution sources. Some innovations in allocating loads include trading loads between point and nonpoint sources which have demonstrated cost savings.

Adequate site-specific information is needed to calibrate and verify mathematical procedures used during analysis. Often, sufficient data is not available, particularly where load allocations from nonpoint sources are concerned. To deal with these situations, EPA recommends that a phased approach to TMDL development be followed.

The phased approach establishes a process resulting in a final TMDL with a full margin of safety and includes the following steps:

Phase I

- Establish/maintain point source controls.
- Establish practical NPS controls using best professional judgement (BPJ) and available data.
- Begin collection of data on NPS loadings, etc.

Phase II

- Develop provisional TMDL using NPS load/reduction estimates.

Phase III

- Develop final TMDL.
- Review/revise point source controls, if necessary.
- Establish/revise NPS controls.

Program Implementation

EPA and the States have separate responsibilities for implementing section 303(d) requirements. Each State has the responsibility for working with EPA to develop its schedules and timing for setting TMDLs based on its identification and prioritization of waters needing water quality-based controls and reporting progress in completing the TMDLs.

EPA is responsible for seeing that the mandates regarding TMDL development are carried out, that program and technical guidance is provided, and that adequate training and assistance is made available. EPA Regional offices are responsible for reviewing and approving State submitted TMDLs and the lists of waters (and loads) still needing TMDLs. EPA is also responsible for tracking the progress being made in TMDL development by the States and in conducting general audits on their accomplishments.

CHAPTER 1
INTRODUCTION

Under the Clean Water Act (CWA), the States and the Environmental Protection Agency (EPA), in cooperation with State and local governments and other federal agencies, are responsible for restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. Two key tools for water quality management are the Total Maximum Daily Load (TMDL) process and monitoring. The principal focus of this guidance is the TMDL process which is mandated under section 303(d) of the Clean Water Act (CWA). The EPA Office of Water Regulation and Standards, Assessment and Watershed Protection Division (AWPD) is responsible for developing guidance and technical support for TMDL development and monitoring within the Monitoring Branch. AWPD is also responsible for exposure assessments (e.g., National Bioaccumulation Study), information services (e.g., databases), and special studies through the Water Quality Analysis Branch. The Nonpoint Source Control Branch is responsible for clean lakes program and nonpoint source (NPS) evaluation and controls.

Total Maximum Daily Loads (TMDLs), Wasteload Allocations (WLAs), and Load Allocations (LAs) are water quality planning and management tools which are used to establish water quality-based controls. The type of TMDL, WLA, or LA needed for a given waterbody will depend on the nature of the water quality problem(s), the geographic target(s), whether the problem is localized or basin-wide, and the characteristics of the receiving water (e.g., complexity of natural circulation and mixing process, existence of multiple overlapping discharges, influences from NPS).

This guidance is composed of four chapters. Chapter 1 describes the requirements of section 303(d) of the Clean Water Act and the associated development of TMDLs, WLAs, and LAs. Identification and prioritization of waters needing TMDLs and the Standards to Permits process are described in Chapter 2. Technical considerations and available control measures are summarized in Chapter 3. Chapter 4 describes State and EPA responsibilities in implementing the section 303(d) requirements.

Purpose of Guidance

The purpose of this document is to provide the States and the EPA Regional offices guidance on implementing the section 303(d) requirement of the Clean Water Act for developing water quality-based controls. TMDLs, WLAs, and LAs are required for water quality limited segments needing more stringent controls to meet water quality standards. The guidance defines TMDLs, WLAs, and LAs in accordance with EPA regulations and establishes definitions for purposes of tracking TMDL development. Also, the guidance addresses EPA's objectives of geographic targeting for nonpoint sources, time sequencing for TMDL development, phasing of TMDL development where background NPS data may not be assessable, tracking the status of actions on priority water quality-limited segments for both clean-up purposes and preventive actions, and discusses related technical aspects of the program.

Summary of Section 303(d) Requirements

Regulatory Definitions

The Water Quality Planning and Management regulation[1] establishes definitions for TMDLs, WLAs, and LAs. These definitions help provide for national consistency in developing water quality-based controls.

- Total Maximum Daily Loads -- The sum of the individual WLAs for point sources and LAs for nonpoint sources and natural background. If a receiving water has only one point source discharger, the TMDL is the sum of the point source WLA plus the LAs for any nonpoint sources of pollution and natural background sources, tributaries, or adjacent segments. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure. If Best Management Practices (BMPs) or other nonpoint source pollution controls make more stringent load allocations practicable, then WLAs can be made less stringent. Thus, the TMDL process provides for nonpoint source control tradeoffs.
- Wasteload Allocation -- The portion of a receiving water's loading capacity that is allocated to existing or future point sources of pollution. WLAs constitute a type of water quality-based effluent limitation.
- Load Allocation -- The portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources. Load allocations are best estimates of the loading, which may range from reasonably accurate estimates to gross

1 40 CFR 130.2

allotments. This will depend on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and nonpoint source loads should be distinguished.

A TMDL is a numerical quantification of the pollutant loading which can be received by a waterbody and is based on the applicable State water quality standard. The TMDL is comprised of WLAs for point sources (e.g., industrial and municipal discharges), LAs for NPSs (e.g., agriculture, construction, silviculture), and a margin of safety. The margin of safety is related to the uncertainty associated with estimating loading capacities and the data or information available for a given pollution problem. A greater margin of safety is associated with load estimates which have larger uncertainties.

Requirements

Section 303(d) of the Clean Water Act requires States to identify waters that do not meet applicable water quality standards (including thermal discharges) with technology-based controls alone. The States are also required to establish a priority ranking for these waters, taking into account the pollution severity and designated uses of waters. TMDLs are to be established and approved for pollutants (and thermal discharges) in order to achieve applicable water quality standards. TMDLs must allow for seasonal variations and a margin of safety which account for any lack of knowledge concerning site-specific discharge conditions.[2] In so doing, the States are to determine a TMDL for a waterbody and to develop WLAs and LAs for related point source and nonpoint source discharges to the same waterbody, respectively. TMDLs, WLAs, and LAs must be established to meet antidegradation and antibacksliding requirements.

Furthermore, States are required to submit to EPA "waters identified and (pollutant) loads established"[3] from time to time for review and approval by EPA. After approval by EPA, States are to adopt these pollutant loads into their continuing planning process (CPP). If disapproved by EPA, EPA will identify these waters and develop TMDLs with related WLAs and LAs to be incorporated into the State's CPP. Similar requirements for developing TMDLs are established for waters that were not identified under section 303(d)(1)(A) of the CWA, for the specific purpose of developing information.[4] EPA has interpreted this requirement to be completed as State resources allow.[5] As a result, States may develop TMDLs for waters that are not impaired (e.g., threatened good quality waters).

---

2 CWA section 303(d)(1)(C)

3 CWA section 303(d)(2)

4 CWA section 303(d)(3)

5 40 CFR 130.7(e)

If States do not submit a list of waters or required TMDLs to EPA, EPA must interpret this as a constructive submission meaning that there are no waters needing TMDLs in that State. It is incumbent on EPA to approve or disapprove this submission. Should EPA disapprove a constructive submission, it is EPA's duty to identify waters needing new or revised TMDLs. Similarly, if a State has defaulted to act over a long period of time, it is EPA's duty to establish TMDLs as necessary to carry out the goals and objectives of the Clean Water Act.[6] In either case, it is EPA's strong preference to work with the States in identifying waters and developing TMDLs.

Definitions for EPA Tracking

For EPA to track the progress of TMDL, WLA, and LA development at a national level, uniform definitions are necessary. In general, WLAs represent the allowable loading allocated to the point sources, LAs represent the allowable loadings to nonpoint sources, and TMDLs represent the cumulative allowable loading to the waterbody as described in the previous section. The following definitions, developed by EPA, should be followed for the purposes of tracking TMDL, WLA, and LA development.

- One discharger will count as one WLA, even if the discharger has multiple water quality-based parameters; revisions or additions to the WLA will count as an additional WLA.
- One LA will be counted for the estimate given to a nonpoint pollution source which results in projected BMP controls; multiple pollutants from the same nonpoint source do not count as additional LAs unless different BMP controls are projected; revisions or additions to the LA will count as an additional LA.
- One waterbody will count as one TMDL; the State-defined water quality standard segment or the state-defined water quality planning segment shall be used to delineate waterbodies; if the water quality-based controls are designed to protect more than one such waterbody (e.g., large basins), more than one TMDL should be counted. For example, a TMDL developed for a watershed which is composed of six segments would count as six TMDLs.

All TMDLs, WLAs, and LAs should be tracked separately to provide additional information to program administrators. In order to recognize the different level of effort that is associated with the development of some TMDLs, WLAs, and LAs, Regions should distinguish (count) complex TMDLs. WLAs, and LAs. The intent is to identify simple analyses that may be performed quickly with little effort, usually by permit writers rather than water quality analysts. The Regions should make the decision relative to complexity during the course of tracking.

---

6 Scott Decision (Scott vs. EPA, Nos. 81-2884 and 81-2885, decided on August 16, 1984).

The following examples are described to illustrate what constitute complex situations. A "complex" condition exists when any of the following situations occur:

- Use of a water quality model is used which is more sophisticated than the simple dilution calculation (e.g., continuous, dynamic models, steady state models that model non-conservative water quality constituents, 2-d and 3-d models, and models that consider sediment interactions).
- Use of simple dilution model is used that requires extensive preparatory work (e.g., lengthy efforts to analyze stream flow variables to develop critical flow, lengthy efforts to analyze water quality data to characterize inputs to the dilution model or to calibrate or verify the model).
- A multiple discharge situation exists where either a simple or sophisticated model and a WLA/TMDL distribution formula of some form is used (a distribution formula, for example, may allocate loads on the basis of flow, production, or relative water quality impacts).
- Load allocations (LAs) situations where considerable effort is required to assess the transient and permanent nature of adverse water quality impacts caused by various nonpoint sources.
- Any other situations where Regions feel justified that the review or development of a particular WLA or TMDL will require attention under EPA's tracking system (e.g., politically sensitive TMDLs, WLAs and LAs requiring review by upper management levels).

TMDLs, WLAs, and LAs are to be counted at the time they are approved by EPA. The WLA or LA does not have to be implemented in a National Pollution Discharge Elimination System (NPDES) permit or BMP control prior to this counting. Where a water quality analysis has been performed and it is found that technology-based requirements are adequate to maintain in-stream standards, the effort should still be counted as a TMDL but not as a WLA or LA. Where a water quality analysis has been performed and it is found that the point (or nonpoint source as appropriate) has been relocated or eliminated, a WLA (or a LA as appropriate) and a TMDL should still be counted for tracking purposes, after review of the proposed water quality-based controls.

Statement of Policy

EPA's objective is to first ensure that current levels of controls on traditional sources are maintained. Next, States should focus on geographic targeting of activities for waters that already exhibit significant water quality problems or aquatic habitat loss, and waters that may be pristine or are threatened and in need of protection. In many of these areas with degraded waters, EPA finds that water quality is impaired not by traditional sources (such as industrial and sewage treatment plant discharges) but by non-traditional sources of pollution (such as nonpoint sources, combined sewer overflows, and stormwater discharges) for which baseline controls are not yet in place. EPA's immediate concern in these areas is to implement practical controls for the non-traditional sources, while maintaining, or, as necessary, improving, the current controls on traditional sources.

More intensive assessments of water quality and evaluation of the sources should be conductedwhere water quality standards violations or indications of declining water quality or habitat loss are observed after controls on non-traditional sources are implemented. Allowable pollution loading should be allocated among all sources on the basis of water quality, and follow-up monitoring should be conducted periodically to ensure that the water quality standards are met. (See phased approach on page 31.) However, the lack of information about non-traditional sources should not be used as a reason to delay implementation of water quality-based controls when impairment is attributed to point sources.

Where additional controls (in addition to practical controls) are still needed to meet water quality standards, site specific TMDLs, WLA, and LAs should be completed to meet water quality standards. TMDL development is the primary method for developing water quality-based controls in waterbodies that are dominated by point source pollution sources.

EPA recommends that States use the TMDL development process in their water quality planning and management programs. The recommendations summarized below are intended to guide the States in managing their surface water quality programs, and are incorporated throughout the remainder of this guidance.

- Geographic Targets. States should develop TMDLs which include both point and nonpoint sources for State identified waterbodies preferably on a geographically targeted basis. Waterbodies could include segments, basins, watershed, and ecoregions as defined by the States. (See page 16.)
- Threatened Good Quality Waters. States are expected to include threatened good quality waters in their identification and prioritization of waters still needing TMDLS. (See page 11.)
- BMP Effectiveness Strategy. LAs for NPSs should be accompanied by a BMP effectiveness strategy for proposed NPS reductions. Such plans would be referenced in reviewing TMDLs for approval. (See page 30.)
- Time Schedule. TMDLs should be developed on a schedule negotiated with EPA Regional offices. Time schedules for the review of TMDLs should also be negotiated with EPA Regional offices. (See page 35.)
- Public Participation. States are encouraged to ensure appropriate public participation in the TMDL review process. (See page 38.)
- Phased Approach for TMDL Development. When insufficient data exist to develop TMDLs (due to a lack of data to quantify NPS loadings), EPA recommends that a phased ap-

proach including an estimated provisional TMDL be established as a practicable control measure toward development of a final TMDL. (See page 31.)

- Environmental Indicators. States should measure the effectiveness of control actions by monitoring changes in ambient water quality or biological conditions. Measuring environmental progress is a critical need.
- States should perform regulatory monitoring, assessments and program evaluations as needed to meet the requirements of the Clean Water Act. States have the primary responsibility for monitoring and water quality analysis. In carrying out this responsibility, States are expected to implement a balanced monitoring program.[7] (See page 39.)

Roles of EPA and the States

EPA Headquarters will provide overall policy, guidance, technical assistance, training, and overview of program implementation by the Regions and States. (See page 43.)

EPA Regions will provide overall policy, guidance, and overview of program implementation by States. This includes providing oversight of the States to ensure that adequate State resources from sections 106/205(j) grants are directed to priority activities in monitoring, water quality analysis, and data reporting. The Regions will also provide technical assistance and training for States and ensure that needed water quality-based controls are developed, and provide needed water quality-based controls if the State fails to act in a timely manner. Finally, the Regions will implement section 106(e) requirement for adequate State monitoring programs and ensure that data are entered into national data systems. (See page 44.)

7 USEPA. 1985. Guidance for State Water Monitoring and Wasteload Allocation Program. EPA 440/4-85-031. OW/OWRS, Washington, D.C.

CHAPTER 2
SECTION 303(d) AND THE WATER QUALITY-BASED STANDARDS TO PERMITS PROCESS

The process for identifying waters needing new or revised TMDLs, establishing priorities, and developing needed pollution controls is depicted by Figure 2-1, the Water Quality-Based Standards to Permits process. The central role in this process is played by the State's water quality standards. State water quality standards form the basic structure of the State's water quality management program and serve to integrate the various water quality control requirements under section 303(d) into a manageable framework. The process is then made effective by issuing water quality-based permits to regulate point source dischargers and implementing BMPs to control nonpoint polltuion sources, assuring that the water quality standards are met.

This process includes the following steps:

1. Identify and prioritize waters needing water quality-based controls.
2. Review and revise/reaffirm water quality standards.
3. Develop water quality-based controls (TMDLs/WLA/LAs).
4. Implement controls.
5. Assess results of controls.

Standards-to-Permits Process

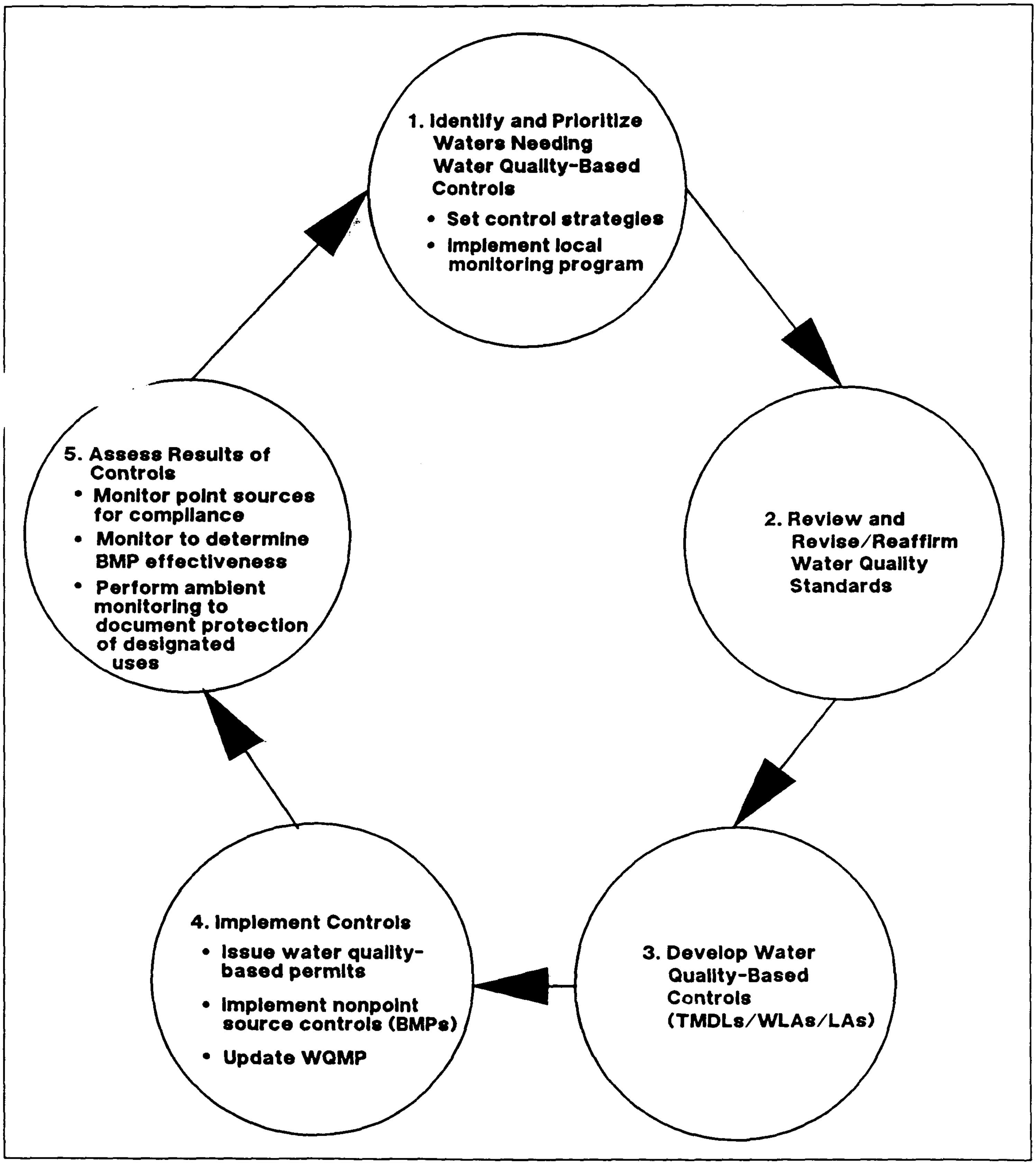
Identify and Prioritize Waters Needing Water Quality-Based Controls

After technology-based controls on traditional sources are in place, and practical controls are in place for non-traditional sources, a procedure is followed where States evaluate environmental data, review water quality standards, and continue to perform assessments to identify waters needing water quality-based controls. As required by section 303(d), these identified waters are listed based on the State's

NOTE: REVISE TO BE CONSISTENT w/ REG. AMENDMENTS

Figure 2-1

General Elements of the Water Quality-Based Standards-to-Permits Process



established priorities for developing TMDLs. Once EPA has approved the list of waters (and loads) needing new or revised TMDLs and the priority ranking for these waters, States prepare their annual work plans to include the TMDL, WLA, and LA work to be done during the following year as well as an estimate of work to be done over the next five years. EPA recommends that States reserve some portion of their resources to address hot-spots as they occur. The prioritized list of waters developed by the State may be submitted as part of its biennial section 305(b) report. As States implement their approved work plans and submit TMDLs to EPA for approval, the TMDLs and their component WLAs and LAs are incorporated into the State's Water Quality Management Plan.[8]

Identification

In accordance with the Clean Water Act, States are required to identify and prepare a list of the waters (and loads) within their boundaries for which existing pollution control requirements after technology-based controls are or will not be stringent enough to meet the applicable water quality standards. States should also include threatened good quality waters in its lists of waters needing water quality-based controls. Through the inclusion of waterbodies that are threatened, States may incorporate a more proactive or preventative water quality management policy which is strongly encouraged by EPA for the following reasons:

- A proactive policy is consistent with 40 CFR 130 which requires that TMDLs be established for all pollutants preventing or are expected to prevent water quality standards from being achieved.
- It is often easier and less costly in the long term to prevent impairments rather than cleaning up pollution problems.
- Meets EPA objectives which support coordination with the States in collecting data on impacted or threatened waters and implementing State plans for water quality monitoring programs.

States should regularly update their lists of waters needing water quality-based controls as assessments are made. For example, as new data are collected and analyzed, it may be determined that a previously impaired waterbody is no longer impaired or vice versa. The list (or the data base which stores the information to produce the list) is then updated to reflect this change in status. To demonstrate that environmental results are being achieved, States may provide summary information on which waterbodies have been added or deleted from the list and which waterbodies were assessed since the last reporting period.

NOTE: REVISE TO BE CONSISTENT W/ REG AMENDMENTS

---

8 40 CFR 130.6 (c)(1)

NOTE: REVISE TO BE CONSISTENT w/ REG AMENDMENTS

To develop the list of water quality limited waterbodies, States should assemble and evaluate existing information on its waterbodies using the general guidelines established under the several categories of waters listed in Appendix A. In addition, data on waters available from the Superfund and Reauthorization Act (SARA), Title III, Toxic Chemicals Release Inventory (TRI) are applicable information for listing purposes. Other data sources may include monitoring/assessment reports from dischargers, environmental groups, universities, etc. Also, States should consider waterbodies that have been previously identified under CWA sections 319(a), 304(l), and 305(b) as needing additional NPS controls, are water quality limited, are not meeting designated uses, or are threatened. Information on these programs is presented in Appendix B.

States must consider the following existing pollution control requirements in identifying waters needing new or revised TMDLs.

- Technology-based effluent limitations required by:
  - Sections 301(b), 306, 307, and other sections of the CWA.
  - State or local authority preserved by section 510 of the CWA.
  - Federal law, regulation, treaty, permit, lease, or other authority.
- Water quality-based effluent limitations required by:
  - Section 301(b)(1)(C) of the CWA and incorporated into an approved NPDES permit.
  - State or local authority preserved by section 510 of the Clean Water Act.
  - Federal law, regulation, treaty, permit, lease, or other authority.
- Other pollution control requirements (e.g., Best Management Practices) required by either Federal, State, or local authority.

Prioritization

Section 303(d) also requires each State to establish a priority ranking for waters identified as needing new or revised TMDLs. It is recommended that States establish a priority and time frame for developing TMDLs over the next five years or a period negotiated with EPA Regions in its State/EPA Agreement (see page 35.) These waters should include all segments where TMDLs are needed to support permits and BMPs during the coming year. Many of these waters do not fully support designated uses; others waters may be threatened good quality waters. Factors that States should consider in setting priorities include:

- The severity of the pollution.
- The uses of the waters.
- National policies and priorities such as EPA's annual Operating Guidance.
- Court orders and decisions.

REVISE AS PER REG AMEND.

- Short-term water program needs; e.g., wasteload allocations needed for permits that are coming up for revisions or for needed BMPs.
- Data obtained in the development of the section 304(l)(1)(A) "long list" and the several categories of waters.

Review and Revise/Reaffirm Water Quality Standards

After waters have been identified and prioritized by States and approved by EPA, water quality standards for the selected waterbody are reviewed by the State and revised or reaffirmed. The Water Quality Standards Regulation[9] sets forth the policies and procedures States are to use in the development, review, revision, and approval of water quality standards. The States have primary responsibility for setting and enforcing water quality standards. At a minimum, States must hold public hearings for the adoption of water quality standards at least once every three years. EPA is to ensure that State standards are consistent with the CWA requirements and water quality standards regulation. EPA has authority to approve or disapprove State standards and, when necessary, to promulgate federal water quality standards.

Standards adopted by States are composed of three parts: an antidegradation statement, designated uses for individual waterbodies, and a narrative or numerical criteria. According to antidegradation requirements, if a designated use is currently being attained, the waterbody may not be classified for a less stringent use. Likewise, if the water quality is better than necessary to meet the designated use, that level of water quality must be maintained unless the State meets the conditions discussed in the Water Quality Standards regulations. The criteria adopted in standards may apply State-wide, or may be designated use specific or waterbody specific. Where narrative criteria are adopted, the States should indicate as part of its water quality standards submission how it intends to implement these criteria. In general, State criteria may be developed for each parameter at two levels of effect, typically acute and chronic.

---

9 40 CFR 131

EPA recommends adopting two-number acute and chronic criteria whenever needed. National criteria may be used directly, or may be adopted using site-specific criteria development protocols outlined in the Water Quality Standards Handbook.[10] Although the proposed Water Quality Standards regulation[11] requires that the State's process for implementing its narrative criterion be described by the State, there is no requirement that this concentration be adopted as a numerical criterion in State water quality standards prior to use in developing water quality-based controls. Additional technical information on use attainability to support the development of water quality standards is available from EPA.[12]

Develop Water Quality-Based Controls

The third step of the standards to permits process is to use water quality standards as the basis for developing TMDLs, WLA, and LAs. The TMDL process gives States some flexibility in allocating pollutant loads among various point and nonpoint sources impacting a water body. To implement TMDLs, the States develop LAs for nonpoint sources and WLAs for point sources, in accordance with 40 CFR 130.7. The LA is that portion of a receiving water's assimilative capacity that is allocated to existing or future sources of nonpoint pollution or to natural background sources. The WLA is that portion of the receiving water's loading capacity allocated to one of its existing or future point sources of pollution. For nontoxic pollutants such as biochemical oxygen demand (which may depress dissolved oxygen levels in the receiving water) and nutrients (which may cause eutrophication), mathematical models may be used to determine the pollution loading consistent with the State's water quality standards and evaluate point source or nonpoint source tradeoffs. In some simple situations, simple dilution equations may be adequate for these analyses. Technical guidance on the use of mathematical models for developing wasteload allocations is available from EPA for a number of pollutants and types of receiving waters (see Appendix C).

For toxic pollutants such as heavy metals, water quality analyses can be done using one or both of two techniques: the pollutant-specific approach and the biomonitoring approach.

---

10 USEPA. December, 1983. Water Quality Standards Handbook. OW/OWRS/Washington, D.C.

11 40 CFR 131

12 USEPA. November, 1983. Technical Support Manual: Waterbody Surveys and Assessments for Conducting Use Attainability Analyses. OW/OWRS, Washington, D.C

USEPA. ______. Technical Support Manual: Waterbody Surveys and Assessment for Conducting Use Attainability Analyses, Volume II Estuarine Systems. OW/OWRS, Washington, D.C.

USEPA. November, 1984. Technical Support Manual: Waterbody Surveys and Assessments for Conducting Use Attainability Analyses, Volume II Estuarine Systems. OW/OWRS, Washington, D.C.

- The pollutant-specific approach is best suited for situations (effluents) with a few well-characterized pollutants or when human health is a concern.
- The biomonitoring approach should be used when the effluent is complex or when interactions of effluents in the receiving water are of concern.

In many cases, both approaches will be needed. As discussed in Appendix C EPA has prepared technical guidance on the development of toxics controls using the pollutant-specific and the biomonitoring approaches.

Implement Controls

States should implement water quality-based controls in order to meet loads established for individual point and nonpoint sources. It is the responsibility of the State to:

- Delegated States issue water quality-based permits.
- Implement NPS controls (e.g., BMPs).
- Update its water quality management plan (WQMP).

Monitoring may be required of dischargers (with appropriate quality control by the regulatory authority) if existing information is inadequate to determine whether water quality-based controls are needed. As with permits, construction decisions regarding publicly owned treatment works (POTWs) or advanced treatments (ATs) must also be based on the most stringent of technology-based or water quality-based limitations. These decisions should be coordinated so that the decision taken on the treatment facility is consistent with the limitations in the permit. Implementation of BMPs should be coordinated with other agencies to ensure that desired environmental results are achieved. Since many implemented BMPs are not regulated, States should establish a BMP effectiveness strategy which is used as a guide for how States expect to meet LAs. This strategy should be designed such that States can track BMP implementation and overall effectiveness to ensure that progress is made towards meeting LAs. This strategy should also describe the coordination which may be necessary with other State agencies, landowners, operators, and managers. (See page 30 for a discussion on BMP effectiveness strategy.)

Assess Results of Controls

Once water quality-based controls are in place, States should assess environmental results. To facilitate State assessment, dischargers are required to provide reports on compliance with NPDES permit limits. They may also be required to assess the impact of their discharge on the receiving water to ensure that the expected water quality is accomplished and water quality standards are met. Effluent and ambient data collection requirements may be written into dischargers' permits to assess the effectiveness of controls and to ensure that the designated use of the water is maintained. If a State has not been approved to implement the NPDES program, permitting and compliance reviews of all permittees in that State are the responsibility of the EPA. In a State with approved NPDES authority, EPA retains oversight responsibility for the State compliance program and authority to conduct compliance and enforcement in that State as necessary. Adequate monitoring should be provided to ensure that BMPs are meeting their designed goals. States are encouraged to use innovative monitoring programs (e.g., cooperative monitoring[13]) to provide for adequate nonpoint source monitoring.

Geographical Approach

Many water pollution concerns are area-wide phenomena that are caused by multiple dischargers, multiple pollutants (with potential synergistic and additive effects), or diffuse sources. As a result, traditional water quality-based procedures (those based on one discharger or point source) may not be appropriate to address these types of impairments. In order to efficiently manage the water quality needs of the nation's surface waters, EPA recommends that States develop TMDLs on a geographical basis such as the watershed. Several States have already begun to base water quality management programs on geographical approaches in order to provide more efficient use of limited water quality program resources and to provide an effective process for assessing both point and nonpoint sources.

Although States may define a waterbody to correspond with their current programs, it is expected that States will consider the extent of the pollution problem and sources when defining the geographic region for developing TMDLs and associated WLAs and LAs. In general, geographical approaches support sound environmental management since many pollution concerns are not isolated to specific locations. Similarly, monitoring and modeling efforts should correspond to the same geographic regions.

Dissolved oxygen, for example, may be limited downstream from sources of BOD_5. In this case, it may be prudent for States to consider the entire river reach, rather than limiting a study (monitoring and modeling) to a narrowly defined area such as a single river segment. Similarly, pollutants which are adsorbed to sediment and are transported downstream to reservoirs (or other settling pools) would be more appropriately addressed by watershed level TMDLs. On the other hand, pollutants which exhibit their maximum toxicity near outfalls and do not pose harm to waters downstream may be addressed with a relatively narrow geographic region. In the latter case, a near-field mixing model may be adequate.

In cases where TMDLs are developed on watershed levels, States should consider modifying their permitting cycle so that all permits on a given watershed expire at the same time. Since TMDLs should

---

13 USEPA. 1984. Planning and Managing Cooperative Monitoring Projects. OW/OWRS, EPA 440/4-84-018, Washington, D.C.

consider all pollutant (including all permitted) sources, more efficient use of resources may be accomplished by developing permits on a similar geographic level as for the TMDLs.

CHAPTER 3
DEVELOPING TMDLs/WLAs/LAs

After waters meeting new or revised TMDLs have been identified and ranked by priority, EPA will review this information to ensure that all significant water quality problems are included and to account for new information on effluent concentrations associated with best available technology (BAT), new water quality criteria, etc., prior to TMDL development. To gain an understanding of the technical requirements needed to develop TMDLs, this chapter describes selected technical considerations associated with TMDL development as well as other control measures that may be implemented to achieve load reduction strategies.

Technical Considerations

TMDL process

The TMDL process includes four steps: 1) selection of the pollutant or toxic characteristics to consider, 2) the estimation of pollutant loading to waterbodies from all sources, 3) the prediction of resultant pollutant concentrations and determination of allowable loads, and 4) the allocation of the allowable loads among the different pollutant sources in such a manner that water quality standards are achieved.

The analyst developing a TMDL must first identify the pollutants of concern and their sources. This may entail additional monitoring, data collection, and analysis. Then, the overall approach for allocating the loads must be selected. For conventional pollutants, a pollutant-specific approach is normally used. For toxic pollutants, a pollutant-specific approach may be used if the effluent characteristics are known, only a few specific toxicants are of interest, and multiple discharges do not result in complex mixtures of toxicants. If the effluent toxics component is not well characterized, or if several toxic constituents with complex interactions (i.e., additive, synergistic, or antagonistic effects) are involved, then the whole effluent approach should be used. If any of the effluents contain chemicals that are persistent or that have bioaccumulative, carcinogenic, teratogenic, or mutagenic potential, then an integrated approach with both chemical specific analyses and whole effluent analyses may be appropriate. Once the basic approach is selected, screening methods may be used in a preliminary fashion to estimate loadings, to identify and quantify processes influencing pollutant behavior, and to estimate pollutant concentrations in the receiving water.

Mathematical models

The use of national or site-specific criteria in computing TMDLs may require the selection and use of a mathematical model. Models which have been applied to point and nonpoint pollution sources are summarized in Appendix D, Tables D-1 and D-2. While it is beyond the scope of this guidance to provide a detailed rationale for model selection, it is appropriate to summarize the type of models available and their applicability.

Model characteristics

Models can be characterized in numerous ways such as data requirements, ease of application, etc. This section summarizes models based on four categories: temporal characteristics, spatial characteristics, specific constituents and process simulated, and transport processes.

- Temporal characteristics - This includes whether the model is steady-state (constant inputs and outputs), time averaged (for example, tidally-averaged), or dynamic. If the model is dynamic, an appropriate time step needs to be selected. For example, streams with their small residence times may require short time steps (hourly or less) while lakes, which typically have residence times in excess of weeks, can generally be modeled with longer time steps (e.g., daily or more). Similarly, loads from NPS models are often lumped together into event or annual loadings.
- Spatial characteristics - This includes the number of dimensions simulated and the degree of spatial resolution. In most stream models, one-dimensional models are used since typically vertical and horizontal gradients are small. For large lakes and estuaries, two- or three-dimensional models may be more appropriate because both vertical and horizontal concentration gradients commonly occur. Segmented or multiple catchment models may be more appropriate for heterogeneous watersheds, whereas, lumped-single catchment models are more appropriate for homogeneous or less complex situations.
- Specific constituents and processes simulated - Models vary in the types of constituents and processes simulated and in the complexity of the formulations used to represent each process. For example, simple DO models include only reaeration and BOD decay while more complex models include other processes such as nitrification, photosynthesis, and algal respiration.
- Transport processes - These include advection, dispersion, runoff, interflow, and the effects of stratification on these processes. Most river models are concerned only with downstream advection and dispersion. Lake and estuary models may include advection and dispersion in one or more dimensions, as well as the effects of density stratification. For toxic modeling, it may be important to use models which account for near-field mixing since many of these pollutants may exert maximum toxicity close to the point of discharge.

To incorporate both point and nonpoint sources into TMDLs, it will be important to consider integrated watershed models.

Model selection

A model should be selected based on its adequacy for the intended use, for the specific waterbody, and for the critical conditions occurring at that waterbody. While the selection of an appropriate model should be made by a water quality analyst, it is useful for program managers to be familiar with the decisions which must be made. Four basic steps have been identified that an analyst would go through to select an appropriate model:

- Identify models applicable to the situation.
- Define the appropriate level of analysis.
- Incorporate practical constraints into the selection criteria.
- Select a specific model.

Identify models applicable to the situation. An obvious choice for narrowing the selection of an appropriate model is based on the waterbody type (river, estuary, or lake) and the type of analysis (BOD/DO, toxics, etc.) A preliminary list of models may also be screened by selecting models which consider the appropriate constituents and processes that are important for the pollutant being studied.

Define the appropriate level of analysis. The four levels of models are:

- Simple calculator models - These include dilution and mass balance calculations, Streeter-Phelps equations and modifications thereof, analytical solutions to transport equations, steady-state nutrient loading models, regression models, and other simplified modeling procedures that can be performed on desk top calculators.
- Steady-state computer models - These models compute average spatial profiles of constituents along a river or estuary assuming everything remains constant with time, including loadings, upstream water quality conditions, stream flow rates, meteorological conditions, etc.
- Quasi-dynamic models - These models are a compromise between steady-state models and dynamic models. Quasi-dynamic models assume most of the above factors remain constant, but allow one or more of them to vary with time, for example waste loading rates or stream flow rates. Some of the models hold the waste loading and flow rates constant, but predict effects such as the diurnal variations in dissolved oxygen due to algal photosynthesis and respiration.
- Dynamic models - These models predict temporal and spatial variations in water quality due to varied loadings, flow conditions, meteorological conditions, and internal processes within the watershed or waterbody. Dynamic

models are useful for analyzing transient events (e.g., storms and long term seasonal cycles) such as those important in lake eutrophication analyses.

The above levels of analysis are listed in order of increasing complexity, data requirements, and cost of application. In general, the more complicated approaches should provide more detailed and more accurate analyses, assuming enough data are available for proper model calibration and verification. Selected models are classified according to their level of analysis and spatial representation in Appendix D, Tables D-3 and D-4.

In addition, lognormal probabilistic models and Monte Carlo simulation techniques have been used to modify some of the above approaches. Probabilistic models use lognormal probability distributions of model inputs to calculate probability distributions of model output. Since this method does not incorporate fate and transport processes, it can only be used to predict the concentration of a substance after complete mixing and before decay or transformation significantly alters the concentration. Monte Carlo simulations combine probabilistic inputs with deterministic models. A fate and transport model is run a large number of times based on randomly selected input values. The output from these models are then rank ordered to produce a frequency distribution. These frequency distributions may then be compared to instream criteria (e.g., criteria maximum concentration (CMC) and criteria continuous concentration (CCC)) to determine if water quality standards are met.

Incorporate practical constraints. In general, the analyst should consider the data requirements for each level of analysis, the availability of historical data, the modeling effort required for each level of analysis, and available resources. Availability of historical data for calibration and verification is one of the key cost savings considerations.

Select a specific model. The analyst should consider model familiarity, technical support and model availability, documentation quality, application ease, and professional recognition and acceptance of a model.

[NOTE: This paragraph will be expanded to include current information on what EPA/ORD supports and provides training on.]

Multiple Discharges

Complex TMDLs should be developed for waterbodies when the mixing zones from multiple pollution sources overlap. The key concern associated with multiple point or nonpoint pollution sources is the potential for additive or synergistic impacts. A recommended procedure for evaluating toxicity from multiple discharges is summarized in a technical support document.[14] To perform this analysis, it may be necessary to apply near-field mixing models for each outfall (mixing zone analysis) in addition to a far-field model which considers pollutants from numerous point or nonpoint sources (after the mixing zone).

Allocation of Loads

The total pollutant load to a waterbody consists of point, nonpoint, and natural background sources. When the total load is such that any additional loading to a waterbody would produce a water quality standard violation, the total load should be allocated to the various pollution sources. The allocation of loads should consider technical, socio-economic, institutional, and political constraints. States are also encouraged to consider public participation and comment when allocating loads to point and nonpoint sources. By involving the local community at an early stage in the TMDL development process, greater public support and consensus building for controls may be developed.

Individual States use various load allocation schemes appropriate to their needs and may specify that a particular method be used. Three common methods for allocating loads equal percent removal, equal effluent concentrations, and a hybrid method, are discussed below. (Other methods are summarized elsewhere.[15])

The first method is equal percent removal and exists in two forms. In one, the overall removal efficiencies of the sources are set so they are all equal. In the latter, the incremental removal efficiencies are set equal. This method is appropriate when the incremental removal efficiencies are relatively small, so that the necessary improvement in water quality can be obtained by minor improvement in treatment at each point source, at little cost.

The second common allocation method specifies equal effluent concentrations. This is similar to equal percent removal if influent concentrations at all sources are approximately the same. However, if one source has substantially higher influent levels, then equal effluent concentrations will require higher overall treatment levels than the equal percent removal approach.

The third commonly used method of allocating loads can be termed a hybrid method. With this method, the criteria for waste reduction may not be the same from one source to the next. One source may be allowed to operate unchanged while another may be required to

---

14 USEPA. 1985. Technical Support Document for Water Quality-based Toxics Controls. OW/OWEP and OWRS. EPA-440/4-085-032, Washington, D.C. *[Note: TSD is currently being revised - final due in mid 1990.]*

15 USEPA. 1985. Technical Support Document for Water Quality-based Toxics Controls. OW/OWEP and OWRS. EPA-440/4-85-032, Washington, D.C.

provide the entire load reduction. More generally, a proportionality rule may be assigned that requires the percent removal to be proportional to the input source loading.

Allocation Trading

Where appropriate and technically feasible, certain efficiencies may be realized by trading allocation of loads. Such a practice is similar to what would be done during the original allocation of loads between point and nonpoint sources. The objective for trades between point and nonpoint sources is to exchange increased control of one pollution source (decreased loading) for no change in control of another pollution source. This type of trading has been applied most often to phosphorus. For example, some publicly-owned treatment works (POTWs) may agree to install urban run-off BMPs in lieu of increased controls (e.g., advanced treatment) at POTWs.

Five criteria need to be met in order to consider allocation trades:

- NPS and point sources must both contribute substantially to pollutant loadings in matching constituents.
- The cost of NPS control per unit abatement must be significantly less than the marginal point source control cost.
- Trades must target the same compound, or target the same ecological problem (e.g., a phosphorus and nitrate trade aimed at eutrophication).
- A single agency must have authority to administer, monitor, and perform program enforcement.
- Effluents must be comparable so that increases in other pollutants do not violate applicable water quality standards.

Most pollutant trades occur between point and nonpoint sources. However, where effluents from two different point source dischargers are comparable and consistent with water quality standards (including antidegradation and antibacksliding regulations and policies), and have minimum technology-based limits applicable to point sources, trades may be acceptable between these two point sources.

The Dillon Reservoir (west of Denver, Colorado) is one example of where point and NPS phosphorous loads are being traded. In this example, the cost associated with point source reduction was $1.5 million per year and the cost associated with NPS controls was $0.2 to $1.0 million per year. Because of these cost savings, pollutant trades allowed the point sources to achieve reductions in phosphorus loads to the Dillon Reservoir by controlling NPSs rather than expanding the sewage treatment system.

Persistent and/or Highly Bioaccumulative Pollutants

Persistent and/or bioaccumulative pollutants require special attention during analysis of toxicity and TMDL development. The primary concern is that persistent pollutants may enter a waterbody at unhazardous levels and may accumulate downstream from other sources.

Potentially these pollutants may accumulate in sediments or aquatic biota resulting in effects on survival or reproduction. They may also cause risk to humans by exposure to hazardous chemicals through drinking water or consumption of contaminated fish or shellfish. Chemicals that bioaccumulate at high rates include metals, organic compounds, and organometallic compounds.

Any chemical that has high potential for persistence and bioaccumulation should be a matter of concern until it can be demonstrated that there are no adverse environmental and human health effects resulting from the discharge of that pollutant into receiving waters. The first step in addressing bioaccumulative or persistent pollutants in effluents is to determine whether or not such pollutants are present. The second step is to determine if such pollutants are hazardous. The final step is to calculate an acceptable discharge rate. Procedures for assessing and controlling risk have been addressed in technical support documentation.[16] Current technical guidance for wasteload allocation summarizes a number of models which are appropriate for modeling the fate and transport of toxics in streams/rivers, lakes, and estuaries. In some cases, development of TMDLs may not be the most efficient use of resources to manage water quality and a goal of zero discharge may be appropriate.

Use of Two-number Criteria

Because of inherent variation in effluent and receiving water flows and pollutant concentrations, specifying a concentration that must not be exceeded at any time or place may not be appropriate. The format that was selected for expressing water quality criteria for aquatic life consists of recommendations concerning concentrations, durations of averaging periods, and average frequencies of allowed excursions. Use of this concentration-duration-frequency format allows water quality criteria for aquatic life to be adequately protective without being as overprotective as would be necessary if criteria were expressed using a simpler format.

Duration of exposure considers the amount of time organisms will be exposed to toxicants. It is expressed as that period of time over which the instream concentration is averaged for comparison with criteria concentrations. Frequency is defined as how often exposures that exceed the criteria can occur during a given period of time (e.g., once every ten years) without unacceptably affecting the community. To account for acute toxic effects, States should adopt acute criteria expressed as the criteria maximum concentration (CMC) occurring in a one-hour averaging period. Similarly, chronic criteria expressed as the criteria continuous concentration (CCC) should be developed as toxicant concentrations which should not be exceeded over protracted periods of time. EPA currently recommends that no longer than a four-day averaging period be used. For the purposes of modeling, the ambient concentration should not exceed the CMC more than once

---

16 USEPA. 1985. Technical Support Document for Water Quality-based Toxics Control. OW/OWEP and OWRS, EPA-440/4-85-032, Washington, D.C.

every three years. (If the biological community is under stress because of spills, multiple dischargers, etc., or has a low recovery potential, or if a local species is very important, the frequency should be decreased.)

Although these criteria were developed for application to low flow conditions, it is important for States to develop NPS pollution controls. Therefore, to address NPS loading, EPA recommends that the two number criteria should be applied for all flow conditions. However, States should adopt duration and frequency parameters to account for the high flow, intermittent nature of nonpoint source loadings. For example, a typical "loading" from a nonpoint urban runoff source may not last for more than two days. As a result, the four day averaging period may not be appropriate.

Sediment Issues

The problems associated with clean and contaminated sediment are not the same. Clean sediment can impair fish reproduction by silting-up spawning areas, and can increase turbidity. The major concerns regarding contaminated sediment are pollutant releases to the water column, bioaccumulation, and biomagnification. Criteria being developed for sediments have centered on evaluating and developing an understanding of the principal factors that influence the sediment/contaminant interactions with the water column (Equilibrium Partitioning Approach). Through such an understanding, exposure estimates of benthic and other organisms can be made. Chronic water quality criteria, or possibly other toxicological endpoints can then be used to predict potential biological effects.

In some cases, sediment criteria alone would be sufficient to identify and to establish clean up levels for contaminated sediments. In other cases, the sediment criteria should be supplemented with biological or other types of analysis before clean-up decisions can be made. The Science Advisory Board will be reviewing methods for establishing sediment criteria for metal contaminants and procedures for establishing standardized bioassays in 1991.

Control Measures

Technology-based controls for traditional sources are minimum controls mandated by the Clean Water Act which must be met by municipal and industrial discharges. When technology-based controls are not sufficient to meet the designated uses (applicable water quality standards), the water is determined to be water-quality limited and more stringent controls are needed to meet the water quality standard. Water quality-based controls may be developed to reduce pollutant loadings to meet instream criteria, typically through the TMDL process and associated WLAs and LAs.

Both technology-based and water quality-based controls may be implemented through the National Pollution Discharge Elimination System (NPDES) permitting process. Permit limits based on WLAs are called water-quality based limits. Under section 304(l)(1)(C) and (D) of the CWA, Individual Control Strategies (ICSs) were established for certain point source discharges of priority toxic pollutants. An ICS is composed of an NPDES permit and supporting documentation to demonstrate that the permit contains adequate controls. A TMDL is considered to be adequate documentation for the ICS. All waters with approved ICSs developed by the States are to be in compliance with water quality standards by June 1992. In addition to permits for point sources, States should implement practical controls for NPSs (e.g., BMPs). Common BMPs are listed in Table 3-1. These controls should be based on LAs when sufficient data exist or to apply best professional judgement to estimate limits where data are not available.

Incorporating TMDLs/WLAs/LAs into Permits

Once allowable loadings have been developed for specific point sources and applicable nonpoint sources, these loads must be incorporated into NPDES permits. The WLA or LA provides a measure of effluent quality that is necessary to protect water quality in the receiving water. It is important to consider how the WLA or LA addresses variability in effluent quality. For example, allocations for nutrients or bioaccumulative pollutants could be expressed as the required average effluent quality because the total loading of these pollutants is of concern. On the other hand, an allocation for toxic pollutants should be expressed as a maximum value for the effluent because the concentration of these pollutants is of more concern than the total loading. It is important to recognize that the duration and frequency with which the required effluent quality level may not exceed are critical aspects of an allocation as well.

Permit limits are designed to require a particular level of effluent quality. Effluent quality is variable, and limits are set at a level so that if the treatment facility maintains the desired level of performance, the probability of exceeding the limits is very low (e.g., the probability is less than or equal to 0.05). If limits are set too high, a facility not meeting the desired level of performance would not exceed the limits as determined by typical monitoring practices. If limits are set too low, a facility meeting the desired level of performance would often exceed the limits. In either case, determination of compliance and enforcement would be compromised.

There is a significant risk of incorrectly enforcing a WLA or LA if effluent variability and the probability basis for both the WLA or LA and the permit limits are not considered. For example, a steady state WLA or LA may specify an effluent value with the assumption that it is a value never to be exceeded. The same value used as the daily maximum permit limit could allow the WLA value to be exceeded perhaps an unacceptable amount of time without observing permit violations using typical monitoring requirements. Even more con-

Table 3-1. Best management practice activity matrix (Adopted from Guide to Nonpoint Source Pollution Control).

BMP	NUTRIENT REDUCTION	STRUCTURAL CONTROL	NONSTRUCTURAL CONTROL	RUNOFF
AGRICULTURE				
Conservation tillage			•	
Contouring			•	
Contour strip cropping			•	
Cover crops			•	
Integrated pest management	•			
Range and pasture management	•			
Sod-based rotations	•		•	
Terraces		•		•
Waste management practices	•	•		
CONSTRUCTION & URBAN RUNOFF				
Structural control practices	•	•		•
Nonvegetative soil stablization	•	•	•	•
Porous pavements	•	•		•
Runoff detention/retention	•	•		•
Street cleaning	•		•	•
Surface roughening			•	
SILVICULTURE				
Limiting disturbed areas	•		•	
Log removal techniques	•	•		
Ground cover			•	
Removal of debris			•	
Proper handling of haul roads			•	
MINING				
Water diversion	•	•		
Underdrains	•	•		
Block-cut or haul-back	•		•	
MULTICATEGORY				
Buffer Strips		•	•	•
Grassed waterway	•	•	•	
Devices to encourage infiltration	•	•		•
Interception/diversion	•	•		•
Material ground cover	•	•		•
Sediment traps		•		•
Vegetative stabilization/mulching			•	•

Source: USEPA. July, 1987, OWRS/CSD.

fusion could result in translating a longer duration WLA requirement (e.g., a four-day average) into daily maximum and average daily permit limits.[17]

Antidegradation and antibacksliding

The procedures for developing water quality-based permit limits for toxics at a source will normally result in new or more stringent water quality-based limits than those contained in a previously issued permit. In a limited number of cases, however, it is conceivable that less stringent water quality-based limits could result. In these cases, permit limits must conform to existing Federal regulations governing both antidegradation (existing instream water uses shall be maintained and protected) and antibacksliding (issuance of permit limits that are less stringent than those contained in the existing permit is prohibited). The pertinent regulations are 40 CFR Part 131 (131.12) and 40 CFR Part 122 (122.44 and 122.62). Permit writers should keep apprised of recent statutory or regulatory developments in this area.

Data collection

Section 308 of the Clean Water Act and corresponding State statutes authorize imposing of monitoring and data collection requirements on the owner or operator of a point source discharge. Requirements may include ambient and biological assessments, toxic reduction evaluations, and in-plant monitoring, etc. The only limitation on this authority is that there must be a reasonable need for the information, the schedule and costs of the requirements must be reasonable, and the request must meet the Paperwork Reduction Act. Needed data collection may be initiated through a direct request (commonly referred to as a "308 letter"), permit reporting requirements, or an administrative order.

Permit requirements for data collection should be established when longer term data (e.g., for several seasons) are needed and there are insufficient data to set water quality-based limitations in the newly issued permit. The permit should include a statement that the permit can be modified or revoked and reissued if the data indicate violation of State water quality standards. Several agencies have experienced problems in negotiating study plans based on a generalized permit requirement. If the permit requirement is non-specific (such as requiring the development and execution of a plan of study) minimum requirements should be included.

17 The reader is referred to the Permit Writer's Guide to Water Quality-based Permitting for Toxic Pollutants (July, 1987) and Technical Support Document for Water Quality-based Toxics Control for additional information on deriving actual permit limits.

Nonpoint Source Controls - BMP Effectiveness Strategy

In order to manage waterbodies with NPS pollutant loads, States should implement BMPs at geographically targeted pollution sources. In some instances it is difficult to ensure, a priori, that implemented NPS controls will achieve expected load reductions. BMP failure may be due to an ineffective BMP or poor implementation. That is, a BMP may not achieve expected load reductions because either the BMP did not work or it was not implemented as designed. The latter case may result from the lack of acceptance among participants such as individual land owners. Key components of a NPS control program would include the following:

- An analysis of institutional resources and capabilities.
- Choosing priority areas for implementation efforts (geographic targeting).
- Developing an implementation strategy which accounts for site-specific factors.

To ensure that BMPs are meeting the objectives established during the development of TMDLs and LAs, States should adopt effectiveness strategies. These strategies would describe NPS load reduction goals and the procedure for reviewing and revising BMP controls. Since many State agencies rely on local authority, grant conditions, cost sharing agreements, cooperative agreements, etc. with other agencies (e.g., Soil Conservation Service) to help implement controls, States are encouraged to work with these agencies to implement workable strategies. These strategies would allow State program managers to monitor TMDL and LA effectiveness. At a minimum, the information a program manager needs to audit a TMDL includes:

- Baseline BMPs for specific NPSs, including load reduction strategies, percent of strategies to be achieved, and a tracking measure/system for BMP implementation.
- Appropriate biological, physical, chemical, and BMP effectiveness monitoring (including why, when, where, what and how to sample) to evaluate overall progress towards attaining designated uses.
- Time frame/schedule for implementation and evaluation of targets, and achieving applicable water quality standards.
- Excerpts from the State's section 319 management program.

The documentary information and assumptions used to develop the TMDLs, WLAs, and LAs would also be made part of the BMP effectiveness strategy.

Under the CLean Lakes Program (section 314), TMDLs are required as a condition of the grant application for funding State projects.

Phased Approach for TMDLs

For setting TMDLs, an analyst needs to have sufficient information to calculate the loadings from both point and nonpoint sources. Adequate site-specific information is needed to calibrate and verify mathematical procedures used during analysis. In general, more data are needed to calibrate and verify procedures for nonpoint sources than for point sources, and often, these data are not existing and readily available. Therefore, a phased approach should be considered when sufficient data do not exist to develop final TMDLs due to the difficulty in quantifying or modeling NPS impacts. Such an approach would include an estimated or provisional TMDL as a practical control measure until sufficient data are obtained to establish a final TMDL with full margin of safety.

The phased approach would provide an opportunity to implement controls on traditional point sources and "first level" controls on non-traditional sources such as storm sewers and combined sewer overflows (CSOs), and to estimate the effectiveness of BMPs in order to establish the provisional TMDL. During this interim period, additional time is available to collect the needed data and also opens opportunities to obtain other resources for data collection (e.g., NPS dischargers, cooperative monitoring, increased funding, etc.)

The phased approach provides States with a means to address priority waterbodies in troubled or threatened watersheds which would otherwise not be managed. In addition, such an approach will demonstrate that the States and EPA are taking action to improve water quality and develop a database for use in preparing final TMDLs.

A phased approach (Figure 3-1) resulting in a full TMDL would include the following steps:

Phase I

- Establish/maintain point source controls.
- Establish practical NPS controls using best professional judgement (BPJ) and available data.
- Begin collection of data on NPS loadings, etc.

Phase II

- Develop provisional TMDL using NPS load/reduction estimates.

Phase III

- Develop final TMDL.
- Review/revise point source controls, if necessary.
- Establish/revise NPS controls.

A more complete description of this approach follows:

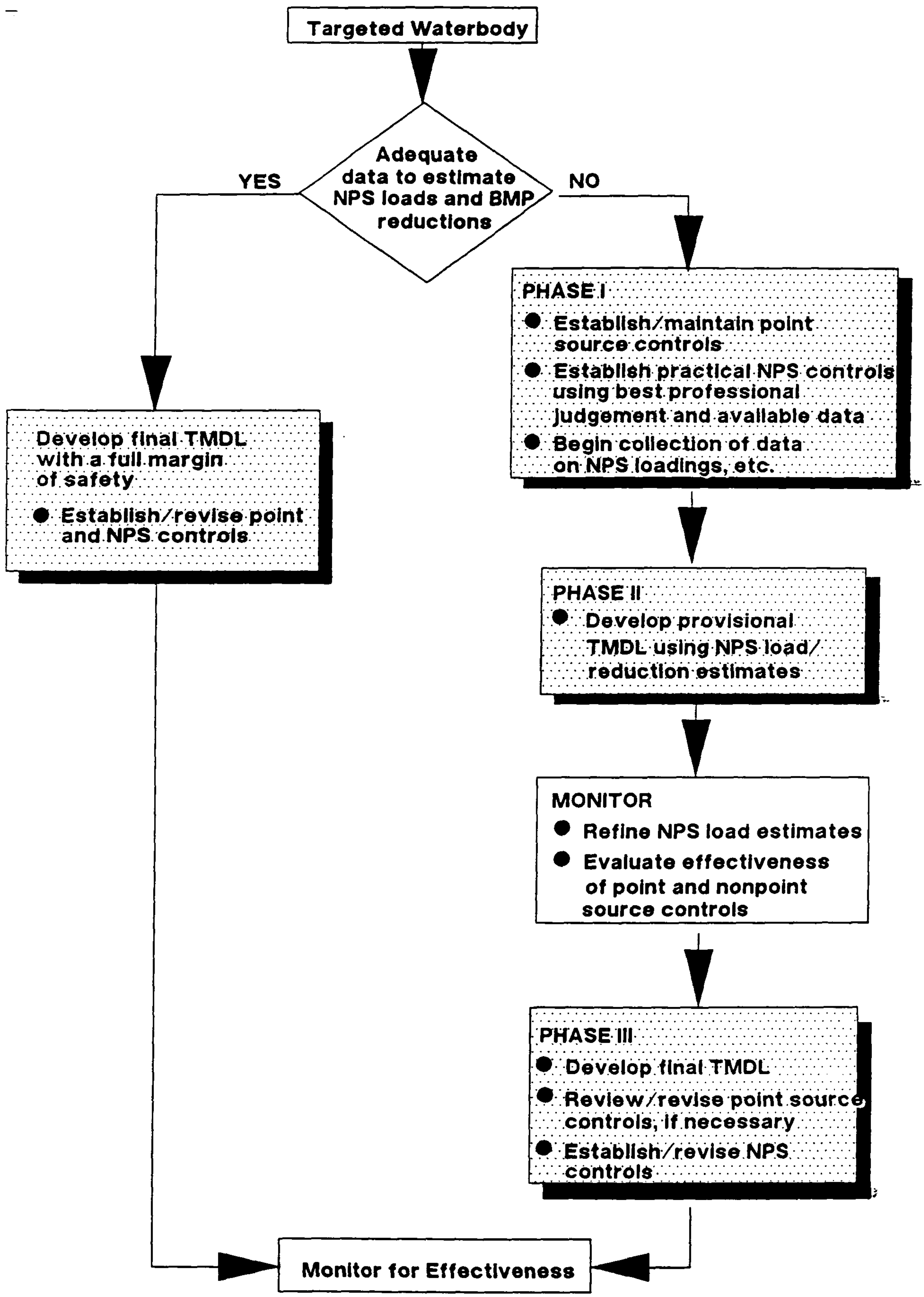


Figure 3-1 Phased TMDL Approach

Phase I

Establish/maintain point source controls. EPA's surface water quality strategy is to ensure that established levels of controls on traditional point source discharges are maintained. In addition, where a pollutant discharger is in violation of the water quality standard, the State is expected to prepare a WLA and establish a water quality-based permit with limits for that discharger. Also, where a group of dischargers are the cause of water quality standard violations without the addition of NPSs or background sources, these sources should have water quality-based permits for each discharger allowing for a margin of safety and NPS loadings.

States are not to employ the Phase I approach as a tactic to delay implementation of needed water quality-based controls. Rather, States are required to establish controls so that water quality standards can be met once sufficient practical controls are established for non-point sources.

Establish practical NPS controls using best professional judgement and available data. In the process of developing a provisional TMDL for geographically targeted waterbodies, States may not be able to calculate actual NPS loadings or the effectiveness of NPS controls. Therefore, it may be necessary to use professional judgement to establish BMPs based on reasonable estimates and available data. Since it could be several years before the effects of initiated BMPs can be determined, it is recommended that care should be taken to document the objectives and approaches used to determine the needed BMPs in a BMP effectiveness strategy.

Begin collection of data on NPS loadings, etc. To compliment the practical controls implemented, States should design a monitoring program within the geographical targeted waterbody. The primary monitoring objectives are: 1) establish NPS loading estimates, 2) evaluate effectiveness of the BMP controls, and 3) continue collecting data from all sources including compliance monitoring incorporated as part of a discharger's permit. These efforts can demonstrate that the State is developing a data base of current information to review and revise as needed, the control practices established. The program design should also be included in the State's BMP effectiveness strategy. Sufficient data should collected in order to develop final TMDLs and refine NPS controls during Phase III.

Phase II

Develop provisional TMDL. Once the above components of Phase I have been established, States are in a position to develop a provisional TMDL for review by EPA. A provisional TMDL would be approvable by EPA even though specific load allocations may not have been identified for NPSs since reasonable estimates were provided. As part of the provisional TMDL, States would establish a time frame for development of a final TMDL with a full margin of safety. The time frame, negotiated with Regional EPA offices, is to be consistent with the BMP effectiveness strategy.

In general, States should complete Phase I and II activities within three years. Once BMP implementation has been initiated, States should implement data collection activities indentified during Phase I. Actual monitoring activities are expedited to vary from waterbody to waterbody. However, States should emphasize the collection of data necessary to complete a final TMDL and evaluate practical NPS controls.

Phase III

Phase III should be initiated when either the time frame agreed upon during Phase II has elapsed. Phase III should proceed prior to the scheduled time frame if sufficient data have been collected to calculate NPS loads and to develop a final TMDL with a full margin of safety.

EPA views the completion of provisional or final TMDLs and the periodic review of final TMDLs as an essential part of its water quality management objective. Changing land use, agricultural practices, population demographics, etc. may result in the need to revise TMDLs. As a result, all TMDLs should have a time frame, negotiated with EPA Regional offices, for periodic review based on data collected from monitoring.

CHAPTER 4: IMPLEMENTATION

EPA/State Agreements

As a foundation for all TMDLs, WLAs, and LAs prepared by the State, EPA and the State should agree on the process that the States will use to develop TMDLs, WLAs and LAs and prepare a written agreement which describes these procedures. (See Appendix E for a general EPA/State Agreement Outline.) Such an agreement promotes consistency between projects and between States (i.e., how background data are applied, how and which models are to be used, how TMDLs are determined, how loads will be allocated, etc.). By agreeing on the procedures that the State will follow (as described in the State's CPP and/or the State/EPA technical agreement), only a sample of TMDLs, WLAs, and LAs need to be reviewed in depth by EPA. This sample in-depth review is to ensure that the State is following the agreed-upon procedures and that the TMDLs, WLAs, and LAs are acceptable. If a problem is found, all TMDLs, WLAs, and LAs may be reviewed in greater detail. For any waterbody where developing wasteload allocations or load allocations is more complex or critical to the approval of a large construction project, a major permit, or large expenditures of Federal resources, the Regional office may, as its option, require the State to submit additional information describing the proposed project. In either event, the Regional office and the State should reach an agreement on the level of detail that is appropriate.

State Responsibilities

Development of Schedules and Timing

Each year the EPA Regional office and the States should reach an agreement on work plans for developing TMDLs as part of the State's annual section 106 and 205(j) grant negotiations. To accomplish this, each State should prepare a TMDL/WLA/LA element in its annual work program that is submitted to EPA for approval. Waters identified in work plans should be based on State developed priorities. These priorities must consider the severity of the impact and the uses of the water. States may find it helpful to include additional information in its work plans from the Waterbody System (WBS), such as: segment descriptors (e.g., State ID numbers, River Reach File numbers or USGS hydrological codes if River Reach numbers are not available), segment length, parameters causing the water quality problems, uses supported or impaired, or special segment designations (e.g., priority waters or national resource waters). For EPA review,

NOTE: REVISE TO BE CONSISTENT W/ REG. AMENDMENTS

enough additional information should be provided for comparison with the list of waters required under section 303(d)(1) and submitted in the State's section 305(b) report.

In order to effectively plan for TMDL development, States and Regional offices are encouraged to establish schedules and time frames in annual work plans and agree to long-term schedules for all waters that will be addressed over the next five years. States would be expected to allow some reserve capacity to address "hot spots" during each year. This procedure:

- Provides clear guidance to the States to establish a time frame for the development, review, and revision of TMDLs.
- Sets national consistency in developing TMDLs.
- Establishes a basis for setting priorities.
- Supports TMDL development for targeted waterbodies using a geographical approach.

TMDL, WLA, and LA Development

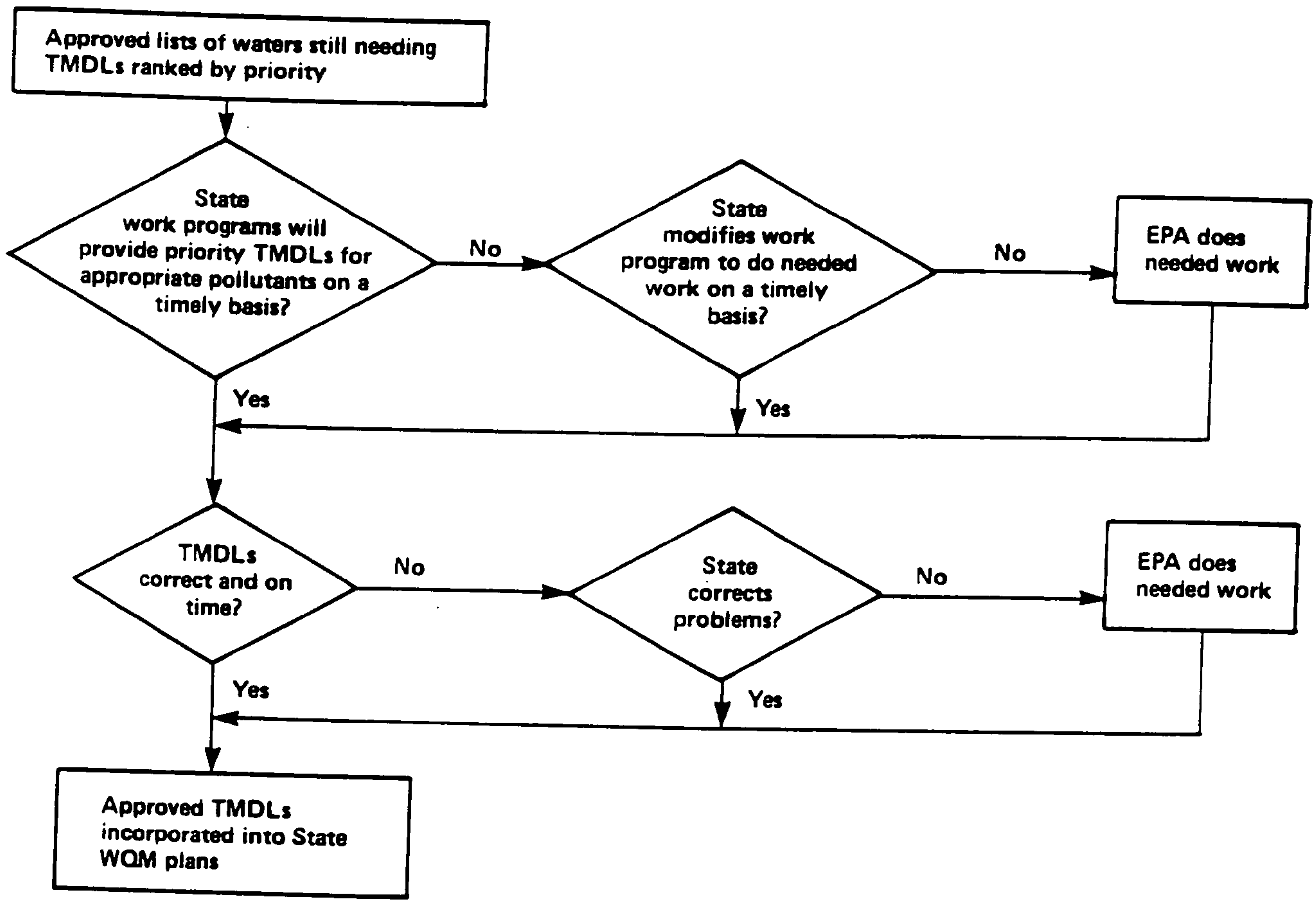
In accordance with the approved priority ranking for those waters and the annual work program, each State develops its proposed TMDLs for those pollutants that are expected to cause water quality standards violations (including whole effluent toxicity) and for the approved list of waters identified as needing new or revised TMDLs. The calculation of TMDLs are summarized in Figure 4-1. States are to use EPA's guidance when developing TMDLs, copies of which may be obtained from the Wasteload Allocation Coordinator in each Regional office.

For those TMDL projects that EPA reviews in detail, States should prepare an abstract report describing each project and submit it to the Regional office for review. This submission should contain: (1) the proposed TMDLs, WLAs, LAs, and (2) supporting information that the Region will need to evaluate the State's water quality analysis and determine whether to approve or disapprove the proposed TMDLs, WLAs, and LAs. Regions and States should reach an agreement on the specific information that reports should contain and determine the individual projects for which such reports are necessary as defined in the EPA/State Technical Agreement.

Quality assurance (QA) and quality control (QC) requirements also must be met. Specific technical QA/QC is necessary in the use of environmental data and models. However, when using models, such as wasteload allocation models which involve "real" environmental data as well as parametric and mathematical relationships, model sensitivity

Figure 4-1

Calculation of TMDLs



studies can help establish the levels of QA/QC required for specific data. For example, the allowable range of uncertainty in the data can be established through model sensitivity studies. This allowable range of uncertainty may indicate, for example, the need for tight limits on precision for a particular pollutant parameter. Further discussion is provided elsewhere.[18] [19] [20]

Continuing Planning Process

Each State is required to establish and maintain a continuing planning process (CPP) as described in section 303(e) of the Clean Water Act. A State's CPP must contain, among other items, a description of the process that the State uses to identify waters needing water quality-based controls, a priority ranking of these waters, developed TMDLs, WLAs, and LAs, and a description of the State process used to receive public review of each TMDL, WLA, and LA. This description may be as detailed as the Regional office and the State feel is necessary to adequately describe each step of the TMDL, WLA, and LA development process. This process may be included as part of the EPA/State Agreement for TMDL development (see page 35).

Water Quality Management Plan

The State incorporates EPA approved TMDLs, WLAs, and LAs into its Water Quality Management Plan (WQMP). The Water Quality Management and Planning regulation[21] states that when EPA approves a TMDL submitted by a State under section 303(d), the TMDL, WLA, and LA is to be deemed automatically incorporated into the State's Water Quality Management Plan. The regulation treats this submission and approval as the equivalent of a WQMP update, certification and approval.

Public Notice and Participation

In accordance with the Water Quality Management and Planning regulation and as described in a State's CPP, TMDLs, WLAs, and LAs should be made available for public review and comment. However, States are encouraged to establish its own procedure for public participation to assure that adequate coverage is given to decisions on TMDLs. States and involved local communities should participate in determining who (and which pollution sources) should bear the treatment or control burden needed to reach allowable loadings. By involving the local communities in decision making, EPA expects that a higher probability of successful TMDL implementation will result.

---

18 USEPA. September 1980. Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-004/80, Washington, D.C.

19 USEPA. December 1980. Interim Guidelines and Specifications for Preparing Quality Assurance Plans, QAMS-005/80, Washington, D.C.

20 USEPA. May 198- Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring, OWRS QA-1, Washington, D.C.

21 Federal Register, January 11, 1985, page 1777.
40 CFR 35 and 130

The State should issue a public notice offering an opportunity for a public hearing pertinent to the TMDL under review; however, if no interest is shown as a result of the public notice, it is possible to waive the hearing. It is also possible to include WLA and LA decisions in conjunction with public notices and hearings on NPDES permits, municipal wastewater treatment works, water quality standards revisions, and WQMP updates. Each notice should identify TMDLs, WLAs, and LAs as part of the subject matter.

Also, if a State feels that the water quality-based controls are critical or if they anticipate that they may be controversial, the State should involve the EPA Regional office as well as the public early in the process and continue to involve them throughout the process rather than waiting until WLAs are submitted to EPA for approval. (See Appendix F for an example of a letter submitting a TMDL, WLA, and LA to EPA for approval and the information to be included with the letter to facilitate EPA review.)

Reporting

Reporting section 303(d) lists of waters still needing TMDLs and expected loads is required under 40 CFR 130.7 to be reported to EPA. These lists should compliment EPA/State Agreements and the CPP, and be incorporated into the WQMP.

Specific Responsibilities

Specific responsibilities of the State are to:

- As the first priority, States should collect and analyze data as needed to make water quality management decisions:
    - Identify: (a) waters still needing TMDLs, including high quality waters, and (b) waters most needing water quality-based and nonpoint source controls, or other actions to prevent or reverse an impairment of the designated use.
    - Develop needed water quality-based controls for both conventional and toxic pollutants. For toxics, use both the pollutant specific and the biomonitoring techniques, as appropriate.
- Ensure that needed environmental data are provided to EPA, including appropriate assessment data; appropriate screening data; and all regulatory data including data needed for approvals of water quality standards and TMDLs/WLAs/LAs.
- Ensure that appropriate quality assurance/quality control procedures are used for all data used in State decision making and for all data reported to EPA, including data reported by dischargers.

EPA Responsibilities

TMDL Review and Approval

EPA reviews the State's annual work plans for developing TMDLs as part of the State's section 106/205(j) work program. If the EPA Regional office disapproves a State's list of waters and/or loads needing new or revised TMDLs, then the Region (working closely with the State) identifies those waters and loads within the State where new or revised TMDLs are necessary to implement the applicable water quality standards. If EPA disapproves a State's priority ranking of these waters, the Region and State are to negotiate acceptable revisions to the priority ranking. If the State chooses not to develop the needed TMDLs for appropriate pollutants on timely basis, EPA is under obligation to develop the TMDLs in cooperation with the State. This will be done by focusing available EPA resources on the most critical water quality problems. The TMDL, WLA, and LA review/approval process by EPA is summarized in Figure 4-2.

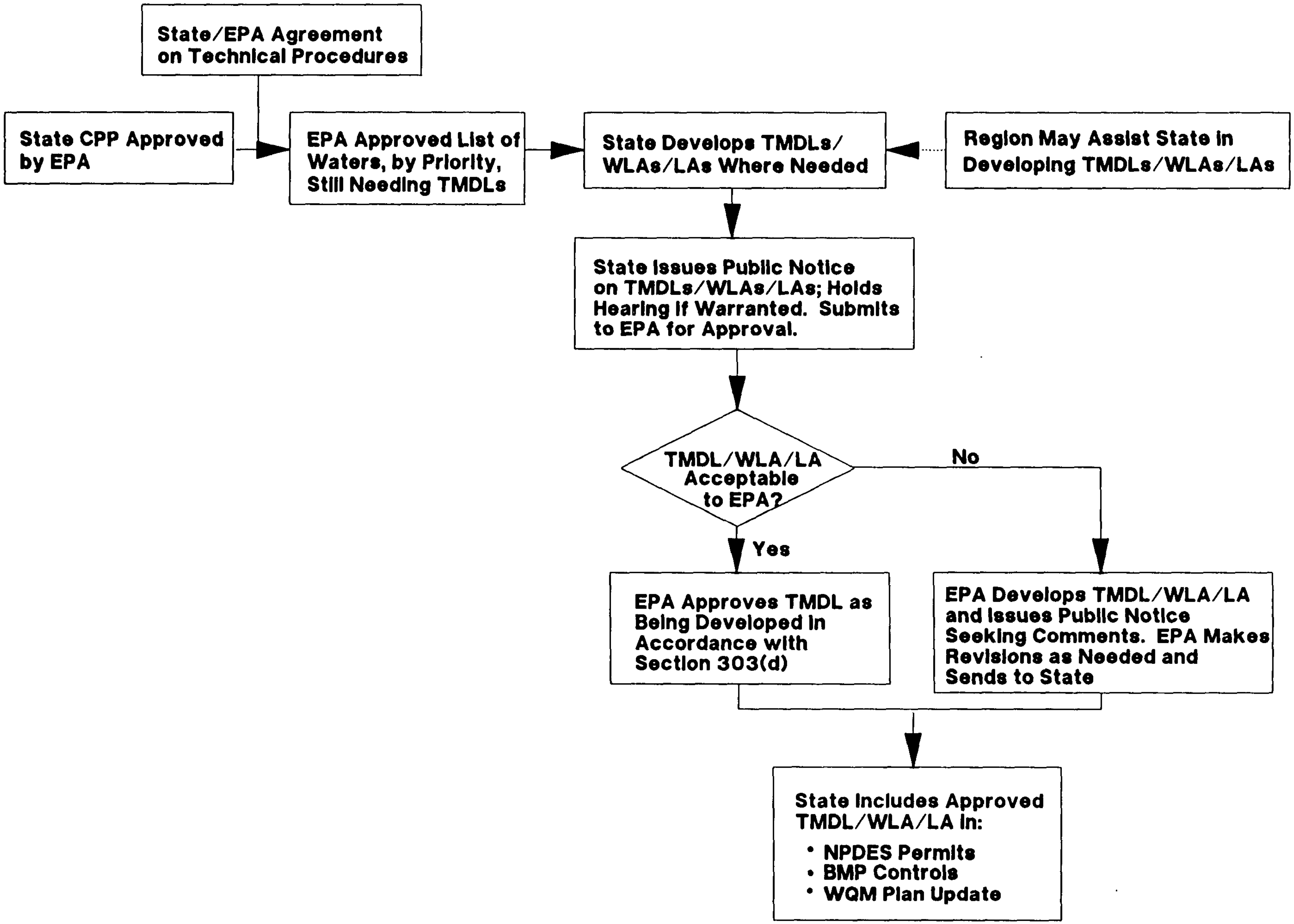
To meet the requirements of section 303(d) and the Water Quality Planning and Management regulation (40 CFR 35 and 130), EPA must review all TMDLs for approval or disapproval. EPA may tailor its review to what is reasonable and appropriate; that is, where a State has clearly described its process in its CPP (and EPA/State Technical Agreement), EPA may conduct an in-depth review of a sample of the State's TMDLs, WLAs, and LAs to determine how well the State is implementing its approval process and give a less detailed review of the remaining TMDLs, WLAs, and LAs. This review of samples of the State submissions, in conjunction with a less detailed review of all other TMDLs, WLAs, and LAs submitted to EPA by the State, will provide a reasonable basis for EPA approving or disapproving individual TMDLs, WLAs, and LAs. The in-depth sample review may include TMDLs, WLAs, and LAs supporting major construction projects and other major control measures.[22] For those States that do not have an approved WLA process, Regions are expected to conduct in-depth reviews of all of the proposed TMDLs. When Regions review the State TMDLs, they should also consider how well the States are following the EPA technical guidance for conducting wasteload allocations.

In either case, EPA must, at a minimum, determine whether the State's proposed TMDLs are "established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality."[23] No WLA or LA will be approved if it will result in a water quality standard being violated, or, in the case of waters whose quality exceed that necessary for the CWA 101(a)(2) goals, results in a lower-

22 Federal Register, January 11, 1985, page 1777.

23 CWA section 303(d)(1)

Figure 4-2 Review/Approval Procedure for State TMDL/WLA/LA



ing of water quality unless the applicable public participation, intergovernmental review, and baseline control requirements of the antidegradation policy have been met.[24]

EPA must either approve or disapprove the State's TMDL, WLA, or LA within 30 days after submission by the State. An approved TMDL, WLA, or LA is "certified" by the EPA as having been developed in accordance with CWA section 303(d) and a letter of such approval is transmitted to the State.

If EPA disapproves a State's TMDL and the State does not agree to correct the problems, then EPA shall, within 30 days of the disapproval date, establish such TMDLs as necessary to implement the water quality standards. However, the Region should inform the State that EPA would prefer to have the State develop the TMDLs, since the short time available for EPA's establishment of the TMDLs would likely necessitate using simplistic and overly conservative techniques in developing the TMDLs and also because negative publicity might arise should EPA be forced to step in.

Tracking

The primary purpose of tracking TMDL development is for EPA to assess the progress towards meeting the goals and requirements of section 303(d) as well as other sections of the CWA. To measure this progress, an increased emphasis has been given to measuring environmental results.

To assist States in the water quality assessments, EPA has developed the Water Body System (WBS). The WBS provides a geographically based framework for entering, tracking, and reporting information on the quality of individual waterbodies as they are defined by each State. The primary function of the WBS is to keep track of water quality assessments and the water quality status of waterbodies, including causes and sources of use impairment. As a convenience to the States, the WBS has been modified to include data fields on whether TMDLs are still needed or are in place. The program is designed to help States comply with the reporting requirements under sections 314(a), 319(a), and 303(d). Once initial information concerning the identification and status of waterbodies is entered into the system, the burden of subsequent reporting will be reduced as States will need only to update information.

Program Audits

EPA expects to measure performance on the basis of environmental results and administrative goals by means of program audits. To achieve this performance measurement EPA will periodically conduct questionaire surveys of State water quality programs. These program

---

24 40 CFR 131.12

audits will serve to determine where additional training or other assistance may be needed and to determine implementation of program objectives.

Technical Assistance and Training

EPA Headquarters and Regional offices are available to provide technical assistance and advice to the States in developing TMDLs, WLAs, and LAs. EPA Headquarters provides for training and assistance on modeling and the WBS.

Guidance Documents and Reports

EPA Headquarters is responsible for developing associated program guidance, technical support with assistance from Research Laboratories, and producing reports resulting from the section 305(b) assessment which includes the section 303(d) listing requirement.

EPA Headquarters Responsibilities

EPA Headquarters is responsible for seeing that the mandates regarding TMDLs in the CWA are carried out, providing oversight of the Regional offices and the States, developing wasteload allocation program policy and guidance, supporting the development of computer software for calculating TMDLs, developing technical guidance documents and providing technical training and assistance.

Specific responsibilities of EPA Headquarters are to:

- Prepare guidance and ensure that technical training and technical assistance is available for monitoring, water quality analysis, and data reporting.
- Perform national assessments and evaluate the national water quality effects of CWA programs.
- Make national data systems more useful for national, regional, and State managers by upgrading and cross-linking the existing systems and developing interactive data retrieval and analysis mechanisms for line managers. Continue support of the River Reach and Industrial Facility Discharge files.
- Ensure that appropriate quality assurance/quality control procedures are used in all national data collection efforts and provide needed laboratory capability for national studies of pollutants requiring special analyses, e.g., dioxin.
- Prepare Headquarters budget requests, and in consultation with the Regions, prepare requests for regional and State water quality monitoring and analysis programs.
- Peer review major agency program activities involving water monitoring and consult with other program offices on water monitoring activities.

EPA Regional Responsibilities

The EPA Regional offices are responsible for assisting Headquarters in developing policy and guidance and distributing this policy and guidance to the States, awarding grants to the States to provide them with resources for developing and implementing wasteload allocations, and providing technical assistance to the States. In addition, the Regional offices are responsible for reviewing and approving, or disapproving, each State's wasteload allocation process; the wasteload allocation element of the annual section 106/205(j) work program; the list of waters where TMDLs, WLAs, and LAs are needed; the priority ranking of these waters; and specific TMDLs, WLAs, and LAs. The EPA Regional offices are also responsible for reporting on State implementation to Headquarters.

Specific responsibilities of EPA Regional offices are to:

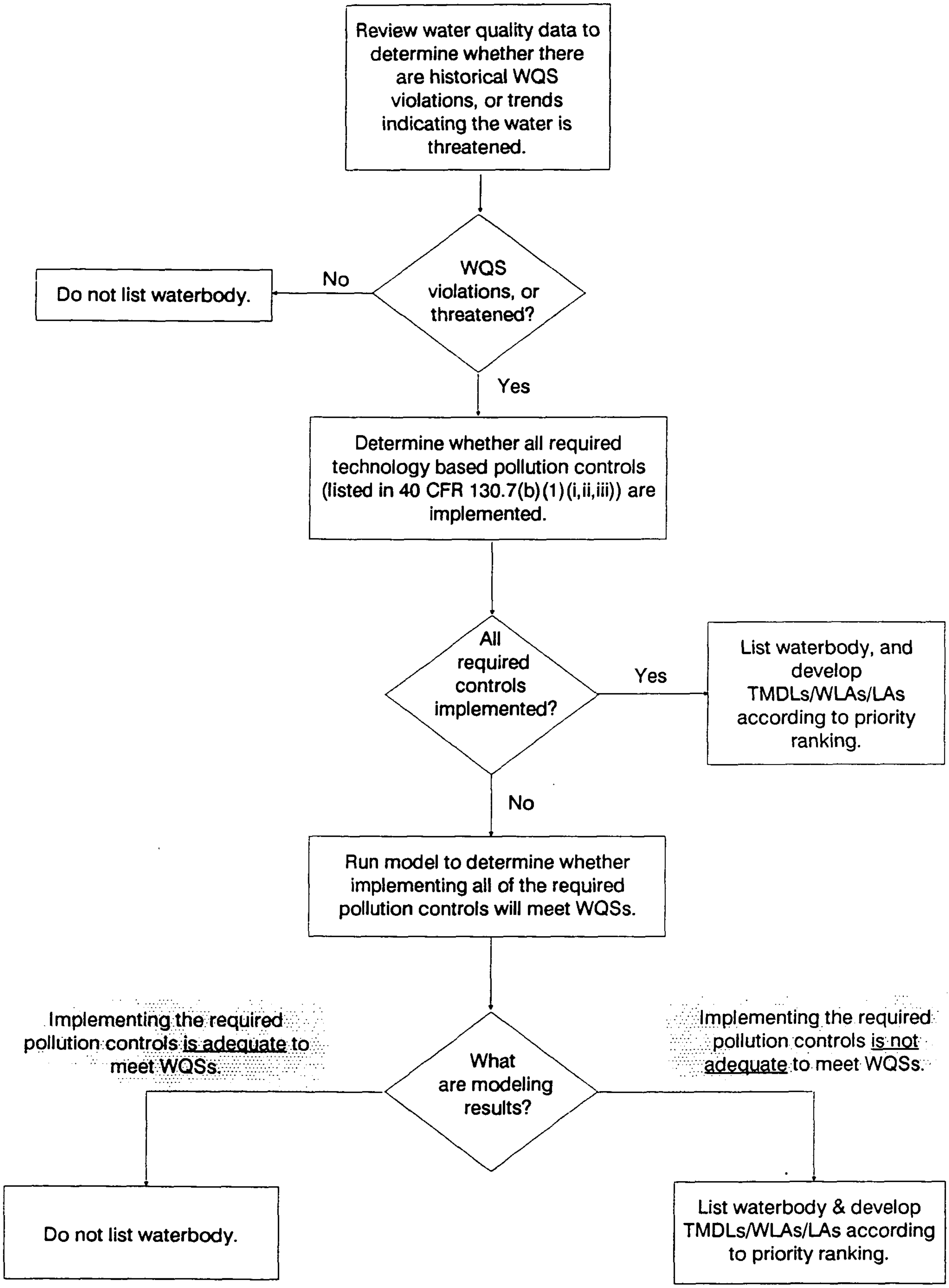
- Ensure that the appropriate regulatory monitoring is performed by States, the Region, or dischargers needed for developing and implementing water quality based controls and identifying needed nonpoint source controls. This includes data required to identify waters needing water quality based controls, data needed to develop controls, and data needed to assess the effectiveness of controls. Ensure that the developed controls are implemented, and provide controls if the State fails to act in a timely manner.
- Provide technical assistance and training to the States. Ensure that each Regional office has the capability to conduct water quality monitoring and analyses. For work involving toxics, where feasible, the Region is expected to have a capability in both the pollutant specific and the biomonitoring approaches.
- Ensure that appropriate quality assurance/quality control procedures are used for all regional and State water quality data and for all data used in regional decision making including data reported by permittees.
- Perform regional water quality assessments primarily based on State data, as needed to prepare Environmental Management Reports.
- Ensure that regional data systems are compatible with and do not unnecessarily duplicate national data systems. Ensure that data collected by the States and the Regions are entered into the national system, including data needed to update the Industrial Facilities Discharge File.

NOTE: REVISE TO BE CONSISTENT W/ REG AMENDMENTS

APPENDIX A
SCREENING CATEGORIES

1. Waters where fishing or shellfish bans and/or advisories are currently in effect or are anticipated.
2. Waters where there have been repeated fishkills or where abnormalities (cancers, lesions, tumors, etc.) have been observed in fish or other aquatic life during the last ten years.
3. Waters where there are restrictions on water sports or recreational contact.
4. Waters identified by the state in its most recent state section 305(b) report as either "partially achieving" or "not achieving" designated uses.
5. Waters identified by the states under section 303(d) of the CWA as waters needing water quality-based controls.
6. Waters identified by the state as priority waterbodies. (State Water Quality Management plans often include priority waterbody lists which are those waters that most need water pollution control decisions to achieve water quality standards or goals.)
7. Waters where ambient data indicate potential or actual exceedances of water quality criteria due to toxic pollutants from an industry classified as a primary industry in Appendix A of 40 CFR Part 122.
8. Waters for which effluent toxicity test results indicate possible or actual exceedances of state water quality standards, including narrative "free from" water quality criteria or EPA water quality criteria where state criteria are not available.
9. Waters with primary industrial major dischargers where dilution analyses indicate exceedances of state narrative or numeric water quality criteria (or EPA water quality criteria where state standards are not available) for toxic pollutants, ammonia, or chlorine. These dilution analyses must be based on estimates of discharge levels derived from effluent guidelines development documents, NPDES permits or permit application data (e.g., Form 2C), Discharge Monitoring Reports (DMRs), or other available information.
10. Waters with POTW dischargers requiring local pretreatment programs where dilution analyses indicate exceedances of state water quality criteria (or EPA water quality criteria where state water quality criteria are not available) for toxic pollutants, ammonia, or chlorine. These dilution analyses must be based upon data from NPDES permits or permit applications (e.g., Form 2C), Discharge Monitoring Reports (DMRs), or other available information.
11. Waters with facilities not included in the previous two categories such as major POTWs, and industrial minor dischargers where dilution analyses indicate exceedances of numeric or narrative state water quality criteria (or EPA water quality criteria where state water quality criteria are not available) for toxic pollutants, ammonia, or chlorine. These dilution analyses must be based upon estimates of discharge levels derived from effluent guideline development documents, NPDES permits or permit application data. Discharge Monitoring Reports (DMRs), or other available information.
12. Waters classified for uses that will not support the "fishable/swimmable" goals of the Clean Water Act.
13. Waters where ambient toxicity or adverse water quality conditions have been reported by local, state, EPA, or other Federal Agencies, the private sector, public interest groups, or universities. These organizations and groups should be actively solicited for research they may be conducting or reporting. For example, university researchers, the United States Department of Agriculture, the National Oceanic and Atmospheric Administration, the United States Geological Survey, and the United States Fish and Wildlife Service are good sources of field data and research.
14. Waters identified by the state as impaired in its most recent Clean Lake Assessments conducted under section 314 of the Clean Water Act.
15. Waters identified as impaired by nonpoint sources in the America's Clean Water: The States' Nonpoint Source Assessments 1985 (Association of State and Interstate Water Pollution Control Administrators (ASIWPCA)) or waters identified as impaired or threatened in a nonpoint source assessment submitted by the state to EPA under section 319 of the Clean Water Act.
16. Surface waters impaired by pollutants from hazardous waste sites on the National Priority List prepared under section 105(8)(A) of CERCLA.

Figure A-1
LISTING PROCESS



NOTE: IS THIS APPENDIX NEEDED?

APPENDIX B
RELATIONSHIP TO OTHER PROGRAMS

Monitoring Program

Ambient water quality monitoring is an information gathering tool used for almost all water quality analyses and is required under section 104(a)(5) of the CWA. Monitoring can help identify waters needing TMDLs, quantify loads, verify models, and evaluate overall water quality management (including BMP) implementation and effectiveness. Once TMDLs, WLAs, and LAs have been developed for a given waterbody it is critical to follow-up with monitoring to document improvement. Due to the complex nature of some waterbodies, one cannot expect improvements immediately. Since the TMDL process is iterative, monitoring data can provide the information for updating and revising current TMDLs, WLAs, and LAs. In addition to providing information for allocation of assimilative capacities, monitoring can be used for setting permit conditions, compliance, enforcement, detecting new problems and trends, etc.

Section 304(l) -- Impaired waters[25]

Section 304(l) of the CWA required States to submit lists of impaired waters and sources to EPA as a "one time" effort. These lists of waters known as the short, long, and mini lists provide three types of designations for impaired waters and source impacts. The mini list (section 304(e)(1)(A)(i)) is a list of waters the State does not expect to achieve numeric water quality standards for priority pollutants (section 307(a)) after technology-based requirements have been met, due to point or nonpoint pollution sources. The long list (section 304(l)(1)(A)(ii)) is a comprehensive list of waters that need additional pollution control actions whether due to toxicity or other impairments; point or nonpoint sources; or toxic, conventional, or nonconventional pollutants. Waters meeting designated uses, but not meeting the fishable/swimmable goals of the Clean Water Act are included on the long list. A waterbody which meets its designated use criteria and does not meet fishable/swimmable criteria would be listed on the section 304(l) long list but not on the section 303(d) list of waters needing TMDLs. It would be appropriate for a State to include the information on all waters from its long lists and apply these data in developing the section 303(d) list of waters that still do not meet applicable water quality standards. The short list (section 304(l)(1)(B)) is a list of State waters that are not expected to meet applicable standards after technology based controls have been met, due entirely or substantially to point sources. A fourth list is the list of point sources of priority pollutants which contribute to the impairment of waters identified on the short list.

Section 319 -- Nonpoint Source Program

One of the key initiatives of the 1987 Amendments to the Clean Water Act was the addition of section 319. The establishment of a Nonpoint Source (NPS) Program is an inherent recognition of today's current water quality programs. As a result of this section, States are required to assess their NPS pollution problems and submit that assessment to EPA. The State assessments include a list of "navigable waters within the State which, without additional action to control nonpoint sources of pollution, cannot reasonably be expected to attain or maintain applicable water quality standards or the goals and requirements of this Act." Other paragraphs of section 319(a) require the identification of categories and subcategories of NPS pollution which contribute to the identification of impaired waters, descriptions of the procedures for identifying and implementing BMPs and control measures for reducing NPS pollution, and descriptions of State and local programs used to abate NPS pollution.

---

[25] USEPA. March, 1988. Final guidance for Implementation of Requirements under section 304(l) of the Clean Water Act as Amended. OWRS and OWEP, Washington, D.C.

Since one of the requirements is to identify waters with impairments due primarily to NPS, a natural application of section 303(d) is to develop TMDLs, WLAs, and most importantly LAs for these waters. Waters which meet applicable water quality standards but do not meet the fishable/swimmable goals and requirements of the Clean Water Act do not have the legal mandate under section 303(d)(1) to require TMDLs.

Section 305(b) -- Water Quality Assessment[26]

Section 305(b) of the Clean Water Act establishes a process for developing information about the quality of the Nation's water resources and a vehicle for reporting this information to EPA. Currently, each State, Territory, and Interstate Commission develops a program to monitor the quality of its surface and ground waters and report the current status of water quality biennially to EPA. This information is compiled, and EPA prepares a biennial report to Congress. The 305(b) report has received additional attention in recent years due to the increased need to assess environmental results. The section 305(b) report allows EPA to:

- help determine the status of water quality;
- help identify water quality problems and trends;
- evaluate the causes of poor water quality and the relative contributions of pollution sources;
- report on the activities underway to assess and restore water quality;
- determine the effectiveness of control programs;
- ensure that pollution control programs are focused on achieving environmental results in an efficient manner;
- determine the workload remaining in restoring waters with poor quality and protecting threatened waters; and
- maintain and update statutorily-required lists of waters identified under sections 303(d), 304(l), 314, and 319.

For each assessed waterbody under the waterbody specific information section of the section 305(b) report, States are asked to provide information on the water quality limited status, nonattainment causes, nonattainment sources, cause magnitude, and source magnitude. Much of this information results from section 305(b) waterbody assessments and would provide useful information for meeting requirements of Clean Water Act section 303(d) and 40 CFR 130.7. The WBS is a useful tracking tool designed to assist States in meeting these requirements.

EPA Criteria and Standards

EPA criteria published pursuant to section 304(a) of the Clean Water Act are guidance based on the latest scientific information available on the effects of a pollutant on human health and aquatic life. States may adopt or modify EPA's section 304(a) guidance in order to protect public health or welfare, and to enhance the quality of water and to serve the purposes of the Clean Water Act. In addition to listing uses and criteria, State water quality standards must contain an antidegradation policy that, at a minimum, ensures that the State maintains and protects existing uses and the water quality necessary to protect those uses. EPA recommends establishing numerical values wherever practical (section 303(c)(2)(B)). However, EPA recognizes many conditions for which narrative criteria should be retained.

States may develop site-specific criteria in cases where background water quality parameters or aquatic organisms differ from those used in the laboratory[27]. The criteria adopted by States[28] are water quality standards which are enforceable requirements and are subject to public review. (Public hearings are required every three years. The

---

26 USEPA. 1989. Guidelines for the Preparation of the 1990 State Water Quality Assessment (section 305(b) Report). OW/OWRS, Washington, D.C.

27 USEPA. 1983. Water Quality Standards Handbook. OW/OWRS, Washington, D.C.

28 Authority granted to States by CWA section 303(c).

resulting standards are subject to EPA review and approval.) Once State criteria and standards are adopted, they form a foundation of the State's water quality management program. (Refer to the Standards to Permits process for further details.)

Marine and estuarine waters

In January 1990, EPA published its National Coastal and Marine Policy (NCMP), which states EPA's goals for coastal and marine protection. They include:

- recover full use of the nation's shores, beaches, and water;
- restore the Nation's shell fisheries and salt-water fisheries;
- minimize the use of coastal and marine water for waste disposal;
- improve and expand coastal science; and
- support international efforts to protect coastal and marine resources.

EPA's programs to protect ocean and coastal waters and the Great Lakes from nutrient and toxic pollutants emanating from point and nonpoint sources are implemented under the Clean Water Act and the Marine Protection, Research, and Sanctuaries Act (Ocean Dumping Act).

Marine and estuarine waters are, in many cases, the ultimate sink for pollutants which emanate from upland sources. Estuaries and marine waters are particularly complex and it is difficult to predict pollutant fate and transport. To address the increased complexity and effect on aquatic life, water quality management efforts must increase accordingly. TMDLs can be a useful tool for management of marine and estuarine waters. Technical support is currently being revised to support estuarine modeling.[29]

Groundwater

Contaminated ground-water discharge to surface water may be a source of contaminants in water quality-limited surface waters. While ground water and surface water are often treated as separate systems, they are in reality highly interdependent components of the hydrologic cycle. Subsurface interactions with surface waters occur in a variety of ways. In several studies, ground water discharge accounted for as much as 90% or more of stream flow in humid regions. Therefore, the potential pollutant contributions from ground water to surface waters should be evaluated when developing TMDLs.

NPDES permits and Individual Control Strategies

According to the Clean Water Act (section 402(a)), all discrete sources of wastewater must obtain a permit that regulates the facility's discharge of pollutants. The Act's approach to control and elimination of water pollution is focused on the pollutants determined to be harmful to receiving waters and on the sources of such pollutants.

Point sources are generally divided into two types: "industrial" and "municipal." Nationwide, there are approximately 50,000 industrial sources which include commercial and manufacturing facilities. Municipal sources, also known as Publicly Owned Treatment Works (POTWs), number about 15,700 nationwide. Wastewater from municipal sources results from domestic wastewater discharged to POTWs as well as the "indirect" discharge of industrial wastes to sewers. In addition, EPA regulations designate several classes of sources as point sources for NPDES purposes even though they may not have a discrete discharge (such as animal feedlots, fish farms, and other aquatic production facilities, aquacultural operations). For purposes of permit issuance and oversight, industrial and municipal sources are further divided into "major" and "minor" sources.

---

29 USEPA. ____. Technical Guidance Manual for Performing Wasteload Allocations, Book III - Estuaries.

Permits for both industrial and municipal sources contain the following terms and conditions:[30]

- Standard conditions common to all permits,
- Site-specific discharge or "effluent" limits,
- Standard and site-specific compliance monitoring and reporting requirements, and
- Other site-specific conditions that EPA deems necessary to adequately control the discharge.

Section 304(l)(1)(D) of the Clean Water Act requires the development of individual control strategies (ICSs) for point source discharges of priority toxic pollutants to waters identified on the short list. (The short list is composed of State waters for which applicable section 307(a) priority pollutant standards are not expected to be met after technology-based controls have been met, due entirely or substantially to point sources.) In its section 304(l) guidance, EPA requested that controls for all listed waters having known toxicity problems from any pollutant, (including chlorine, ammonia, and whole effluent toxicity) be given the same priority as waters where only section 307(a) pollutants are involved. An ICS consists of an NPDES permit, to the extent possible, for each point source listed and documentation that the permit has been developed with consideration of other dischargers. A TMDL for the waterbody and a WLA for the individual dischargers would be considered as adequate documentation. An approvable ICS would consist of effective NPDES permit limitations and schedules for achieving such limitations if they cannot be achieved upon permit issuance, along with documentation which shows that the controls selected are appropriate and adequate. [31] [32]

---

30 USEPA. 1989. A Primer on the Office of Water Enforcement and Permits and Its Programs. OW/OWRS, Washington, D.C.

31 USEPA. 1985. Techncial Support Document for Water Quality-based Toxics Control. EPA-440/4-85-032.

32 USEPA. 1987. Permit Writer's Guide to Water Quality-based Permitting for Toxic Pollutants. EPA 440/4-87-005.

APPENDIX C
RELATIONSHIP TO OTHER GUIDANCE

Monitoring guidance

According to the Clean Water Act, States and Interstate Agencies, in cooperation with EPA, are to perform the water quality monitoring necessary to establish and revise water quality standards, calculate TMDLs, assess compliance with permits, and report on conditions and trends in ambient waters. The current program guidance[33] discusses the programmatic relationships of monitoring as an information collection tool for many of EPA's program needs. With NPS pollution recently receiving additional attention, tools have been developed to monitor and evaluate NPSs.[34] Revised Monitoring Program Guidance will be available in late 1990.

Wasteload allocation technical guidance

States and EPA have developed WLAs for a number of years. As a result, extensive technical guidance has been developed for preparing WLAs. In all, nine documents have been prepared and are summarized in Table B-1. (Some of these documents are in draft form.)

Table B-1. Wasteland Allocation Guidance Documents

Book	Guidance
I	General Guidance (Program Guidance)
II	Streams and Rivers
III	Estuaries
IV	Lakes and Impoundments
V	Toxics Control Guidance
VI	Design (Critical) Conditions
VII	Permit Averaging
VIII	Screening Manual
IX	Innovative Wasteload Allocations

These guidance manuals have been developed to make improvements in methodology more widely available and to provide a collection of procedures to support of development of WLAs. However, technical guidance for LAs have not been developed to date.

Cooperative Monitoring

Cooperative monitoring involves shared efforts by individuals or groups in assessing water quality conditions and developing local water quality-based controls. Cooperative arrangements are encouraged by the Clean Water Act as referenced in section 104(a). Cooperative monitoring projects require careful planning and strong management controls. Current guidance[35] describes the factors to be considered in designing and implementing cooperative

---

33 USEPA. 1985. Guidance for State Water Monitoring and Wasteload Allocation Programs. OW/OWRS, EPA 440/4-85-031, Washington, D.C

34 USEPA. 1987. Nonpoint Source Monitoring and Evaluation Guide (Draft). OW/OWRS, Washington, D.C. [Monitoring Guide is currently being revised. New version due in late 1990.]

35 USEPA. 1984. Planning and Managing Cooperative Monitoring Projects. OW/OWRS, EPA 440/4-84-018, Washington, D.C.

–

monitoring projects so that specific provisions are made for the collection and analysis of scientifically valid water quality data and so that the State water pollution control agencies have the necessary information for final review and approval of all projects.

Cooperative monitoring projects can serve the same usefulness as other monitoring studies; however, they also provide a mechanism to utilize additional resources. In addition to "tapping" additional resources for monitoring, there are other incentives for States and the regulated community to cooperate, such as having more site-specific data from which to develop site-specific, scientifically-based water quality criteria.

Technical Support Document for Water Quality-based Toxics Control[36]

The Technical Support Document (TSD) for Water Quality-based Toxics Control presents recommendations to regulatory authorities when they are faced with the task of controlling the discharge of toxic pollutants to the Nation's waters. Included in this document are detailed discussions on EPA's recommended criteria for whole effluent toxicity, a screening analysis methodology for effluent characterization, human health risk assessment, the use of exposure assessments for wasteload allocations, and the development of permit requirements and compliance monitoring. This TSD provides guidance for assessing and regulating the discharge of toxic substances. It supports an EPA initiative involving the application of biological and chemical assessment techniques to control toxic pollution and proposes solutions to complex and site-specific pollution problems. The TSD is currently being updated and revised.

Permit Writers Guidance[37]

The Permit Writer's Guide to Water Quality-based Permitting For Toxic Pollutants provides State and Federal NPDES permit writers and water quality management staff with a reference on water quality-based permit issuance procedures. This guidance presents fundamental concepts and procedures in detail and briefly refers to more advanced toxics control procedures, such as dynamic modeling of complex discharge situations, which may not yet be incorporated into many State programs. The Guidance is meant to explain aspects of water quality-based toxics control in terms of what a permit writer currently needs to know to issue a water quality-based toxics control NPDES permit.

The NPDES permits program is now focused on control of toxic pollutants. This document is directed at supporting these toxics control efforts. Water quality problems related to conventional pollutants, such as those associated with point source contributions to oxygen depletion, are addressed in other guidance documents.

The Permit Writer's guidance addresses three types of toxic effects: toxic effects on aquatic life, toxic effects of human health, and toxic effects due to the bioaccumulation of specific chemicals. Each effect must be dealt with on an individual basis using available data and tools. This guidance also catalogues the principal procedures and tools available and presents them in the context of their relationship to permit issuance.

An integrated toxics control strategy using both whole effluent toxicity-based assessment procedures and pollutant-specific assessment procedures is strongly for most permitting situations. Both procedures are needed to enforce State water quality standards. Both have benefits and disadvantages, and so both are often needed in the toxics control process. Chemical specific controls will almost always be needed to meet State standards for individual toxicants and to assess an effluent for human health and bioaccumulation problems. Effluent toxicity testing will usually be necessary to assess overall toxicity since effluents are often complex mixtures of pollutants.

---

36 USEPA. 1985. Technical Support Document for Water Quality-based Toxics Control. OW/OWRS & OWEP, EPA-440/4-85-032, Washington, D.C.

37 USEPA. 1987. Permit Writer's Guide to Water Quality-based Permitting for Toxic Pollutants. OW/OWEP, Washington, D.C.

Nonpoint Source Guidance[38]

Section 319 of the Clean Water Act establishes new direction and considerable Federal financial assistance for the implementation of State NPS programs. NPS guidance encourages States to develop State Clean Water Strategies for integrating and unifying the States' entire approach to water quality protection and clean-up. Three steps were identified in the process: comprehensive assessment of impaired or threatened waters, target protection of waters, and development of strategic management plans. EPA is encouraging States to develop NPS programs which build upon related programs (e.g., Clean Lakes, National Estuaries, Stormwater Permits, Ground Water, Toxics Controls, State Revolving Funds, and Wetlands) and to coordinate with other Federal Agencies.

Current guidance includes information on NPS requirements associated with section 319, principally development of State Assessment Reports and State Management Programs. Provisions and grant application requirements are also summarized.

Antidegradation and antibacksliding

Revisions to water quality standards may include revisions to the State's antidegradation policy or the procedures through which the State plans to implement the antidegradation policy. Antidegradation policies and procedures must ensure that the State maintains and protects existing uses and the quality of water necessary to protect those uses.

Antidegradation policies must also ensure the protection of water quality above that necessary to maintain fish and recreation, unless, after fulfilling public participation requirements, States can demonstrate that lower water quality is necessary for important economic and social development in the vicinity of the water body. However, in no case may a State allow water quality to deteriorate below that necessary to protect existing uses. Finally, antidegradation policies must maintain and protect water quality for any outstanding national resource waters that the State designates. Antidegradation implementation procedures must address how States will ensure that the permits and control programs meet water quality standards and antidegradation requirements. States must provide an opportunity for the public to review and comment on all aspects of water quality standard revisions. Any changes to water quality standards are subject to EPA review and approval, and would include the review of the State's antidegradation policy.

---

[38] USEPA. 1987. Nonpoint Source Guidance. OW/OWRS, Washington, D.C.

APPENDIX D
SUMMARY OF SELECTED MATHEMATICAL MODELS

Table D-1	WLA models and their applicability to different water quality problems.
Table D-2	Characteristics and Capabilities of Selected NPS Runoff Procedures and Models. (after Review and Analysis of Available NPS and Integrated Watershed Models)
Table D-3	Level of analysis and spatial resolution of selected WLA models.
Table D-4	Characteristics and Capabilities of Integrated Watershed Models. (after Review and Analysis of Available NPS and Integrated Watershed Models)

Table D-1 WLA models and their applicability to different water quality problems.

Model Name	Water Body			Water Quality Problem		
	Stream River	Estuary	Lake	DO/BOD	Eutrophication	Toxics
Hand Calculation Methods	X	X	X	X	X	X
WQAM	X	X	X	X	X	X
SNSIM	X			X		
DOSAG-1	X			X		
DOSAG-3	X			X	X	
QUAL-II	X			X	X	
QUAL-IIe	X			X	X	
RECEIV-II	X	X		X	X	
WASP	X	X	X	X	X	
AESOP	X	X	X	X	X	
HSPF	X		X	X	X	X
SLSA	X		X			X
MICHRIV	X					X
CTAP	X	X	X			X
EXAMS	X	X	X			X
MEXAMS	X	X	X			X
TOXIWASP	X	X	X			X
WASTOX	X	X	X			X
SERATRA	X		X			X
FETRA	X	X				X
TODAM	X	X				X
TOXIC			X			X
CHNTRA	X	X	X			X
SEM		X		X		
HARO3	X	X	X	X		
FEDBAKO3	X	X	X	X		
DEM		X		X	X	
MIT-DNM	X	X		X	X	
EXPLORE-1	X	X		X	X	
H.S. Chen		X		X	X	
Steady-State Nutrient Loading Models			X	X	X	
Chapra Dynamic Loading Model			X	X	X	
Larsen Dynamic Loading Model			X	X	X	
CLEAN			X	X	X	
CLEANER			X	X	X	
MS.CLEANER			X	X	X	
LAKECO			X	X	X	
ONTARIO			X	X	X	
WQRRS	X		X	X	X	
Grand Traverse Bay Model			X	X	X	

Table D-2 Characteristics and Capabilities of Selected NPS Runoff Procedures and Models.
(after Review and Analysis of Available NPS and Integrated Watershed Models)

	LAND USE/LOAD SOURCES						HYDROLOGY			WATER QUALITY			TIME SCALE			DATA NEEDS			SPACE SCALE		
	Urban	Agriculture	Forest/Natural	Mining	Precipitation	Chemical Application	Surface Runoff	Subsurface Flow	Snowmelt	Sediments	Nutrients	Pesticides/Toxics	Annual Loads	Event Loads	Continuous Simulation	Detailed	Moderate	Minimal	Segmented/Multiple Catchments	Lumped/Single Catchment	Use, Documentation, Support
LOADING/SCREENING PROCEDURES																					
Hydroscience	●						●		●		●		●					●		●	A/M
EPA Screening Procedures	●	●	●		●					●	●	●	●	●				●		●	A
WRENS			●				●		●	●	●	●	●					●	●		A
WLFNPS		●	●				●		●	●	●			●			●		●		M/A
SWMM - Level I	●						●	○		●	●		●				●			●	A
RUNOFF MODELS																					
Simplified SWMM	●						●				●			●	●		●		●		M
ARM		●				●	●	●	●	●	●	●		●	●	●				●	E/A
NPS	●	●	●				●	●	●	●	●			●	●	●			●		E/A
HSPF/PERLND & IMPLND	●	●	●	●	○	●	●	●	●	●	●	●		●	●	●			●		E
CREAMS/CREAMS 2		●	●			●	●			●	●	●		●	●	●				●	E
ANSWERS		●	●	●			●	●		●	●			●		●			●		A
ACTMO		●				●	●	●	●	●	●	●		●	●	●			●		M
SWMM	●						●	○	●	●	●			●	●	●			●		E
STORM	●						●	○	●	●	●				●		●			●	E
MUNP	●						●			●	●			●			●			●	M
ILLUDAS/DRAINQUAL	●						●	●			●			●		●	●		●		A
DR3M	●				●		●	○		●					●	●			●		A
PRMS			●				●	●	●	●				●	●	●			●		A

Notes: ● - Capability included in model

○ - Capability not explicitly included but can be user-defined

Use/Documentation/Support

E - Extensive
A - Adequate
M - Minimal

Table D-3 Level of analysis and spatial resolution of selected WLA models.

	Level of Analysis				Spatial Representation			
					Dimensions			
Model Name	Hand Calculations	Steady-State	Quasi Steady-State	Dynamic	0-D	1-D	2-D	3-D
Hand Calculation Methods	X	X	X		X	X	X	
SNSIM		X				X		
DOSAG-1		X				X		
DOSAG-3		X				X		
QUAL-II		X	X			X[a]		
RECEIV-II				X		X	X	
WASP				X[b]		X	X	X
AESOP				X		X	X	X
HSPF				X		X		
SLSA		X				X		
MICHRIV		X				X		
CTAP		X				X	X	X
EXAMS		X				X	X	X
MEXAMS		X				X	X	X
TOXIWASP				X[b]		X	X	X
WASTOX				X[b]		X	X	X
SERATRA				X			X[c]	
FETRA				X			X	
TODAM				X		X		
TOXIC			X			X	X	X
CHNTRA				X		X		
SEM	X	X				X		
HARO3		X				X	X	X
FEDBAKO3		X				X	X	X
DEM				X		X	X[a]	
MIT-DNM				X		X		
EXPLORE-1				X		X	X[a]	
H.S. Chen				X			X	
Steady-State Nutrient Loading Models		X			X			
Chapra Dynamic Loading Model				X	X			
Larsen Dynamic Loading Model				X	X			
CLEAN				X		X		
MS. CLEANER				X		X	X	X
LAKECO				X		X		
ONTARIO				X		X	X	X
WQRRS				X		X		
Grand Traverse Bay Model				X		X	X	

[a]Quasi 2-D

[b]Tidally-averaged dynamic estuary models

[c]2-D, vertical

Table D-4 Characteristics and Capabilities of Integrated Watershed Models. (after Review and Analysis of Available NPS and Integrated Watershed Models)

	WATERBODY & FLOW CONDITIONS						WATER QUALITY									TIME SCALE		DATA NEEDS		SPACE SCALE		
INTEGRATED WATERSHED MODELS	Rivers/Streams	Lakes/Impoundments	Estuaries	Confined Flow	Drainage/Control Structures	Point Source Discharges	Temperature	D.O./BOD/NBOD	Suspended Sediment Transport	Sediment Scour/Deposition	Sediment Contaminant Interaction	Nutrient Kinetics	Pesticides/Toxics	Biologic Simulation	Dynamic	Steady-State	Detailed	Moderate	Multi Land Use Multiple Catchments	Single Land Use Single Catchment	Data/File Management	Use, Documentation, Support
HSPF	●	●		○	●	●	●	●	●	●	●	●	●	●	●		●		●		●	E
SWMM (RECEIV)	●	●	●	●	●	○		●				●	○	●	●		●		●			E
PRS	●	●											●		●		●		●			A
UTM-TOX	●		●		●	●	○		●	●			●		●		●		●			M
SWAM	●	●					●		●	●		●	●		●		●		●			M/A

Notes: ● - Capability included in model

○ - Capability not explicitly included but can be user-defined

Use/Documentation/Support

E - Extensive

A - Adequate

M - Minimal

APPENDIX E

GENERAL OUTLINE
EPA/STATE AGREEMENT FOR DEVELOPMENT OF TMDLs, WLAs, and LAs

Since conditions, procedures, and methodologies may vary between EPA Regions and their States, a general outline of an example agreement is provided. This outline can be used in conjunction with the referenced technical guidance documents to prepare EPA/State Agreements.

I. General

   A. Purpose, Scope, and Authority
   B. Statement of Policy

II. Water Quality Standards Considerations

   A. General
   B. Type of Stream Classifications

III. Allocation Procedures and Policies

   A. Basic Approach for Establishing Boundaries for Effluent Limitations Determination
   B. Determination of Effluent Limitations Using Water Quality Models
   C. Determination of Effluent Limitations Using Other Analytical Tools
   D. Special Case Policies

IV. Approval of TMDLs, WLAs, and LAs

V. Incorporation of Allocations into NPDES Permits

   A. General
   B. Priority Considerations

Appendix - State Continuing Planning Process (CPP)

APPENDIX F

EXAMPLE TRANSMITTAL LETTERS

The following letters are provided as examples to initiate the review process and EPA's action. Included as examples are the State's transmittal of completed TMDLs, WLAs, and LAs to EPA requesting approval, EPA's letter approving the State's TMDL, WLA, and LA, EPA's letter requesting additional information prior to approval, and EPA's letter of disapproval.

EXAMPLE: STATE LETTER TO EPA REQUESTING TMDL, WLA, AND LA APPROVAL

Regional Administrator
U.S. Environmental Protection Agency
Region ___________
Street Address
City, State, Zip Code

Dear __________________________:

In accordance with 40 CFR 130.7(d) and section 303(d) of the Clean Water Act (33 U.S.C. 1251 et. seq.), the (State water pollution control agency) submits for your review and approval the (wasteload allocations and/or total daily maximum load) for the (discharges) to (waterbody) as being established at a level necessary to meet the applicable water quality standard(s) with consideration of seasonal variation and a margin of safety.

This (wasteload allocation/total daily maximum load) was given public review during (date(s) of review period) and approved by the State and will serve as the basis for NPDES permits, construction grants projects, and for incorporation into the State's Water Quality Management Plan. To facilitate your review, we are enclosing the calculations used to develop the TMDL, WLA, and LA.

Sincerely yours,

____
State Water Pollution Control Official

Enclosure[39]

---

39 Methods used, analyses, and calculations showing that the WLA is established at a level necessary to implement the applicable water quality standards. (see 40 CFR 130.7(c)).

EXAMPLE: EPA LETTER TO STATE APPROVING TMDL, WLA, AND LA

Chief, Water Division
State Water Pollution Control Agency
Street, Box Number
City, State, Zip Code

Dear ______________________:

We have completed our review of the total maximum daily load/wasteload allocation for the (discharges) to (waterbody) as submitted by your agency on (date). From our review, the effluent limits as established (e.g., oxygen demanding substances, nutrients; general toxicity, toxic substances, etc.) for the defined segment are approved.

This total maximum daily load/wasteload allocation meets the requirements for total maximum daily loads and wasteload allocations as specified under section 303(d) of the Clean Water Act and is hereby approved.

Sincerely yours,

____
Regional Administrator

EXAMPLE: EPA LETTER TO STATE REQUESTING ADDITIONAL INFORMATION

Chief, Water Division
State Water Pollution Control Agency
Street, Box Number
City, State, Zip Code

Dear ______________________:

We have completed our review of the TMDL, WLA, and LA for the (discharges) to (waterbody) as submitted for approval by your agency on (date). We have the following comments or questions:

1.____________________________

2.____________________________

3.____________________________

etc.

We cannot proceed in our review of your request for approval until a satisfactory reply is received on the above comments or questions. A prompt response is requested to avoid disapproval.

Should the submitted TMDL, WLA, and LA be disapproved, EPA will, in accordance with section 303(d) of the Clean Water Act, establish the TMDL, WLA, and LA for the (discharges) to the (waterbody) as defined and as determined necessary to implement the applicable water quality standard(s).

If you have any questions, or need further clarification of our comments, please contact _(name)___ on (phone number).

Sincerely yours,

____
Regional Administrator

EXAMPLE: EPA LETTER TO STATE DISAPPROVING TMDL, WLA, AND LA

Chief, Water Division
State Water Pollution Control Agency
Street, Box Number
City, State, Zip Code

Dear ________________:

We have completed our review of your response (dated) to our comments and questions (dated) regarding the TMDL, WLA, and LA submitted by your agency (dated) for the (discharges) to (waterbody). We find the TMDL, WLA, and LA not acceptable and is hereby disapproved for the following reasons:

1. ________________________________

2. ________________________________

3. ________________________________

etc.

In accordance with section 303(d) of the Clean Water Act, EPA will, within thirty (30) days from this date, establish the TMDL, WLA, and LA for (discharges) to (waterbody) necessary to implement the water quality standard(s) including consideration of seasonal variation and a margin of safety.

Sincerely yours,

____
Regional Administrator

LIST OF ACRONYMS

AT	Advanced Treatment
BAT	Best Available Technology
BCT	Best Conventional Technology
BMP	Best Management Practice
BOD_5	5-day Biochemical Oxygen Demand
BPJ	Best Professional Judgement
CCC	Criteria Continuous Concentration
CFR	Code of Federal Regulations
CMC	Criteria Maximum Concentration
CPP	Continuing Planning Process
CSO	Combined Sewer Overflow
CWA	Clean Water Act
EPA	Environmental Protection Agency
FR	Federal Register
ICS	Individual Control Strategy
LA	Load Allocation
NCMP	National Coastal and Marine Policy
NPDES	National Pollution Discharge Elimination System
NPS	Nonpoint Source
POTW	Publicly Owned Treatment Works
QA/QC	Quality Assurance/Quality Control
TMDL	Total Maximum Daily Load
TRE	Toxic Reduction Evaluation
TRI	Toxic Release Inventory
TSD	Technical Support Document
WBS	Waterbody System
WLA	Wasteload Allocation
WQMP	Water Quality Management Plan
WWTP	Wastewater Treatment Plant

SELECTED OFFICES, DIVISIONS, BRANCHES, AND SECTIONS WITHIN EPA

		General Contact Phone Number*
OW	Office of Water	382-5700
OWRS	Office of Water Regulations and Standards	382-5400
	AED Analysis and Evaluation Division	382-5389
	ITD Industrial Technology Division	382-7120
	CSD Criteria and Standards Division	382-7301
	AWPD Assessment and Watershed Protection Division	382-7040
	Monitoring Branch	382-7056
	Monitoring Management Section (TMDLs/WLAs)	
	Monitoring Analysis Section	
	Water Quality Analysis Branch	382-7046
	Information Services Section	
	Special Studies Section	
	Exposure Assessment Section	
	Nonpoint Source Control Branch	382-7085
	Clean Lakes Section	
	Nonpoint Source Control Section (BMPs/LAs)	
OMEP	Office of Marine and Estuarine Protection	382-7166
OWEP	Office of Water Enforcement and Permits	475-8488
OMPC	Office of Municipal Pollution Control	382-5850
ODW	Office of Drinking Water	382-5543
OGWP	Office of Ground Water Protection	382-7077
OWP	Office of Wetlands Protection	475-7791

* All area codes are 202.