

## **STAKEHOLDER INVOLVEMENT IN WATERSHED-BASED PERMITTING: THE PENOBSCOT RIVER EXAMPLE**

David F. Mitchell, Ph.D.  
Senior Ecologist  
ENSR  
Acton, MA 01720  
USA

Ken Gallant  
Senior Environmental Engineer  
Champion International Corp.  
Bucksport, ME 04416  
USA

### **ABSTRACT**

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Watershed-based decision-making has become increasingly important in the development of discharge permits throughout the nation. Numerous states have reorganized their water quality planning and permitting sections along watershed boundaries to coordinate data collection, facilitate analysis, and synchronize permit issuances, including development of Total Daily Maximum Loads (TMDLs) for impaired waters identified under Clean Water Act (CWA) Section 303(d). The development of a TMDL for the Penobscot River, Maine provides a good example of the challenges inherent to watershed-based planning and the need for stakeholder input. This paper highlights the activities of the Penobscot River Basin Dischargers Council (PRBDC), a private, voluntary group of industrial and municipal dischargers, during the development of the TMDL. Early involvement by PRBDC members in the Penobscot River TMDL development was important due to the wide and divergent spectrum of stakeholders in the basin. PRBDC activities included: preliminary discussions with regulatory staff, input on river sampling work plans, involvement in river and effluent discharge sampling, evaluation of sampling results, and comments on draft TMDL.

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### **INTRODUCTION**

Watershed-based planning and permitting has been gaining in prominence throughout the nation. Taking a holistic, watershed approach allows many planning and permitting activities to be integrated and coordinated, including, but not limited to, data collection and water quality surveys, permit issuance synchronization, water use determinations, wetlands and wildlife management, hydropower licensing, and implementation of agricultural best management practices (BMPs). U.S. EPA and the New England states have reorganized their water quality planning and permitting sections into river basin "teams" to coordinate data collection and synchronize permit development. This emphasis on watershed-based permitting is consistent with the previous shift of National Pollutant Discharge Elimination System (NPDES) effluent limitations from technology-based effluent limitations (TBELs) to water quality-based effluent limitations (WQBELs) (Figure 1).

CWA Section 303(d) requires states to identify waters that do not meet water quality standards, to priority rank them, and to develop total maximum daily loads (TMDLs) for these impaired waters. Failure to meet deadlines for 303(d) lists and TMDL development have led to citizen suits in over

half the states. Some of these suits were resolved in 1997, but additional notices of intent to sue have been filed in new states, thus indicating that TMDLs will be an active regulatory issue in 1998 and years to come.

In 1997, regulatory attention and TMDL development activities were focused on the Penobscot River basin of Maine. The Penobscot River is a great resource to the people and environment of Maine due to its central location, large watershed size, abundant flows, ecological resources, and aesthetic appeal. This paper describes the on-going development of a TMDL for the Penobscot River, ME and focuses on the activities of a watershed stakeholder group (i.e., PRBDC) in providing input and assistance to TMDL development.

## OVERVIEW OF TMDL PROCESS

The purpose of a TMDL is to allocate acceptable loads among different pollutant sources and/or implement appropriate control actions such that water quality standards are met throughout the receiving water, not just within a limited reach. To that end, TMDLs provide a basin-wide allocation of contaminant loads among dischargers, non-point sources, allocates reserves for growth, considers seasonal variation, and allows for a margin of safety to account for uncertainty. Conceptually, a TMDL "links the development and implementation of control actions to the attainment of water quality standards" (U.S. EPA, 1991).

U.S. EPA has developed guidance for the development of TMDLs, notably Guidance for Water Quality-based decisions: The TMDL Process (U.S. EPA, 1991) and Watershed Pollutant Trading (U.S. EPA, 1996). From these guidance documents, the following functional definitions can be derived:

**Total Maximum Daily Load (TMDL):** The sum of the individual Waste Load Allocations (WLAs) for point sources and Load Allocations (LAs) for non-point sources and natural background. A TMDL may be defined as:

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

**Loading Capacity (LC):** The maximum load that a water body can receive without exceeding water quality standards.

**Load Allocation (LA):** The portion of the loading capability of a receiving water that is attributable to non-point sources and/or natural background.

**Waste Load Allocation (WLA):** The portion of the receiving water that is allocated to existing or future point sources of pollution (e.g., discharge licenses).

**Margin of Safety (MOS):** The required component of the TMDL that accounts for the lack of knowledge about the relationship between the pollutant loading and resulting water quality (e.g., as uncertainty is reduced the MOS should be decreased).

The ease of development of a TMDL is related to the presence of adequate information (i.e., water quality data) to determine appropriate allocations. In most cases, this data is often incomplete, outdated, or missing entirely; further water quality sampling or hydrologic calculations are often required. Following implementation of the TMDL, the effectiveness of water-quality based controls is assessed as to achievement of water quality standards. If the water quality standards are achieved, no further action is required and the waterbody is removed from the Section 303(d) list. If the water quality standards are not met, further refinement of the TMDL is required until compliance is met.

## **TMDL DEVELOPMENT IN MAINE**

Like other New England states, Maine has adopted a five-year timetable to permit all discharges in the major watersheds of the state. The Maine Department of Environmental Protection (ME DEP) is the lead agency responsible for developing TMDLs in Maine with review and approval by the United States Environmental Protection Agency (U.S. EPA), New England Region. Following approval by U.S. EPA, the implementation of a TMDL occurs, including adjustments to existing NPDES licenses/permits; implementation of BMPs to non-point sources, and additional follow-up water quality monitoring.

In 1996-97, the ME DEP started data collection for development of a TMDL for the Penobscot River, one of the premiere river in Maine (i.e., recently considered for nomination as an American Heritage River). The Penobscot watershed (approximately 8,750 square miles) occupies a central location in Maine and is comprised of about 95% undeveloped land. The Penobscot also claims the largest percentage of Atlantic salmon (*Salmo salar*) returns in Maine. Despite these features, water quality concerns did exist, including: concerns about dioxin concentrations and potential effects on wildlife; identification of non-compliance waters for bacteria and dissolved oxygen; state-wide concerns about mercury bioaccumulation in fish flesh; site-specific toxicity identified in some discharges; and potential aquatic habitat limitations.

In addition, the Penobscot River has diverse interested watershed stakeholders including: the river communities, environmental activist groups, a Native American tribe (Penobscot Indian Nation), industry groups, educational entities, hunting and sportfishing enthusiasts, commercial fishermen, recreational boaters, commercial shipping, agricultural interests, as well as many licensed (i.e., permitted) industrial and municipal point dischargers. These elements set the stage for a lively and potentially contentious stakeholder involvement in the TMDL process.

The current primary source of information on water quality impairment in the Penobscot River is contained in the 1996 CWA Section 303(d) list prepared by ME DEP. The 303(d) list refers to the federally mandated identification of "water quality-limited waters" requiring TMDLs by a state. The designation of a waterbody on the 303(d) list is based on comparison with the state's water quality standards with respect to: 1) designated uses for the waterbody; 2) criteria (physical, chemical, and biological) to protect its designated uses; and 3) the state's antidegradation statement.

In the 1996 303(d) list, ME DEP identified five segments of the Penobscot River between the confluence of East and West Branches to the limit of the estuary (i.e., the 103 mile stretch of the Penobscot River between Millinocket and Bucksport) for non-attainment (ME DEP, 1996). These stretches included freshwater and estuarine waters with a mixture of Class B, Class C and Class SC designations and all identified as "priority" waters. The non-attainment water quality parameters were dissolved oxygen, dioxin, and bacteria. Figure 2 identifies the river and estuary segments which are non-attainment and the water quality parameter in question.

## **FORMATION OF THE PENOBSCOT RIVER BASIN DISCHARGERS COUNCIL (PRBDC)**

In 1997, as it became understood that ME DEP and U.S. EPA would use a watershed approach to set wastewater discharge permit limits, several point source dischargers in the Penobscot watershed felt it was important to have their interests and positions represented in a coordinated unified manner early in the TMDL development process. As a result of this desire, the Penobscot River Basin Dischargers Council (PRBDC) was formed. The PRBDC, a private voluntary group of industrial and municipal dischargers, consisted of four municipalities and five industrial point source dischargers. Formation of the PRBDC was unique in that it was the first time a formal coalition of municipal and industrial dischargers joined together to represent their common interests. Historically, each group has been represented by their respective trade organizations, such as the Maine Wastewater Control Association (MWWCA) for the municipalities, and the Maine Pulp and Paper Association (MPPA) for the forest products based industries within PRBDC.

The purpose of the PRBDC is best described by its mission statement, which states, in part:

"The mission of the Penobscot River Basin Dischargers Council is to assist its council members and applicable regulatory agencies with a review and analysis of water quality and other related data which will be used as the basis for developing discharge licenses on the Penobscot River. The Penobscot River Basin Dischargers Council will ensure that the data is accurate, representative of actual conditions, and utilized appropriately by the regulatory agencies..."

The PRBDC was organized as a two-tiered organization consisting of a three member Executive Steering Committee and general membership. The Executive Steering Committee was composed of two permanent members (representing the industrial and municipal sectors, respectively) and one revolving active member (alternated between industrial and municipal representation on a per needs basis). The revolving member concept allowed general members to participate in a short-term role in steering committee activities. ENSR, an environmental consulting firm, provided technical assistance, liaison support with regulatory agencies, communication support, and served as a central clearinghouse for the group. In addition to meeting with regulatory agencies, the Executive Steering Committee held monthly teleconferences to discuss PRBDC issues. The minutes of the meetings, as well as project progress reports, were shared with the general membership.

## **ACTIVITIES OF PRBDC**

The general activities of the PRBDC were to review and evaluate available water quality data, meet and discuss TMDL development with ME DEP and U.S. EPA; to provide input and comment on the ME DEP 1997 Penobscot River water quality assessment workplan; and to coordinate and assist with the data collection in the summer 1997 surveys. Each of the activities is described below.

### **Data Collection, Review and Evaluation**

A review of the available water quality data from available sources was made to evaluate whether sufficient evidence of impairment indicated the need for TMDL development. Data sources for the Penobscot River which were reviewed included:

- Previous Penobscot River Basin WLA Studies (ME DEP, 1987; 1991). These WLA studies used the QUAL-2E water quality model to estimate potential dissolved oxygen conditions, biological oxygen demand, algal chlorophyll, and various nutrient fractions in sub-sections of the river;
- Surface Water Ambient Toxic Monitoring (SWAT) Report/Dioxin Monitoring Program (ME DEP, 1997a). The SWAT program monitors the levels of toxic contaminants in Maine waterbodies and their fisheries through fish and lobster tissue monitoring;
- Dioxin Monitoring Program which analyzes for dioxin (i.e., 2,3,7,8-TCDD) and furan residues in fish and lobster tissues (Mower, 1996);
- Recent results from 16 biological monitoring stations located on the mainstem of the Penobscot and in portions of the West Branch used to evaluate whether toxic contaminants are causing deleterious effects through consideration of the condition of the aquatic benthic community (Davies, 1996);
- Permit Compliance System (PCS) is maintained by the ME DEP to track NPDES permit monitoring data and non-compliance with discharge permit requirements;
- USGS Water Quality Data from three surface water gaging stations in the Penobscot River basin at which historical surface water quality data have been collected (USGS, 1995); and
- Additional information sources for water quality including: water quality and fish tissue data collected by the Penobscot Indian Nation (PIN); Federal Energy Regulatory Commission (FERC) environmental impact reports for the Upper Penobscot River Basin; Endangered species information; New England Interstate Water Pollution Control Commission (NEIWPC); and NPDES permit-specific data and reports.

Data from each of these sources was reviewed and assessed as to its data quality and relevance for the TMDL process for the Penobscot. This was done for the water quality parameters which were identified as sources of non-attainment by the 1996 303(d) list (i.e., dissolved oxygen, bacteria, and dioxin) and for other water quality parameters to determine if TMDL development was appropriate for these parameters. Figure 3 provides a summary of this evaluation. Details on each of the water quality parameters is given below.

Dissolved oxygen. Dissolved oxygen (DO) is a primary concern in various stretches of the Penobscot River. Previous WLA models indicate that under certain low flow situations, DO levels may not meet classification standards. Thus, it is these modeling results, rather than discrete field observations, which are the basis for the concern.

The recent data review indicated a limited number of field observations to compare with these modeling results. The limited data collected by ME DEP in early September 1996 and USGS in 1993-94 indicate that DO was generally above Class B standards (i.e., 6.5 mg/l). However, evaluation of field data is often complicated by the location, timing, and temperature of the sampled water, such that the utility of any single measurement is limited. In summary, there was sufficient evidence to warrant concern about DO in the Penobscot River due to the WLA studies. These limited field observations were neither sufficient to confirm or reject this concern, since they were not taken in locations and at times when oxygen minima would be expected. The development of a TMDL to address this issue is appropriate due to the combination of point dischargers, non-point sources, and natural factors which can influence DO dynamics in the river.

Bacteria. The 1996 303(d) list identifies bacteria as a cause of non-attainment in two freshwater segments (231R; 234R) and one estuarine area (235M) in the Penobscot River and one segment of the Piscataquis River (219R). The proximate causes of non-attainment was identified by ME DEP as due to untreated wastewater from combined sewer overflow (CSOs) in Lincoln, the Brewer/Bangor area, and Dover Foxcroft. The decision to list these stretches as non-attainment was based on water quality sampling, knowledge of the CSOs, and best professional judgment (P. Mitnick, pers. com.). The CSOs in Brewer and Bangor are among over 30 communities statewide which will require significant engineering solutions for control or abatement. ME DEP estimated the statewide effort will take 15 years and cost \$250-300 million. Accordingly, there is no need for a TMDL to address this issue since the causes of non-attainment have been well documented and the implementation of infrastructural/engineering improvement should be sufficient to cause attainment.

Dioxin. Dioxin was identified as a candidate for TMDL development based on the results of previous fish biomonitoring studies on the Penobscot. Fish tissue concentrations measured in 1995 exceeded Maine Bureau of Health's recommended maximum acceptable concentration (MAC), although trends in the dioxin data indicate declining dioxin concentrations with time. In addition, concentrations of dioxin (and dioxin toxic equivalents (DTE)) in fish and lobster tissues from the Penobscot were low relative to other Maine rivers, including reference rivers.

Decreases in point source dioxin loadings to the Penobscot are also expected due to current and future technological and regulatory changes. In 1997, U.S. EPA (New England Region) issued the most stringent dioxin permit limits ever imposed in New England to a pulp and paper facility. Further, planned changes in bleaching technology to minimize dioxin production will be phased in at both identified dioxin point source discharge facilities on the Penobscot River. Continued regulation of dioxin point source discharges through NPDES licenses, technological process changes to reduce dioxin, and continued fish tissue monitoring are the most feasible methods for controlling and monitoring dioxin loadings to the Penobscot. For all of these reasons, no dioxin-specific TMDL is necessary for the Penobscot River.

Other parameters. In addition to the listed 303(d) parameters, other water quality issues were identified that have the potential to require a TMDL to address them. One of the water quality issues which emerged as a potential TMDL concern for the Penobscot River is nutrients, more specifically, nitrogen and phosphorus. There have been observations of algal blooms and poor water visibility reported in the impoundments along the Penobscot River (PIN, 1996). Nutrients and resulting algal blooms represent a potential future issue for the Penobscot River. To address this issue, the results of the 1997 ME DEP WLA sampling and an independent PIN sampling program specifically targeted at nutrients was to be evaluated for consideration of developing a TMDL for nutrients. A TMDL is often appropriate for watershed-based decision-making due to the large variety of point and non-point sources of nutrients.

In addition to dioxin, several other toxics of potential concern for Penobscot River water quality were identified by the data review. These constituents include five metals (chromium, lead, mercury, selenium, and zinc) identified from data from the SWAT and PCS programs. Further evaluation indicated that none of these parameters are likely to pose a significant water quality concern in the Penobscot and, thus, inclusion of these metals in TMDL development was not warranted.

In summary, the data review and evaluation indicated that of the 303(d) list parameters only dissolved oxygen was of potential concern and appropriate for a TMDL. This TMDL development was to be supported by verification of the present WLA and application of other factors. The nutrient issue will need further evaluation of 1997 results before development of a TMDL is warranted.

### **Meetings with Regulatory Agencies**

Throughout 1997, there were several meetings of PRBDC representatives with ME DEP and U.S. EPA. The purpose of these meetings were to: (1) assess what existing water quality data was available and how it would be used in TMDL development; (2) to determine what data would be obtained as part of the summer 1997 water quality surveys; and (3) to participate in the planning and implementation of the 1997 Penobscot River sampling plan. Participation of PRBDC and the Penobscot Indian Nation (PIN) was crucial in ensuring that sufficient equipment and manpower was available to carry out the Penobscot River water quality sampling events.

### **1997 Penobscot River Workplan**

As part of the development of a TMDL for the Penobscot River, ME DEP needed to update (i.e., verify) the existing WLA study to account for current river flow and license discharge conditions. In the planning process for the summer 1997 data collection (and at the request of PRBDC), ME DEP developed a draft Penobscot River Basin Workplan in January 1997 to describe and document the effort. The draft Workplan was reviewed by PRBDC, who provided comments to the ME DEP at meetings held in February and March 1997 and provided written comments in April 1997. A revised final Work Plan was issued by ME DEP in May 1997.

The basic elements of the final Penobscot River Basin Work Plan were as follows (ME DEP, 1997b). To support the WLA model, a series of 6 one-day survey and 1 three-day survey were planned for the Penobscot River. A total of 30 river stations, ten tributary stations, and 15 effluent discharges were to be sampled. The one-day surveys monitored DO, temperature, and salinity (and chlorophyll *a* as needed). The three-day survey parameters sampled included DO, temperature, salinity, nutrients (nitrogen and phosphorus fractions), chlorophyll *a*, and secchi disk depth (in pools). In addition, 24-hour, composite effluent samples were collected from the dischargers to be measured for BOD<sub>u</sub>.

To avoid assessment of the river water quality under inappropriate flow conditions, a low flow "trigger" threshold of flows below 8000 cfs (as measured at was established for the one-day survey and less than 5600 cfs. These minimum flow values were required to initiate the sampling notification (see below).

The Workplan also contained an explicit chain of command and notification of regulatory agencies and stakeholders (i.e., ME DEP, U.S. EPA, PRBDC, PIN), Bangor Hydro, and Great Northern Paper); a schedule of planned and alternate survey dates; a roster of survey personnel (participants include ME DEP, U.S. EPA, PIN, the University of Maine, and staff contributed by PRBDC members); quality assurance and quality control (QA/QC) provisions; and appended standard operating procedures for laboratory analyses and field procedures (ME DEP, 1997b).

A stakeholder meeting to review the final Penobscot River Basin Workplan was held by ME DEP in Bangor on May 20, 1997. In addition, a field reconnaissance of the Penobscot River and Piscataquis River (a major tributary of the Penobscot) to identify sampling locations and facilitate survey coordination was held on May 21-22, 1997.

During summer 1997, the ME DEP and U.S. EPA, with the assistance of PRBDC, PIN, and other watershed stakeholders, conducted successful water quality assessment surveys of the Penobscot River. Low flow trigger thresholds were achieved and data collection efforts went smoothly. The level of detail included in the workplan and the significant contributions of the stakeholders were important factors in the success of the sampling program.

## **SUMMARY AND LESSONS LEARNED**



At an early stage, the individual dischargers on the Penobscot River realized that it would be beneficial to participate in the TMDL development process in order to have an opportunity to review available water quality data and to assess its potential relevance to the TMDL development process. Furthermore, they recognized that there was strength in numbers. Data review activities and meetings with the regulatory agencies successfully concluded with active recognition and involvement of the PRBDC as a major stakeholder in the Penobscot River basin. Participation by PRBDC allowed for input into development of the sampling and analytical workplan, helping promote good science, quality control, and quality assurance. Involvement of the PRBDC and other watershed stakeholders with the ME DEP and the summer sampling program was considered a "win-win" situation for both dischargers and state staff.

The data collection and evaluation activities indicated that the current ME DEP approach for developing a TMDL incorporates good science in watershed-based decision-making. The application of the resultant Penobscot River WLA is likely to provide a basis for a scientifically defensible TMDL for DO, provided that other TMDL components (e.g., MOS) are explicitly addressed. The existing WLA suggested that there is limited assimilative capacity for BOD in some stretches of the Penobscot River. These could become an issue if a large MOS or reserves for growth are included. Bacteria and dioxin, the other 303(d) identified water quality parameters will be better addressed through existing or planned control technology. The available water quality database does not indicate other toxic parameters to be problematic. The PIN nutrient and algal survey being independently conducted may lead to concerns regarding nutrients and possible eutrophication.

In the case of watershed permitting, formation of a watershed-specific group such as PRBDC has been effective because the PRBDC was able to focus on Penobscot River issues only. As a result, efforts were more site-specific and concentrated which enabled the PRBDC to participate in the development of the watershed-based permitting in a more effective and influential manner.

Members of the PRBDC agree that their involvement was a worthwhile venture. The PRBDC played a key role in the 1997 water quality assessment. It allowed an opportunity to work directly with regulators and other watershed stakeholder groups (e.g., Penobscot Indian Nation) in developing and implementing a watershed sampling workplan. It allowed an opportunity for PRBDC members to better understand the permitting process and how water quality information is used to determine waste load allocations and TMDL on specific watersheds. As a result of the involvement, the PRBDC's primary goal to ensure that the data gathered was accurate, representative of actual conditions, and appropriately used by the regulatory agencies had a much greater chance for success. Potential future PRBDC activities include review of the summer sampling results and future application of that data into a revised Penobscot WLA and development of the Penobscot River Basin TMDL.

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