Impact of TMDLs on Indiana's Surface Water Quality Monitoring Program *

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A Watershed Approach

Indiana has employed a watershed approach to surface water quality monitoring since 1995 when the current strategy was developed. In 1998, the strategy was revised due to staffing shortfalls, a priority to eliminate NPDES (National Pollutant Discharge Elimination System) permit backlog, initiation of the TMDL (Total Maximum Daily Load) program, and source water protection considerations.

The State's current monitoring strategy features rotating basin monitoring with probabilistic sampling and ambient monitoring at 160 fixed stations. A combination of these approaches offers the best means for making statistically valid assumptions in reporting water quality trends for a watershed or a river basin. Figure 1 shows the geographical location of the major river basins in the State along with the year of intensive field observation. Figure 2 depicts/displays locations of the 160 fixed stations that are monitored monthly. The primary purpose of our monitoring strategy is to ensure that we are able to fulfill the basic federal requirements of the 305(b) water quality report. It is also probably the most efficient way of administering a state's surface water quality monitoring program, given the constraints.

More Resources Needed to Fill the Gap

Indiana's surface water quality monitoring (SWQM) program is not currently able to specifically identify all water quality impairments and loss of designated uses in the State. In 1996, the Indiana Department of Environmental Management (IDEM) shifted from monitoring only for problems where point sources are involved. At the heart of its SWQM program is watershed or probabilistic sampling, using a 5-year rotating basin approach plus an expanded monthly fixed station program, which closely matches source water protection for drinking water supplies. For identified stream pollution problems, a special investigation team identifies pollutant sources. IDEM believes that for any given year we can characterize the quality of no more than about one-fifth of all State waters with this approach. To cover the rest of the State's waters, we would need more resources to fill this gap.

IDEM collects hundreds of water samples each year and analyzes them for a standard suite of conventional parameters. At contract laboratories, samples are analyzed/tested for nutrients, metals, inorganic elements, and cyanide. Special sampling is conducted for pesticides and bacteria *(E. coli)*. Where possible, IDEM collects samples near USGS gauging stations, where flow data are recorded. [Recently, financial assistance has been requested to keep USGS flow monitoring stations active.] In addition, IDEM collects monitoring data on fish communities, stream sediment, benthic macro invertebrate communities and habitat by watershed.

IDEM uses nearly all available data, including monitored, evaluated, and quality-checked chemical, physical, biological, bioassessment, habitat quality evaluation, point source loading, drinking water supply, relevant diagnostic consultant reports, and special studies. Except for volunteer data, IDEM uses an increasing amount of data/information from a variety of federal agencies, other state departments, an interstate compact (ORSANCO - Ohio River Valley Water Sanitation Commission), local governmental units, academia, and data from the NPDES dischargers. Volunteer monitoring data are challenging to use due to a variety of sources, consistency in testing, and verification of data quality.

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Total Maximum Daily Load - Defined

A Total Maximum Daily Load (TMDL) describes the amount of a pollutant that a waterbody can assimilate and still meet water quality standards for its intended uses. In general, TMDLs are developed by analyzing the pollutants and sources of those pollutants causing a water quality violation and determining how much the pollutants need to be reduced to achieve water quality standards for the impaired waterbody. The pollutants may come from point sources or nonpoint sources. Point sources are regulated by the National Pollutant Discharge Elimination System (NPDES) and are usually municipal or industrial wastewater treatment plants. Examples of nonpoint sources are runoff from pavement surfaces, construction sites, crop lands, confined livestock feeding, forestry and mining operations, and failing septic systems. The TMDL process allocates the amount of pollutant allowed from point and nonpoint sources and assures that water quality standards will not be violated once the recommended TMDL project is successfully implemented.

TMDLs - A Driving Force

The new TMDL program has been the driving force to more fully document the causes and sources associated with impaired and threatened waters. From our early experience, it is apparent that there are not enough data routinely gathered to support and develop a TMDL for an impaired waterbody. This, of course, means that additional field data – more than usual – will need to be collected in order to develop a TMDL.

TMDLs are extremely comprehensive, far-reaching, and will become a major component in water quality assessment and watershed management in the future. TMDLs main thrust will be to more clearly identify and define nonpoint sources of water pollution. They will signal a significant shift from historic point source focus to a watershed restoration approach.

IDEM identified 208 impaired waterbodies with 378 parameters in its 303(d) listing for 1998. This list contains 18 different types of impairments. Fish consumption advisories, impaired biotic communities, bacteria *(E. coli),* dissolved oxygen/ammonia, cyanide, metals, and pesticides are the most common causes for water quality impairments. Preliminary cost estimates for planning, pre-survey, collecting primary field data, modeling, and calculating the TMDLs will range from $2.0 million to $2.5 million per year for the next 15 years. This estimate does not include the implementation phase which is estimated to run about a third of this annual TMDL developmental cost. Thus, the TMDL workload for Indiana is formidable -- developing one TMDL every other week for the next 15 years.

TMDLs - A Multi-million Dollar Program

Table 1 shows data/information that was obtained through an informal survey conducted last fall among the six Great Lake States in US EPA Region 5. It discloses that the average number of impaired waterbodies per state for the region is 465, with an average of 31 TMDLs to be performed per year per state over the next 15 years. That's an estimated total of about 2,800 TMDLs - a rather significant number of water quality plans to improve the Great Lakes Basin water environment! Most states do not have adequate data to develop TMDLs addressing nonpoint sources. Four of the six states have private contractors assisting in planning and preparing TMDLs. Already, three of the six states have submitted at least one TMDL to the US EPA Chicago regional office for review. In 2000, all six states are planning to submit one or more TMDLs for US EPA review and approval. Cost estimates to plan and prepare a TMDL vary considerably - - from $10,000 to $2,500,000 - - depending on parameters, complexity, location, experience, and process of implementation. However, the average amount is estimated at $100,000 per TMDL, excluding implementation phase. And finally, the long term impact of the TMDL program will definitely change the way states administer their water quality monitoring programs.

Table 1. TMDL Survey of Great Lake States in US EPA Region 5, Fall 1999

***Average number of impaired waterbodies per state**	**465**
***Number of TMDLs to be performed per state per year**	**31**
***Average staff size assigned to TMDL program**	**4.3**
***Number of states that have hired contractors**	**4**
***Number of states that completed a TMDL in 1999**	**3**
***Number of states that will submit a TMDL in 2000**	**6**
***Estimated cost of developing a TMDL**	**$100,000**

***Region 5 states have asked US EPA to play a leadership role in establishing mercury TMDLs due primarily to the source of pollution, which is methyl mercury from air deposition (a regional legacy problem).** [See Appendix A.]

Futuristic Assumptions

Based on existing information, the direction headed and known elements in IDEM's future water quality monitoring program, the following is assumed :

1) Indiana's TMDL list of impaired waters will expand - - i.e., increase from the current number of 208 - - during future listing cycles;

2) IDEM will be given essential resources to build on current SWQM program and add to it systematically, enabling successful establishment and subsequent implementation of the TMDL program;

3) IDEM will not approach US EPA to request backstop on any TMDLs in Indiana, i.e. IDEM expects to handle the anticipated workload without direct federal assistance (excluding grants); and

4) Indiana's TMDL program will not be subject to any active litigation.

Significant changes in Indiana's surface water quality monitoring program are now being planned and implemented that will aid and assist the TMDL program in several ways. For example, the number of watershed monitoring (probabilistic) sites will be reduced annually by 40 percent, which would have minimal impact on the statistical strength for a given parameter under normal distribution. This reduction translates to added time on source identification, which indirectly aids the front-end of a TMDL investigation. A special investigation team (2 FTE) has trained the new TMDL team; it will continue to assist in pollutant source identification; and it will probe into causes of unknown contamination. The SWQM program will be strengthened with greater focus/attention to nonpoint sources of pollution. Closer scrutiny of nonpoint sources of pollution would assist and discern the primary influence of ambient, natural background pollution. And, an eventual shift of allocable resources from less intensive aspects of monitoring to the TMDL program must be considered.

Perspectives for the Early 2000 Years

Because of the highly probable (and likely) assumption that the number of impaired surface waters of the state will be expanded as they are identified through the monitoring program, the TMDL program will become a permanent program – not one that has a life span of 15 years. In formulating the TMDL program, US EPA appears to have led us to believe that all this country's presently impaired surface waters - - there are an estimated 20,000 TMDLs nationwide - - will meet current water quality standards by 2015, and furthermore that all threatened waters will not be degraded to the impaired class. The proposed TMDL Rule imposes the unrealistic requirement that states collectively develop and send to US EPA three TMDLs every workday for the next 15 years to address the nation's 20,000 impaired waters. To seriously consider this notion, one only needs to look back at the Clean Water Act (signed into federal law in 1972) with the promise to everyone that all the nation's surface waters would be safe for full body recreational contact in 15 short years. Now, here we are some 28 years later. But are we? Yes, we have made tremendous strides in cleaning our country's waterways, with great energy and drive to issue NPDES discharge permits for all point sources

but still are woefully short in being able to allow everyone to fish, swim or boat safely in all waters. It will take time – many years for most of the best management practices to become fully effective – to erase nonpoint source pollution and at a huge financial cost....$2 billion based on existing estimates and not counting additional or new TMDLs that will be added to impairment lists or the full, long term cost of implementation.

Under the TMDL and watershed priority, US EPA proposes to provide funds in excess of $100 million in grants to states to create and implement watershed restoration action strategies (WRAS). The WRAS will give states flexibility to employ an adaptive restoration approach in addressing water quality problems on a watershed basis, and can include TMDLs, controls on non-point sources, and habitat restoration and improvement activities. Additionally, US EPA is proposing to offer up an estimated $45 million to states to begin TMDL activities as well as make available about $50 million in Section 319 funds for nonpoint source projects. These amounts (about $195 million) are an important start, but considerably short to make a difference in improving the Nation's impaired waterbodies when considering it cost well over $100 billion in public funds just to bring this country's municipal wastewater treatment facilities up to secondary treatment standards.

The use of volunteers to assist the state agency in obtaining quality data needs to be developed since the state's resources are limited. This underutilized resource would greatly increase the capacity to monitor more of the state's waters each year as well as fill in many data gaps. After this year, when we complete the first iteration of the rotating basin cycle, plans will be directed to enhance the volunteer monitoring program.

Probably the most significant factor affecting the TMDL program is the implementation phase, which could take several years to determine the effectiveness of recommended actions. Implementation is the key to success or failure of the TMDL program. Good planning, stellar field data, outstanding models, creditable load and wasteload allocations, and applicable recommendations are essential in TMDL development process but unless stakeholders at all levels are convinced of the need to make changes, the TMDL program is for naught – a chasing after the wind. Commitments and reasonable assurances from those who have a tangible stake in positive, physical features of the watershed must be obtained and lasting for success in the TMDL program.

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