

CHAPTER SEVEN SURVEILLANCE AND MONITORING PROGRAM

I. Introduction

Surveillance and monitoring leads to the development of specific studies conducted to track and evaluate the successes or failures of remedial actions and goals. Specifically, monitoring will incorporate the use of environmental indicators. Indicators are developed to track an increase or decrease in environmental quality. This type of analysis, as indicated above, will allow the evaluation of remedial actions. A positive evaluation or an improvement in environmental quality will be a tool useful in restoring impaired beneficial uses. An example of the use of surveillance and monitoring and the use of environmental indicators is macrobenthic community analysis. The IDEM Office of Water Management collects samples of the macrobenthic community from six locations on the Grand Calumet River and Indiana Harbor Ship Canal. This monitoring will provide important data to assess the quality of the environment. The results of the monitoring will be converted to an Invertebrate Community Index score or ICI. These scores relate to the overall quality of the environment where the macrobenthic organisms were collected. To restore this specific impaired beneficial use, stakeholders may determine an acceptable prescribed for this aquatic system, and when that score is achieved, delisting could occur.

IDEM staff, in conjunction with interested stakeholders, are currently developing surveillance and monitoring strategies for each of the fourteen impaired beneficial uses. These strategies will be designed to measure the quality of the environment, and when the appropriate endpoints have been established, will lead to restoration of the impaired beneficial uses.

II. The Impaired Beneficial Uses

This document describes several studies necessary to complete identification of use impairments, description of causes, and quantification of sources. The purpose of this section is to develop a surveillance and monitoring program to assess the impaired beneficial uses and keep track of progress toward delisting. Because ecosystems do not recognize the artificial boundaries of the various programs within IDEM, the Remedial Action Plan Coordinating Committee decided to evaluate each impaired use individually.

The IDEM Office of Water Management (OWM) has committed to biennial monitoring of sediment contaminants at six locations on the Grand Calumet River and Indiana Harbor Ship Canal. The locations include Bridge St., Cline Ave., Kennedy Ave., Indianapolis Blvd., Sohl Ave., and at the Dickey Road bridge over the Indiana Harbor Ship Canal. The monitoring effort will provide important data to assess long term trends of the sediment contaminant levels in the Grand Calumet River and Indiana Harbor Ship Canal. It will also aid in evaluating the successes and/or failures of remediation actions and goals. Results of the samples collected in 1996 have

not been finalized.

i. Restrictions on Fish and Wildlife Consumption

When fish tissue analyses show that contaminants no longer exist at levels so as to cause a fish consumption advisory, the impaired use will be restored. This beneficial use impairment is based on the Indiana State Department of Health's annual Indiana Fish Consumption Advisory.

ii. Tainting of Fish and Wildlife Flavor

IDEM has committed to performing a statewide survey to monitor tainting of fish flavor. As a result of the Great Lakes Initiative, Northwest Indiana will be a focal point of the survey. IDEM is currently drafting a proposal for this study. Additionally, CARE's habitat subcommittee is devising a study to monitor wildlife flavor. Both phenolics and low oxygen affect the taste of fish and wildlife. Other compounds in Northwest Indiana may also taint fish and wildlife flavor.

iii. Degraded Fish and Wildlife Populations

Establishment of a monitoring program to assess change and improvement in populations of fish and wildlife species in the Area of Concern will depend on the establishment of a baseline condition of these populations. Sufficient data on fish populations may exist for the establishment of baseline conditions; however, these data have not been collected in a manner specifically designed for delisting purposes. Current monitoring programs should be modified or new programs developed that allow collection of data necessary to measure changes in specific fish populations. Such a monitoring program should provide a measure of all species present and allow for detailed enumeration of population structure and size for a small number of indicator species (species from each trophic level of the fish community should be included in this monitoring effort). After standardized methods of monitoring have been instituted and the baseline population conditions established, monitoring should be conducted at least once every five years. Delisting should be based on community goals established by the Great Lakes Fishery Commission (1995).

No evaluation of wildlife populations in the Area of Concern is currently available that would provide a baseline upon which to evaluate delisting for this impaired beneficial use. Some basic surveys of wildlife populations have been completed on select areas or sites within the Area of Concern (see TAMS, 1991; ___) but relatively little detailed information exists on wildlife populations. Data gaps identified in Chapter Six if adequately addressed should provide the foundation upon which wildlife population monitoring programs could be established. Populations that have been and are continuing

to be impacted by the decrease of and degraded condition of existing habitat. Delisting guidelines require environmental conditions which support healthy, self-sustaining communities of desired fish and wildlife at predetermined levels of abundance that would be expected from the amount and quality of suitable physical, chemical and biological habitat present in the Area of Concern. Surveys identifying the amount and quality of habitat needs to be completed prior to establishment of monitoring programs for wildlife populations. Monitoring programs should be designed such that indicators for all major classes of aquatic and terrestrial wildlife are included.

iv Fish Tumors or Other Deformities

Additional fish community surveys may be used to monitor for this impaired use. Fish community samples are collected using standard electrofishing techniques. All fish are identified to species, weighed to nearest grams, measured to nearest millimeters and checked for the presence of external anomalies. External anomalies are categorized by the acronym DELT (deformities, eroded fins, lesions, and tumors). Deformities can affect the head, spinal vertebrae, fins, and stomach shape; eroded fins are a necrosis of the tissue; lesions and ulcers appear as open sores or exposed tissue; tumors are the loss of carefully regulated cellular proliferative growth in the tissue, generally referred to as neoplasia. A virus, bacteria, parasite or exposure to toxic chemicals or the combination can cause anomalies (OEPA 1987). Anomalies that are not included with DELT anomalies are recorded as "other" (such as swirled scales and Popeye disease). "A high frequency of DELT anomalies is a good indication of poorly treated effluents, intermittent stresses, and chemically contaminated substrates."(OEPA 1987).

v. Bird or Animal Deformities or Reproductive Problems

Delisting of this impaired beneficial use can occur when incident rates of deformities or reproductive problems in sentinel wildlife species do not exceed background levels in inland control populations. Establishment of a monitoring program to determine when delisting objectives have been met will require monitoring of indicators on the Grand Calumet River or Indiana Harbor as well as similar populations at some inland location. Species selected for this type of monitoring must be relatively common and easily obtained from the areas selected for monitoring. Nesting birds should be utilized as a surrogate for other classes of wildlife in the Area of Concern, unless future problems are identified in small mammals and /or amphibians. Development of a monitoring program using Early Embryo Assay (Henshel, et. al., submitted for publication, 1997) on colony nesting birds could be an effective method of determining delisting of this impaired beneficial use in the Area of Concern.

vi. Degradation of the Benthos

At each sample location benthic community analysis and sediment toxicity tests will be performed. These tests have been tentatively planned to be performed at two year intervals. Unless there are scientific reasons to add or subtract sites, the same locations will be used for the life of the Remedial Action Plan. Results will be compiled, compared, and published in some form of periodical. The cost for this study is dependant on the number of sampling points. A detailed sampling plan will be developed in the near future.

vii. Restrictions on Dredging Activities

Monitoring stations have been chosen (Figure xv). Every two years (tentative) IDEM will collect grab samples at each monitoring station and analyze them for PCB's, PAH's, metals, and other pollutants from the Inland Dredged Materials Guidance. Before dredged sediments can be open-lake disposed, these sediments are evaluated based on the Inland Testing Manual (ITM). The ITM is a tiered approach to determine whether dredged material can be discharged into CWA Section 404 waters.

viii. Eutrophication or Undesirable Algae

IDEM's OWM Biological Studies section will examine the nutrients associated with eutrophication, such as phosphates and nitrates.

ix. Restrictions on Drinking Water Consumption or Taste and Odor Problems

The IDEM's OWM Drinking Water branch evaluates all monitoring data collected by public water systems for compliance with standards. No requirements for additional treatment have been issued. Additionally, water samples should be taken regularly to detect contaminant levels below water quality standards. IDEM is currently developing rules for ground water standards.

x. Beach Closings

The National Park Service and local health agencies monitor coliform levels in Lake Michigan beaches. Swimmers exposed to elevated levels of bacteria and coincidental pathogens risk skin, ear, and intestinal infections. Therefore, pursuant to 327 IAC 2-1-6, the criteria Indiana uses to evaluate full body contact for recreational uses is as follows: *E. coli* concentrations shall not exceed 125 cells per 100 ml of water as a geometric mean based on not less than five (5) samples equally spaced over a thirty day period, nor exceed 235 cells per 100 ml of water in any one (1) sample. There are many uncertainties associated with determination of *E. coli* sources. Preliminary studies

associate high *E. coli* concentrations with heavy rainfall and wind direction, but data are not sufficient to confirm this association. Scientists do not understand how extensively tributaries transport *E. coli* to Lake Michigan.

The Inter-agency Technical Task Force on *E. coli*, consisting of technical experts from local, state, and federal agencies, has come together to develop an implementation strategy that addresses causes and solutions to *E. coli* contamination. The Task Force will develop methods of data collection, a real-time forecasting system identification of the sources and fate of bacteria and a systemic program of remediation to address this issue.

xi. Degradation of Aesthetics

Unightly or Objectionable deposits are common in the Grand Calumet River. They can be placed in three categories:

1. General refuse or debris. Shopping carts, automobile rims, and many other items have been discarded in the river and can be seen from the banks;
2. Sediment Islands. Discharge practices at the Hammond Sanitary District caused the formation of a sediment "island" in the Grand Calumet River on the west side of Columbia Avenue; and
3. Sediment Consistency. Sediment samples taken from the Grand Calumet River and Indiana Harbor Ship Canal have been referred to as "driveway sealer" because of their tar like appearance.

Prior to each report cycle, IDEM staff will traverse the river to determine if unsightly or objectionable deposits are visible. If so, photographs will be taken and published in the reporting document. Photographs will also be taken of sediment samples. These will also be published in the reporting document.

xii. Added Cost to Agriculture or Industry

The U. S. Army Corps of Engineers routinely assesses the navigability of the Indiana Harbor and Canal. These assessments are public information. The assessments will be published in periodic reporting documents.

xiii. Degradation of Phytoplankton or Zooplankton Populations

Regular phytoplankton / zooplankton samples should be taken to restore this impaired beneficial use.

xiv. Loss of Fish and Wildlife Habitat

This impaired beneficial use can be restored when the amount and quality of physical, chemical and biological habitat required to meet fish and wildlife management goals have been achieved and protected. A detailed inventory of habitats within the Area of Concern needs to be completed and then surveyed every three to five years to determine status of protection and/or restoration. These surveys should be conducted such that suitability for feeding, nesting and cover of resident and migratory birds, mammals, reptiles and amphibians can be determined. A Floristic Quality Index (Swink and Wilhelm, 1994) should be completed on areas being restored to native plant species. Stream habitat should be evaluated every three to five years after remediation/restoration activities. Ohio's Biological Criteria for the Protection of Aquatic Life (1987) or US EPA Remedial Action Plan and Bioassessment Protocols for Use in Streams and Rivers (1989) should be utilized to monitor stream habitat improvements.

III. Environmental Indicators

Most measurements can be tied to compliance monitoring activities or to specific incidents in which compliance enforcement resulted or was avoided. As we move forward, those mechanisms will continue to be used and translated into environmental indicators to measure progress. To develop environmental indicators, IDEM is developing a new program to improve the quality and reliability of data received by the agency and coordinate the information with our compliance monitoring efforts. Major efforts on developing environmental indicators will be made this year.

The Environmental Performance Partnership Agreement allows IDEM to use performance measures as the tools to assess the agency's progress toward achieving its goals and objectives. Administrative Indicators and Environmental Indicators will be used as these performance measures. Administrative Indicators are used to measure management responses that trigger or correct environmental problems. In the Partnership Agreement, Environmental Indicators are used to measure environmental stresses or conditions showing progress toward achieving environmental strategic priorities, goals, and objectives.

IV. Mapping

An increasing number of state agencies and other individuals throughout Indiana are utilizing the GPS to record and accurately locate sampling points, boundaries, and data collection points. This new technology will enhance locating major spills, etc. and accurately identifying these points on maps. The GPS will allow for quicker map making through the use of the GIS by allowing for more accurate and reproducible maps of the area.

V. Conclusion

IDEM staff are currently developing surveillance and monitoring strategies for each of the fourteen (14) impaired beneficial uses. These strategies are designed to restore these uses by identifying use impairments, describing causes, and quantifying sources. This chapter evaluated the impaired beneficial uses individually and IDEM staff will follow suit for the initial development of each surveillance and monitoring strategy. An update of continuing work in monitoring and indicators will be provided in a biennial report to be submitted to the International Joint Commission by IDEM and the CARE Committee. When there is apparent overlap within the agency or other agencies, then those uses will be addressed together.

The Environmental Performance Partnership Agreement document will aid in the delisting of these impaired beneficial uses by the creation of the environmental indicators. Some of these indicators will be the building blocks for which surveillance and monitoring strategies are established and/or revised. Each strategy may address just one or many impaired beneficial uses that can lead to the delisting of each beneficial use.

The studies that have been described in this chapter have the commitment of various agencies within the state and federal government to address and restore these beneficial uses. The administrative indicators will be the check and balance step for revising an environmental indicator whenever necessary. In turn, this will lead to the modification and reevaluation of a particular strategy.