Ohio 5-Year Surface Water Monitoring Strategy, 1982 - 1986

Ohio Environmental Protection Agency
Office of Wastewater Pollution Control
Division of Surveillance and Standards

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CONTENTS [a]

[a] Sections marked with * have been omitted or included in draft form.

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PREFACE

The Ohio EPA has reviewed surface water monitoring activities in Ohio with the goal of establishing a methodology for the design and management of these activities so that maximum information is obtained per unit effort. That basic goal has been met as evidenced by this document (see Part 2.3). We have begun to implement the methodology in two steps, first, the identification of information needs, and secondly, the design of monitoring networks to meet those needs. The majority of this document, the 5-year Monitoring Strategy, defines the data needs of surface water programs within Ohio EPA.

The impetus to develop this document can be traced to the experience of writing the 1980 Water Quality Inventory Report for Ohio (305(b) report). We learned through that experience that a wealth of water quality data is being collected, but the utility of the data is greatly impeded by the absence of a well-defined strategy for transforming the data into information that is meaningful to decision makers. Preliminary work on the Monitoring Strategy began in September 1980 and in February 1981 the first draft was distributed and reviewed by the Ohio EPA and U.S. EPA. The draft Monitoring Strategy was instrumental in developing the Monitoring Activities List and Program for FY 1982.

We had hoped to complete a comprehensive document for the initial Ohio 5-year Monitoring Strategy, but unfortunately some sections of the Monitoring Strategy for FY '82 - '86 had to be omitted, or left in draft form [a]. The completeness of the Monitoring Strategy is expected to improve as program managers recognize and appreciate that a small investment of their time spent in developing and/or refining the 5-year Monitoring Strategy will result in substantial improvements in the overall efficiency of their respective programs. It is hoped that releasing the Monitoring Strategy in its present form will spur the involvement of staff from other key water quality programs.

This document will be revised beginning in November 1981 and the Ohio 5-year Surface Water Monitoring Strategy, 1983 - 1987 will be completed by January 15, 1981. Thereafter, the 5-year Monitoring Strategy will be updated annually to reflect changes in information needs and the resources available to meet those needs. The details of surface water quality monitoring activities in Ohio for each federal fiscal year (i.e., 10/1 to 9/30) will continue to be described in an annual document entitled Ohio Water Quality and Pollutant Source Montoring Program.

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[a] An explaination of the status of an incomplete section is given within notation marks (! ... !).

PART 1

THE RELATIONSHIP BETWEEN MONITORING AND WATER QUALITY MANAGEMENT

1.1 Introduction

Environmental monitoring is an important step in the management and protection of natural resources. Ideally, monitoring is the activity that "drives" the progression of events from problem identification and assessment, through management decisions on such issues as pollution abatement programs, and finally to the enforcement of environmental regulations. A succession of federal laws and guidelines have attempted to relate the purpose of water quality monitoring directly to management goals (Ward 1979). Initial guidelines for coordinating water data acquisition activities were issued by the U.S. Bureau of the Budget in 1964. Next, the Federal Water Quality Act of 1965 (P.L. 89-234) created or reorganized state and local agencies which resulted in more systematic water quality monitoring programs (Ward 1979). Water quality standards were established as a result of PL 89-234, and monitoring was oriented towards the assessment of in-stream conditions and the detection of water quality standard violations (Loftis and Ward 1979). The Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) introduced effluent standards to water quality management programs, and effluent monitoring was added to the activities of regulatory agencies. The U.S. Environmental Protection Agency (U.S. EPA) has issued guidelines for monitoring programs in Model State Water Monitoring Program (U.S. EPA 1975) and Basic Water Monitoring Program (U.S. EPA 1977).

Today, for a variety of reasons, it is apparent that there is a large and growing need for precise analytical methodology in the design and management of data gathering networks (Moss et al. 1978). The primary reason is the decreasing marginal utility of the data. In other words, "As more information becomes available and the hydrological uncertainties are reduced, more objective management of these programs is required because the added value of each new increment of data is less than its predecessors"(Moss et al. 1978). Data needs have also become more specific and thus demand more fine-tuned collection programs. Finally, the resources available to meet data needs are limited. Numerous authorities have voiced similar concerns, most notably the National Academy of Science (NAS 1977) which listed three major deficiencies in the overall environmental monitoring program of the U.S. EPA:

1) the inadequate use of scientific principles to design, operate and evaluate monitoring programs,
2) the need to monitor in anticipation of, and to detect new environmental problems, and
3) the fragmentation of monitoring among and within various governmental agencies.

More recently, a report released by the General Accounting Office (1981) recommended major changes in the monitoring approaches of the U.S. EPA and the U.S. Geological Survey. The report found that the continued emphasis on fixed station networks by both agencies is inefficient and produces less information per unit effort when compared to other monitoring programs such as intensive or synoptic surveys.

The obvious purpose of any monitoring program is to fulfill the data needs of the state pollution control agency and to meet minimum "core" requirements needed by U.S. EPA to meet national goals (e.g., NAWQMN stations). However, collecting data is not an end in itself because there is no inherent value in the data themselves (Moss et al. 1978). The value of the data lies in the information that can be conveyed to a decision making process. Our experience in Ohio indicates that, in all to many cases, this simple truth has been overlooked and monitoring programs tend to continue as simply data collecting mechanisms. Thus, a key process in the development of the 5-year Monitoring Strategy has been defining the relationship between environmental monitoring and water quality management programs.

At Ohio EPA the application of monitoring data is primarily related to the management of the pollution abatement programs funded under the Clean Water Act. An understanding of how the information is used in the management process is essential to those who technically design and evaluate monitoring activities. For example, a limnologist would design different protocols for sampling a lake depending upon whether general background information is needed or whether the lake is a canidate for a grant under the Clean Lakes Program. Differing sampling protocols are needed because the results from a brief reconnaissance survey may be appropriate to characterize general lake quality, but data from such a survey are inappropriate for deciding whether or not to fund lake restoration projects. It is also true that the best data collection network cannot overcome a problem of the misuse of data that it produces. That is, there is nothing to prevent data from a well-designed general lake survey from being misused or misrepresented by unqualified people to meet the more specific information needs of lake restoration projects. Therefore, to minimize the misuse of data and to acquaint those who design the data collection networks with the intended use of that data, the information needs and decision making processes of Ohio EPA and U.S. EPA are an integral part of the 5-year Monitoring Strategy.

1.2 The Use of Monitoring Results in Point Source Control Programs

Information derived from water monitoring data must be an essential part of the construction grants management and decision making process if the expenditure of public funds for the construction of municipal treatment facilities is to be justified. The valid use of monitoring data is no less important in establishing the level of treatment to be required of industrial dischargers. Water monitoring data is necessary to satisfy two broad activities related to point source control programs; 1) the wasteload allocation process, and 2) the water quality standards process, especially the evaluation of stream uses.

The Ohio EPA is seeking to better integrate the various water pollution control programs by defining a logical progression of management steps that will result in a cost-effective system of water quality assessments, sound decisions on pollution abatement projects, and finally, if needed, enforcement action. Figure 1A highlights the sequence of events leading to the issuance of an NPDES permit. The figure depicts conceptual relationships in the management process and is not a step by step process chart. It must be stressed that the collection of water quality data necessary to support the re-evaluation of stream uses and classification of the stream as water quality

FIG. 1A. Conceptual relationship between water quality standa wasteload allocations and the NPDES permitting process. The solid lines and boxes show the key steps in the management process, the dotted lines and boxes represent the prerequisites that are needed to make the system work, and the dashed lines and boxes depict public participation and feedback within the system.

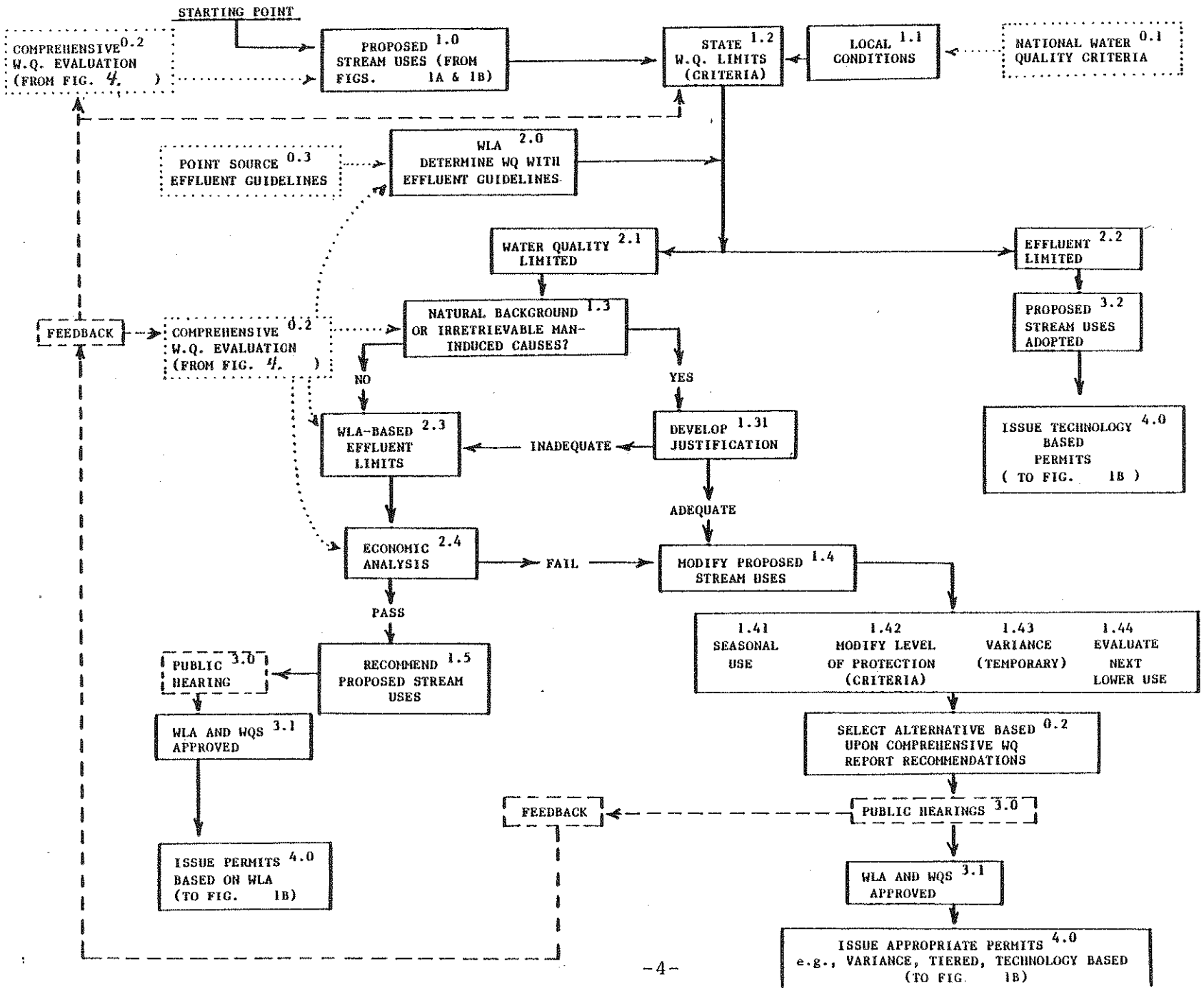
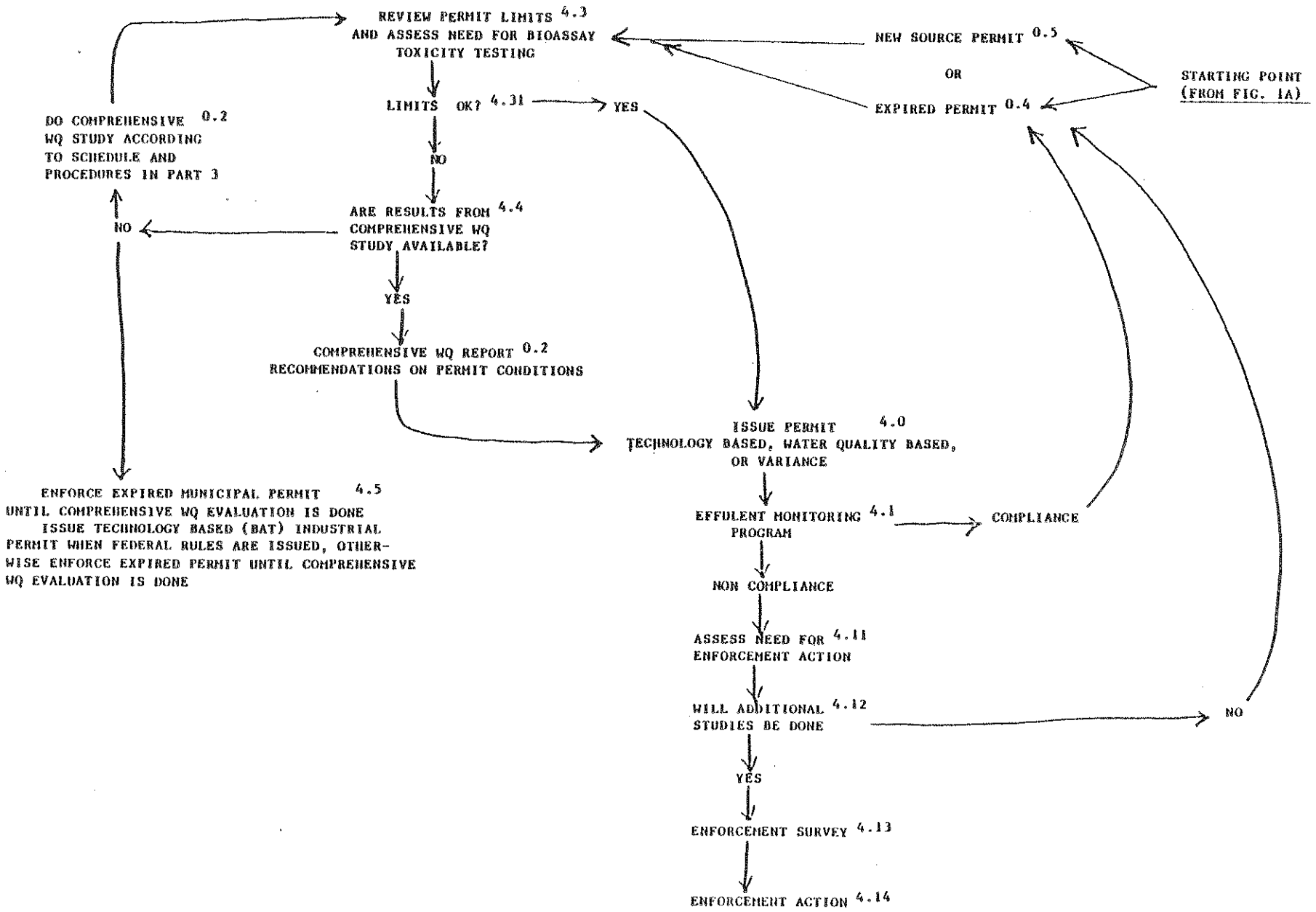


FIG. 1B. Conceptual relationship between water quality standards, wasteload allocations, and the NPDES permitting process (continued from 1A).



or effluent limited will be necessary before the approach outlined in Fig. 1A can work. Part 3.24 discusses the compilation of comprehensive water quality evaluations.

Figures 1A and 1B illustrate the conceptual relationship between water quality standards (WQS), wasteload allocations (WLA), and the National Pollutant Discharge Elimination System (NPDES) permitting process. The comprehensive water quality evaluation (step 0.2) is the underlying force that drives the system from problem assessment through the sequence of managemnet decisions on pollution abatement projects. The key steps in the management process are represented as solid blocks. Prerequisites that are needed to make the system work and the public participation process are shown as dotted and dashed blocks, respectively. Many of the steps shown in Figs. 1A and 1B are very general but greater detail is provided in Part 3 of the 5-year Monitoring Strategy.

The management process begins with the development of water quality standards (WQS) using the results of the comprehensive water quality report (step 0.2). The WQS for any given stream consist of two parts: first, a designated use that the stream is capable of supporting, and secondly, criteria or limits for the levels of pollutants or other characteristics of the waterbody. When the criteria for a pollutant are not violated, they will generally ensure a level of water quality sufficient to support a specific designated use. Details of the methodology that Ohio EPA is using to a re-evaluate stream uses are described in Part 3.21: suffice it to say here that a proposed aquatic life stream use is formulated based upon biological criteria and existing chemical/physical conditions (step 1.0). The limits or criteria for the proposed stream use (step 1.2) are developed from national water quality criteria (step 0.1) and can be tailored to fit local conditions (step 1.1).

Next the stream segment is classified as water quality limited (step 2.1), or effluent limited (step 2.2). Water quality limited is where water quality limits are not achievable through the imposition of point source effluent guidelines (CWA, Section 301(b)(1)(A) and Section 301 (b)(1)(B)). Effluent limited is where water quality limits are achievable through the imposition of point source effluent guidelines. This classification is made according to the wasteload allocation (WLA) results reported in the comprehensive water quality report (steps 0.1, 0.3 and 2.0). As shown in Fig 1A, proposed stream uses are adopted for effluent limited segments (step 3.2) and technology based permits are issued (step 4.0).

The proposed stream uses may be modified in water quality limited segments (step 1.4). Natural background and/or irretrievable man-induced causes for poor water quality are investigated (step 1.3) and a justification is developed (step 1.3) if these are the apparent causes for non-attainment of the proposed stream use. The proposed stream use will be adopted in situations where natural background or irretrievable man-induced conditions do not prevent the attainment of that use and where the necessary wastewater treatment facilities are affordable and result in worthwhile environmental benefits (e.g., economic analysis is passed, step 2.4). In these situations NPDES permits would be issued (step 4.0) based upon the WLA effluent limits (step 2.3). If natural background and/or irretrievable man-induced causes are justified, or the economic test is failed (e.g. wastewater treatment is not affordable), the proposed water quality standards are modified (step 1.4).

Figure 1A shows the four basic alternatives for modification:

1.41. Seasonal use designation where criteria are applicable only during certain times of the year. (Note that this is not equivalent to the Seasonal Warmwater Habitat use as defined in the Ohio WQS. See Part 3.21 for further discussion).

1.42 Modify level of protection by having less stringent criteria for certain parameters but retain the same general use designation.

1.43. Issue variances for specific discharger(s) that delay the imposition of more stringent effluent limitations on the parameter(s) that exceed WQS criteria.

1.44. Remove the present designated use and evaluate the next lower use designation.

One of these four alternatives is selected based upon the recommendations contained in the comprehensive water quality report (step 0.2). NPDES permits are then issued in accordance with the type of modification made (step 4.0) following public hearings (step 3.0). Also included in Fig. 1A is a proposal for combining the public participation involvement in the WLA and WQS process (steps 3.0 and 3.1). This should be possible because the two programs will be more closely integrated from the initial data collection, through the compilation of the comprehensive report, and into the management decision making process. Figure 1A also denotes the channels for feedback the public hearing process.

Figure 1B is a process chart for the issuance, review, and renewal of NPDES permits. Detailed procedures for the review process (step 4.3) and the criteria for determining the adequacy of limits (step 4.31) are found in Part 3.26. An essential element of this process chart is what to do when a permit expires (step 0.4) and the review process determines the limits to be unacceptable (e.g., the permit limitations cause WQS to be exceeded). There is widespread concern at the local, state, and national level about the costs of achieving water quality standards irrespective of any evaluation of the environmental degradation resulting from the WQS violation(s). The congressionally mandated review of Advanced Treatment projects is a prime example of an attempt to limit federal funding to wastewater treatment facilities that can be expected to result in material water quality benefits.

Both Ohio EPA and U.S. EPA recognize this concern as legitimate and believe that actions should not be taken which require more stringent wastewater treatment <u>without</u> adequate water quality survey data to justify the additional costs. Therefore, water quality based NPDES permits will only be issued after careful consideration of stream uses, and in some cases, the cost may be too high for meeting those uses. However, because of constraints on monitoring resources, it will be some time before the backlog of water quality problem areas can be studied in sufficient detail to evaluate stream uses and use value (Fig. 1B, step 4.4).

The following policy will be adhered to when NPDES permits expire before adequate biological and water quality assessments are made. Under Ohio law the entity must make a request for permit renewal prior to the expiration of their current NPDES permit. The conditions and limits of an expired NPDES permit are enforceable until such time that Ohio EPA completes its review of the request for renewal, and, as a matter of policy, the review and the issuance of a final permit table will not be completed until the management steps in Fig. 1A are completed. In those cases where the expired permit contains only a final table for effluent limits and where interim effluent limits are included in Findings and Orders issued by the Director, the interim limits will be enforced. Enforcing expired permits in this manner (step 4.5) is a preferable alternative to re-issuing existing or technology based permits as an interim step because it avoids the conflict with Sec. 301b of the CWA which states that effluent limitations must ensure the attainment of WQS. The process shown in Fig. 1B complies with Sec. 301b but in a way that reflects current environmental management thinking, not rigid adherence to the previous emphasis on implementing effluent controls without full consideration of their environmental and economic impacts.

The above discussion and Figs. 1A and 1B were intended to give an overview of the major components of the wastewater management program and to show that monitoring must be the key element that drives the system. A more thorough discussion of the wastewater management system is presented in Parts 3.21-3.25. Emphasis in the remainder of the 5-year Monitoring Strategy is on the mechanisms that integrate the WQS, WLA, permits, and constructon grants programs, and on the monitoring support these programs need.

A comprehensive water quality monitoring strategy should consider other issues as well, such as non point pollution, groundwater quality, and toxic pollutants. These issues have not been ignored in this edition of the 5-year Monitoring Strategy, but neither have they received the attention they deserve, a consequence of limited manpower and the difficultly of coordinating the interests and concern of other Offices within Ohio EPA. Any water quality issue can be addressed through the 5-year Monitoring Strategy as explained in Part 2.3. Future editions will include expanded coverage of those topics that program managers and staff take an active role in developing.

!1.3 The Use of Monitoring Data in Other Water Quality Programs

General discussions of the use of monitoring data in the management of other water quality programs will appear in future editions of the 5-year Monitoring Strategy. !

PART 2
MONITORING ACTIVITIES

2.1 A Review of EPA's Past Monitoring Programs

The Ohio EPA and its predecessor agency, the Ohio Department of Health, have been engaged in major water quality monitoring programs since 1949. The first round of in-depth river basin surveys were conducted between 1949 and 1960, and included the sampling and analyses of point source discharges as well as streams. The following river basins were included: The Maumee, Great Miami, Scioto, Cuyahoga, Muskingum and Mahoning. Fixed monitoring stations were established to provide on-going monitoring in critical stream segments upon completion of the original surveys, i.e., after 1960. Several of the original basin surveys were updated during the late 1960's; all were updated from 1973 to 1980 by studies pursuant to Sections 208 and 303(e) of the Clean Water Act. Most of the later studies included limited biological assessments, analyses for additional chemical/physical parameters, where appropriate, and bioassays of certain wastewater discharges. Fixed monitoring stations were added or deleted throughout Ohio's ambient monitoring network as a result of intensive survey evaluations and an analysis of the State's 1975 305(b) water quality report. Stations were also established in Lake Erie tributaries to monitor loadings to the lake in accordance with the terms of the 1972 U.S. - Canadian agreements on water quality of the Great Lakes.

Fish samples from the Ohio River, Lake Erie and major tributaries have been analyzed for pesticides and other organic residues in cooperation with other agencies for the last several years. In addition, an advanced early warning monitoring program has been initiated by the Ohio River Valley Water Sanitation Commission (ORSANCO) on the Ohio River to provide a warning to downstream users of potential hazards of contaminated water. The Ohio EPA, in cooperation with the Ohio Department of Natural Resources (DNR) and U.S. Geological Survey (USGS), has 13 continuous 4 parameter water quality monitors and stream flow gages as part of Ohio EPA's ambient monitoring network. The Ohio EPA and USGS are also evaluating selected Ohio public lakes and reservoirs to determine water quality and eutrophic status.

2.2 Basic Purpose and Objectives under the Clean Water Act

Appendix A to Subpart G of 40 CFR 35 sets forth the minimum requirements for an acceptable monitoring strategy under the Act. The objectives and general requirements stated therein are as follows:

- To provide data, information, or reports necessary to determine compliance with permit terms and conditions,
- To develop and maintain an understanding of the quality (causes and effects of such quality of the waters) in the State for the purpose of supporting State water pollution control activities in relation to the achievement of national goals according to the Act,
- To report on such quality and its causes and effects, and
- To assess the effectiveness of the State's pollution control program.

To this end, the State is required to establish and maintain a broad range of monitoring activities, both before and after implementing pollution controls, including: measurement of pollutant sources, determination of water quality (physical, chemical and biological), and the evaluation of their effects upon the State's beneficial use designations. Monitoring programs and activities shall be carried out according to normally accepted practices which have been promulgated or otherwise issued by the Administrator of U.S. EPA, in the form of regulations, guidelines, technical manuals, or handbooks.

The objectives listed in Appendix A 40 CFR 35 can be divided into three functional categories which follow a logical progression from problem identification, to corrective measures, to legal action (if necessary). We believe that these three functional categories and the nine objectives listed in Table 1 fulfill the requirements of the Act.
Defining the monitoring requirements in this way stresses the inter-relationship between monitoring support and the water quality management steps discussed in Part 1.2. Monitoring is plainly identified as a key element in each functional step. It follows that management decisions can only be as good as the monitoring support available, especially with the complexity of todays water quality issues.

Table 1. Water quality monitoring objectives as defined by the Clean Water Act and Appendix A to Subpart G of 40 CFR 35.

Function: Surface Water Quality Assessment

Objective 1. To collect and interpret baseline data on the physical/chemical and biological quality of the surface waters of Ohio.

Objective 2. To establish, where possible, cause and effect relationships between existing water quality, sources of pollution, and prevailing land use.

Objective 3. To compare existing water quality with state and national criteria and the legislative goals of the Clean Water Act.

Objective 4. To publish documented reports on site-specific and state-wide problem assessments for use in water quality management programs.

Function: Water Quality Management and Pollution Abatement

Objective 5. To develop and revise water use designations, to substantiate their attainability, and to develop criteria to protect those uses.

Objective 6. To formulate, assess, and revise wasteload allocations, effluent limitations, permit conditions, and water quality management strategies consistent with attainable water uses.

Objective 7. To assess the effectiveness of the State's pollution control program.

Function: Enforcement

Objective 8. To conduct inspections and collect data to insure compliance with NPDES permits.

Objective 9. To collect and analyze data necessary to prepare legal action against discharges.

2.3 An Approach to the Design and Management of Surface Water Monitoring Activities in Ohio

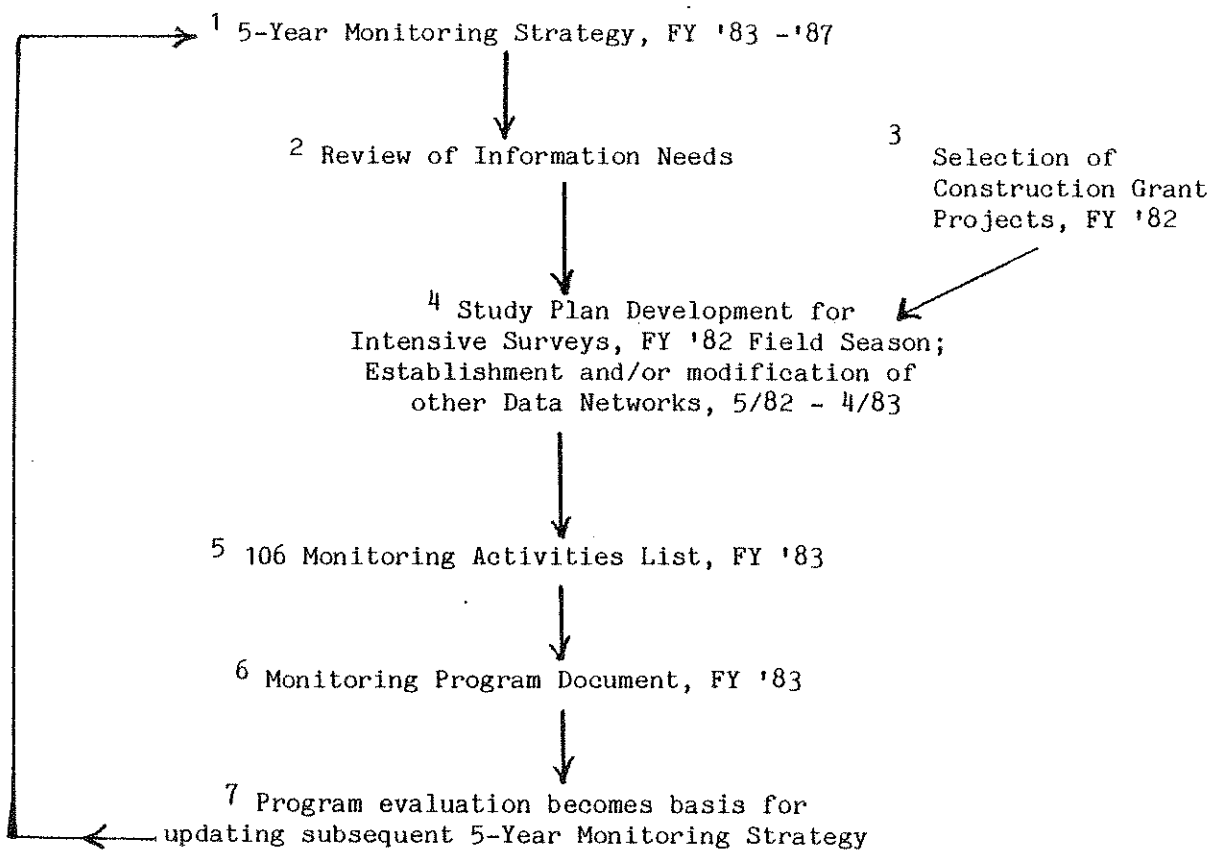
The need for water quality data exceeds our ability to produce it. The information needs of large scale, and often urgent, water quality issues such as wasteload allocations, advanced treatment justifications, and water quality standard use designations compete with one another and with the needs of less urgent, but still vitally important issues such as the detection of water quality trends and the evaluation of streams with respect to the goal of aquatic protection. Some information needs frequently do not receive adequate attention in the design and evaluation of monitoring activities which results in the collection of insufficient data to resolve the issue. Because many decisions in wastewater management programs cannot be delayed until such time that adequate information does exist, data are often unintentionally misused in order to support the decision made. Thus, it is essential to develop an overall framework in which to place information needs to ensure that sufficient data are available to make valid management decisions.

The key element of the 5-year Monitoring Strategy is the definition of an approach to the design, refinement, and management of surface water monitoring activities conducted by Ohio EPA. Staff members from Ohio EPA and U.S. EPA have jointly evolved a sequence of administrative and technical steps that will greatly improve the utility of the monitoring activities over the next several years. The objective is to avoid the common pitfall of initiating data collection activities without sufficient thought as to how the data can and will be used. This can only be done by fine tuning monitoring activities to meet specific monitoring needs.

Figure 2 presents the basic management steps that determine the State's surface water monitoring activities for any given year (reporting period based upon the federal fiscal year, Oct. 1 - Sept. 30). The initial step is the revision of the 5-year Monitoring Strategy, and a more or less concurrent evaluation or review (step 2) of the information needs of all surface water programs. Special emphasis is placed on the subbasins and stream segments where Construction Grant Projects have been selected (step 3) for water quality analyses (wasteloads and/or biological studies). Note that the the first three steps are targeted to be completed by February 15. It is imparative that this target date be met so that adequate time exists to conduct thorough design work for the plans of study (step 4). After planning work for the upcoming field season, the 106 Monitoring Activities List for the next fiscal year is prepared (steps 5 and 6). The Monitoring Program Document is then revised and added to based upon the Activities List. The overall water program evaluation (step 7) becomes the basis for revising the 5-year Monitoring Strategy, and the process repeats itself during the next year.

The development of the 5-year strategy is an iterative process that reflects the changing data needs and goals of the Agency. This is accomplished through defining agency information needs and establishing immediate and long-term monitoring goals (see Part 3). Subbasins are selected where monitoring efforts will be concentrated and basic data needs are outlined (see Parts 2.4 and 3). The management steps outlined in Fig. 2 result in an intergration of short-term, high priority needs with long-term, lower priority (e.g., less urgent) needs. The 106 Monitoring Activities List is the mechanism whereby the changing resources available to meet monitoring needs are considered in determining the level of monitoring work to be undertaken each year.

Fig. 2. A framework for managing surface water monitoring activities conducted by the Ohio EPA.



Target Dates for Completing Steps	
1	January 15, 1982
2	February 15, 1982
3	December 20, 1981
4	March 15, 1982
5	June 1, 1981
6	August 1, 1982
7	November 1, 1982

2.4 Selecting Subbasins for Study

The selection of hydrologic units or subbasins for intensive study is also an integral part of an effective monitoring strategy. The selection process should consider all information needs, not just a single issue, although major program needs such as advanced wastewater treatment justifications and WQS use-attainability issues must clearly receive emphasis. The exact procedure to be used in selecting areas for monitoring work is presently undefined, but the choice of subbasins for study in FY '82 will incorporate consideration of more than just the Construction Grant Project Priority List, which for all practical purposes is a single issue priority list.

Appendix 3 is a catalog of basic types of information needs or water quality issues that may be significant to a particular group in a particular subbasin. It is our intent to use the information in Appendix 3 as a springboard for selecting the geographical setting for monitoring work. Appendix 3 will also serve as a mechanism to alert those who plan intensive surveys of where certain types of water quality studies are needed.

The annual list of projects or stream segments for study should allow for the most efficient expenditure of the monitoring resources available. Efficiency in monitoring is obviously improved by concentrating studies in individual subbasins rather than scattering work between subbasins throughout the state year after year. Projects on the 1981 construction grant priority list are scattered in 39 subbasins throughout the state and yet only 7 subbasins have 3 or more priority projects. Ideally the selection of segments for WLA study and/or intensive survey study should be limited to projects in these 7 "most critical" subbasins and perhaps adjacent subbasins within the same drainage. Municipalities within these priority subbasins should be made priority projects as well, whenever this is possible. Monitoring activities in subbasins with a low density of priority projects should be delayed until the number of priority projects increases or resources are available to do the monitoring necessary.

2.5 The Monitoring System Matrix, An Evaluation Tool

It is the State's responsibility to establish a monitoring program which will fulfill the nine objectives listed in Part 2.2. The 1981 Basic Wastewater Program Grant (Sec. 106 grant) identified 37 monitoring related activities (see appendix 1) which the Office of Wastewater is undertaking to meet that responsibility. Nineteen of the activities are closely related to the basic objectives while the remainder involve administrative tasks or concern very special, non-recurring tasks. The relationships between the 19 monitoring activities and the basic objectives are explored in Table 2. The monitoring objectives and activities are combined in Table 2 to form a matrix or framework within which the total water quality monitoring system is defined and evaluated. As stated by Ward (1979):..."The matrix, by defining the regulatory monitoring system and clarifying the many interactions within the system, provides a basis upon which a more thorough approach to managing, evaluating, and eventually optimizing regulatory monitoring can be developed". The interrelationships of the activities and objectives are depicted as follows:

xxxx - The activity directly results in the objective being met. (i.e., the direct result of a monitoring activity is the collection of data).

xxx - The activity is an essential component in meeting the objective. (i.e., data generated from certain activities are essential for establishing cause/effect relationships).

xx - The activity is indirectly related to meeting the objective. (i.e., the activity generates information or reports which are of value in meeting the objective).

x - The activity can be related to meeting the objective in limited or specific cases, either directly or indirectly. (i.e., NAWQMN station data could be used in an enforcement action but the small number of stations in the State make this unlikely).

Also shown in Table 2 is an approximate cost of each activity. These figures do not include transportation expenses which would substantially raise the cost for some activities (e.g., 20 & 13, 12, 22, 21, 1, 2, 30). Only rough estimates of manpower and laboratory analysis costs could be made for some activities because accurate time and sample accounting procedures are not available (see Appendix 2 for specifics of cost calculations). Although a more detailed analysis of monitoring efficiency is desirable, this matrix can serve as a mechanism to target inefficient activities for in-depth examination. For example, an activity score (number of x's in Table 2 for each activity) can be totaled and used as a subjective rating of each activities' value to the overall objectives of the monitoring program.

Table 2. Monitoring system matrix for FY'81 (see text for explaination of symbols).

Activity Cost[a] ($\times 10^3$ $)	Description of Monitoring Activity[b] (Activity No.)	Objective 1 collect baseline data	Objective 2 establish cause/effect	Objective 3 compare WQ with goals	Objective 4 publish reports	Objective 5 Revise WQS	Objective 6 assess WLA and permits	Objective 7 assess overall abatement program	Objective 8 insure compliance with NPDES permits	Objective 9 prepare enforcement
51.3	National Ambient Water Quality Monitoring Network (NAWQMN) (11)	XXXX	X	XXX	X	X	X	X		X
74.1	State Ambient Water Quality Monitoring Net.(20 & 13)	XXXX	X	XXX	X	X	X	X		X
6.3	NAWQMN - Biomonitoring (14)	XXXX	XX	XXX	X	X		XX		
3.2	Monitoring Lake Erie fish for toxic residues (7)	XXXX	XX	XXX	X			X		
27.0	Clean Lakes Program (12)	XXXX	XXX	X	XXX	X		X		
334.4	Intensive Surveys (re: AST/AWT, WLA) (30 & 28)	XXXX	XXX	XXX	XXX	XXX	XXX	XXX	XX	X
76.2	USGS Gages	XXXX			XXX		XXX			
39.0	USGS low flow stations	XXXX			XX		XXX			
165.0	USGS continuous water quality monitors	XXXX	XX	XX	XX	XX	XXX	X		
3.3	USGS COD monitoring	XXXX					XXX			
19.3	USGS lake studies	XXXX	XX	XX	XXX	X	X	X		
36.6	USGS stream reaeration studies	XXXX					XXX			

Table 2. (Continued)

Activity Cost[a] ($\times 10^3$\$)	Description of Monitoring Activity[b] (Activity No.)	Objective 1 collect baseline data	Objective 2 establish cause/effect	Objective 3 compare WQ with goals	Objective 4 publish reports	Objective 5 Revise WQS	Objective 6 assess WLA and permits	Objective 7 assess overall abatement program	Objective 8 insure compliance with NPDES permits	Objective 9 prepare enforcement
6.3	Review Mahoning River WQS (5)			XX		XXXX	XXX	XX		
25.4	Review statewide WQS (25)					XXXX	XXX	XX		
10.8	305b report (26)			XXX	XXXX	XX	X	XXX		
38.5	Compliance monitoring (1)	XXXX						XX	XXX	XXX
15.1	Compliance sampling inspections inspections with toxic bioassays (2)	XXXX	X	X	XXX		X	XX	XXX	XXX
53.9	NPDES enforcement support (21)	XXX	XXX		X					XXXX
55.5	Investigate complaints (22)	XXXX	XX							XX

[a]Estimated costs of manpower and sample analysis(see appendix 2 for breakdown of costs).

[b]See appendix 1 for description of activities.

The activity score can be used to compute a dollar cost per unit score for each activity (Table 3). Those activities with low activity scores or those ranking in the top 25% with regard to cost per unit activity score may then be selected for immediate review. Using the ranking of cost/score ratios the five activities targeted for review are intensive surveys, USGS gages, USGS continuous monitors, state ambient network, and complaint investigations. Intensive surveys and both USGS activities are integral components of the state's monitoring effort and their high cost of operation overwhelms even high activity scores. However, because they are the most costly activities to maintain, every effort should be made to maximize the use of the data generated. The state ambient network is also expensive (even without transportation costs) and will be targeted for in-depth review. A combination of reducing costs and increasing the utility of the data should be sought. Complaint investigation appears to be an activity where substantial improvement in cost per unit activity score is possible. Investigating fewer complaints and utilizing the data to meet other objectives would improve the overall monitoring program.

Each interrelated component in the matrix is discussed in Appendix 6. We have attempted to define the regulatory monitoring system as precisely as possible. The purpose of this exercise is twofold. First, the comments and suggestions relating to each activity and objective provide a springboard for the assessment of data collection and analysis techniques. That is, it provides a starting point upon which a more thorough approach to managing, evaluating, and eventually optimizing the monitoring activities can be developed. Secondly, it provides a means of recording and organizing both general and specific ideas for improving monitoring activities. Many such ideas arise in "brainstorming" sessions or are suggested by outside-agengy sources, but are seldom written down and, thus, are not explored and implemented. Much of the narrative in Appendix 6 is only a skeleton upon which to build and refine. The descriptions of some portions of the matrix were made very brief because of the time constraints for completing this document. The most pertinent ideas and suggestions will be evaluated and incorporated into the monitoring activities through a system of addressing information needs (see Part 2.3).

Table 3. A ranking of 19 monitoring activities based upon the ratio of cost in thousands of dollars per activity score, a subjective evaluation of the activities' value to the overall monitoring program. Underlined activities are being reviewed to improve cost/score ratio.

Activity	Activity Score	Ratio Cost/Score	Rank
NAWQMN	13	3.9	8
State Ambient	13	5.7	5
NAWQMN biomonitoring	13	0.5	16
Fish toxic residues	11	0.3	19
Clean Lakes	13	2.1	11
Intensive Surveys	25	13.4	1
USGS Gages	10	7.6	3
USGS Low Flow	9	4.3	7
USGS Continuous Flow Monitors	16	10.3	2
USGS COD Monitoring	7	0.5	17
USGS Lake Studies	11	1.5	12
USGS Stream Reaeration	9	5.2	6
Mahoning R. WQS	11	0.6	15
Statewide WQS	9	2.8	10
305(b) Report	13	0.8	13
Compliance Monitoring	12	3.2	9
Compliance Monitoring - Toxic Bioassay	18	0.8	14
NPDES Enforcement	11	0.5	18
Investigate Complaints	8	6.9	4

PART 3
SURFACE WATER PROGRAM DESCRIPTIONS AND INFORMATION NEEDS

3.1 Agency Information Needs, Data Needs, And Monitoring Goals

For monitoring to be effective, that is for it to have a decisive impact upon wastewater management programs, the basic information needs of the management process must be assembled and addressed through the framework outlined in Part 2.3. An initial list of work or information needs was developed with input from various groups within the agency. These groups were asked to estimate the types and ammounts of information concerning water quality that their programs would require during the next 5 years. Table 4 lists the information needs of the water quality management programs administered by Ohio EPA along with one or more objectives for each need. The objectives are concise reasons why the information is needed for the management of specific programs. At present many information needs and objectives are broadly defined, however, every effort should be made to refine them as precisely as possible so that more specific data needs can be determined.

Table 4 also lists monitoring goals that have been established in order to fulfill the information needs. Most information needs have immediate goals or tasks identified which are a pre-requisite to proceding within the monitoring strategy framework outlined in Part 2.3. A review of each immediate goal should be undertaken to define the specific elements of the task, the resources and responsibilities for the task, and a schedule for completing the task. After the immediate goals are achieved it will be possible to review long-term goals (e.g., estimates of required monitoring activities) and to reset priorities.

The majority of the needs and goals of the 5-year Monitoring Strategy relate to the municipal construction grants program and its supporting activities. Information derived from water monitoring data must play an essential role in the municipal construction grant management process in order to ensure that expenditure of public funds are justified. Water monitoring data is necessary to satisfy two broad activities related to the construction grants program; 1) the water quality standards process, especially the evaluation of stream uses, and 2) the wasteload allocation process. The general kinds of data needed in these two activities are discussed seperately in Parts 3.21 and 3.22. This is followed by a section which outlines the integration of the two activities into a comprehensive water quality evaluation. Part 3.25 summarizes the construction grant program in Ohio.

The remainder of Part 3.2 addresses other water quality programs administered by the agency. The brevity with which some programs are addressed is not meant to denote that they will receive a secondary role in future development of the 5-year Monitoring Strategy or the Monitoring Program. Limitations on time and resources dictated that emphasis had to be placed somewhere, and the wastewater management program was the obvious choice because of ongoing efforts by Ohio EPA to obtain a State Management Assistant Grant (section 205g). Other water quality issues such as toxic pollutants, groundwater quality, and nonpoint pollution are important concerns and must receive greater attention in Ohio's Monitoring Program. It is our intent to better define Agency information needs and monitoring goals in these areas at the earliest possible date.

ble 4. A priority listing of the monitoring needs of the water quality management programs administered by the Ohio EPA. A generalized objective is listed for each need along with immediate and 5-year goals where they have been determined.

Part A - Surface Water Monitoring

WORK OR INFORMATION NEEDS	OBJECTIVE	GOALS	PRIORITY
GENERAL PROGRAM NEEDS			
1. Water quality assessments for small communities currently without WWTPs.	To document water quality impacts and justify treatment needs for municipalities entering construction grants program.	Immediate - select appropriate survey methodology. estimated # of surveys: '82: 30; '83: 50; '84: 70; '85: 40; '86: 10	Moderate
2. Water quality assessments and modeling for pending ADVANCED TREATMENT projects.	To justify funding ADVANCED TREATMENT construction grants projects in accordance with federal requirements.	Immediate - coordinate the development of detailed survey study plans with other information needs. estimated # of surveys: '82: 40; '83: 50; '84: 60; '85: 50; '86: 30	High
3. Water quality assessments of completed ADVANCED SECONDARY TREATMENT projects.	To assess impact of completed AST projects and to determine if AWT facilities are justifiable.	estimated # of surveys: '82: 0; '83: 5; '84: 10; '85: 15; '86: 20	Low-High
4. Stream surveys for pending municipal enforcement actions	To document extent of water quality problem in support of enforcement action	Immediate - review survey methodologies and derive guidelines estimated # of surveys: '82: 20; '83: 25; '84: 30; '85: 35; '86: 40	High
5. Stream surveys for pending industrial enforcement actions	To document extent of water quality problem in support of enforcement action	Immediate - review survey methodologies and derive guidelines estimated # of surveys Industrial: '82: 5; '83: 5; '84: 5; '85: 5; '86: 5 Coal program: '82: 2; '83: 2; '84: 2; '85: 2; '86: 2	High

Table 4. (Continued)

WORK OR INFORMATION NEEDS	OBJECTIVE	GOALS	PRIORITY
6. Water quality assessments and modeling in areas with permitted industrial entities.	To develop and support NPDES permit limits for industrial dischargers.	Immediate - incorporate as a factor in the selection of subbasins for survey See also #2 1986 - Have work completed in 107 subbasins	High
7. Stream surveys of 316(a) demonstration projects.	To verify that power plant thermal discharges with 316(a) variances have no adverse impact on aquatic life.	1982 - 2 surveys on Muskingum River 1983-'86 - periodic low-flow event effect monitoring in 3 river basins.	High ? Low
8. Evaluation of 316(b) demonstration projects.	To develop and implement a methodology for monitoring the entrainment and impingement of fish at cooling water intakes; To apply methods in the compliance monitoring of cooling water intakes in Lake Erie.	Immediate - development of methodology 1982-'86 - evaluate 6 projects in Lake Erie. especially # 11.	High ? Moderate
9. Evaluate acid mine drainage reclamation projects	To provide technical assistance to Soil Conservation Service regarding RAMP projects involving the discharge of impounded water; to assess the need for and effectiveness of other mine drainage reclamation projects.	Immediate - coordinate evaluation of RAMP projects with other data needs, especially # 11. 1982 - coordinate data collection and analysis with other agenices involved in the mine drainage issue (ODNR, Dept. of Interior, USGS). 1982-'86 - conduct studies and report results.	High High ?
10. Field testing of aquatic life stream use criteria.	To refine and validate the OEPA aquatic life stream use criteria, including EWH, WWH I, WWH II, and IS (formerly SWH)	Immediate - develop study plan and conduct field surveys in 1981. 1982 - write justification document for stream use criteria.	High High
11. Assess stream uses in Ohio's surface waters.	To review the water quality standards in accordance	Immediate - develop desk top review procedures (appendix 5) and review subbasin to be studied in 1981; Plan field work in streams to be reevaluated.	High
12. Develop procedures for non-aquatic life stream uses.	To establish consistent methodology to be employed in classifying water for non-aquatic life uses	Immediate - develop procedures.	High

Table 4. (Continued)

WORK OR INFORMATION NEEDS	OBJECTIVE	GOALS	PRIORITY
13. Review specific statewide WQS criteria.	To evaluate scientific validity and attainability in Ohio waters of the following criteria: Iron, Lead, Oil and Grease, Ammonia.	Immediate - assess need for review of other criteria, outline how any changes will be made.	High
14. Policy statement on use-value analysis.	To establish guidelines for assessing actual and potential benefits of stream use characteristics.	Immediate - define scope of statement and assign responsible staff.	High
15. Water quality surveys of high quality streams.	To develop baseline data necessary for the protection of high quality streams.	Immediate - develop methodologies and incorporate as a factor in the selection of subbasins for survey work; See also #2. 1982-'86 - survey high quality streams in all subbasins selected for study.	Moderate
16. Compile previous data on toxic pollutants in the aquatic environment and information on the generation and/or disposal of toxic substances within Ohio	To provide base line data for use in toxic pollutant monitoring and effluent control	Immediate - Develope a work plan for this task and coordinate with pretreatment, permitting groups, Hazardous Wastes, ect. 1982- Include results as part of 305(b) report	High
17. Monitor aquatic environment for the presence of toxic pollutants.	To evaluate potential problem areas and develop baseline data on toxics in water, sediment, and fish.	Immediate - list potential problem areas (subbasins); develop methodologies for evaluation; develop process charts for using information in WQS program, etc. 1982-'86 ?	High
18. Survey water quality in lakes and reservoirs.	To develop baseline data, especially for trophic status evaluation; to obtain necessary data for the Clean Lakes Program; to evaluate the effectiveness of lakes restoration projects.	?	?
19. Assemble report on the water quality of Lake Erie.	To strenghten 305(b) report;To provide information useful to the general public; To provide data useful to agency programs.	Immediate - Develop outline for report, and assign responsibilities for its completion.	Moderate

Table 4. (Continued)

WORK OR INFORMATION NEEDS	OBJECTIVE	GOALS	PRIORITY
20. Long term monitoring of surface waters.	To determine WQ trends and assess the impact of the states pollution control efforts as required by the 305(b) report.	Immediate - develop methodologies for data collection and analysis. 1982-'86 ?	Moderate
21. Develop feedback concerning federal water quality programs and incorporate into 305(b) report.	To effectively communicate, and document where appropriate, Ohio EPA's comments on federal programs.	Immediate - establish format and issues to be developed for 1982 and '84 305(b) reports.	Moderate
22. Investigate water pollution complaints.	To determine nature and extent of water quality problem.	Immediate - select a survey protocol and coordinate data collection with other information needs	Moderate
23. Develop set of basin maps for general use in the Division	To fulfill multiple uses in reporting monitoring data of all types, especially in 305(b) report.	Immediate - Determine the most useful format and have a final set of plates made by graphics	High
24. Compile historical record of pollution abatement projects in Ohio including data on costs, treatment types, and W.Q. improvements	To provide a data base to judge the effectiveness of pollution control programs	Immediate - Determine available means to accomplish task 1984 - present findings in 305(b) report	Moderate
25. Evaluation of groundwater monitoring and existing data.	To meet Section 305(b) reporting requirements; To locate areas of surface/groundwater hydrologic interaction. To integrate groundwater surface water monitoring;	Immediate - Describe data network, present yearly summary statistics, and characterize problems 1982 - map locations of groundwater/surface water exchange. 1983 - coordinate activities of all groups involved and formulate a combined groundwater/surface water monitoring strategy.	High Moderate Moderate
26. Developing integrated water quality monitoring throughout the State.	To compile bibliography of data sources on water resources/quality in Ohio; To develop a "water quality/data assurance system" in order to facilitate maximum exchange of data - between users; To institute a state-wide water monitoring strategy encompassing parties engaged in monitoring.	1982 - complete bibliography 1984 - finialize "water quality/data assurance system" 1986 - Implement integrated statewide monitoring strategy.	Moderate Low-High Moderate-High

Table 4. (Continued)

WORK OR INFORMATION NEEDS	OBJECTIVE	GOALS	PRIORITY
27. Water quality assessments of urban NPS runoff (including combined sewer overflows?)	To evaluate water quality problems (especially metals) arising from urban runoff and relate to WQS use-attainability; To assess proposed pollution abatement programs in light of findings.	?	?
28. Compile basin loading data for pollutants including non point and point sources	To meet requirements of Section 305(b); To aid in interpreting results from intensive surveys; To incorporate NPS loading into wasteload allocation process; To incorporate NPS loading information into decisions concerning phosphorus removal at WWTP.	1982 Develop software to calculate loadings for LEAPS and PEMSO data bases. 1982 - Finalize draft procedure for evaluating the impact of P removal on Ohio's surface water. 1984 - Report basin loadings in the 305(b) report	High Low Moderate
29. Water quality assessments of raw public water supplies (surface water only).	To insure public water supply WQS are met, especially with regard to toxic pollutants.	Immediate - coordinate activities of Office of Planning, Wastewater, and Public Water Supply.	?
30. Evaluate the Ohio EPA effluent monitoring program	To determine the effectiveness of the program and improve the rate of compliance; To coordinate the program with the other monitoring activities and needs	Immediate - Assess the methods used in compliance monitoring (including role of self-monitoring reports in selection of entities for sampling, rates of past compliance, etc.) and make recommendations. Compile basic facts on compliance program (see monitoring matrix)	High
31. Monitoring of major dischargers. 170 Municipal 100 Industrial	To insure compliance with NPDES permit conditions.		High

No. of entities	'82	'83	'84	'85	'86
Industrial					
CEI	50	40	25	10	0
CSI	50	60	75	90	100
Municipal					
CEI	135	130	120	110	100
CSI	35	40	50	60	70

Table 4. (Continued)

Part B - Point Source Effluent Monitoring

WORK OR INFORMATION NEEDS	OBJECTIVE	GOALS	PRIORITY
GENERAL PROGRAM NEEDS			
32. Monitoring of non-major dischargers. 1000 Municipal minors 500 Industrial primaries	To insure compliance with NPDES permit conditions.		High
33. Establish tracking system for effluent monitoring program.	To track where and what effluent monitoring needs to be done, and has been done; To optimize the use of effluent monitoring resources.	Immediate - outline specific needs of system, investigate current resources that may be of value.	
34. Bioassays of NPDES discharges.	To provide toxicity data used in permitting process: 1) for new sources 2) for establishing permit limitation 3) for compliance monitoring	Immediate - establish how managers would use data in writing permits.	
	To provide toxicity data for use in intensive studies.		
35. GC/MS Scans of NPDES discharges.	To provide data on the presence of toxic pollutants being discharged to the water of the State.	Immediate - coordinate with other information needs and activities (see #12).	

Year

No. of entities	'82	'83	'84	'85	'86
Industrial					
CEI	100	200	300	300	300
CSI	50	100	175	175	175
Municipal					
CEI	200	300	400	500	500
CSI	20	30	50	75	100

No. of bioassays

	'82	'83	'84	'85	'86
	Public / Industrial				
Screening bioassays	10 / 30	20 / 40	30 / 80	40 / 100	50 / 140
Definitive bioassays	5 / 15	5 / 20	10 / 40	10 / 50	10 / 70
Flow-thru bioassays	0 / 5	0 / 5	0 / 10	0 / 10	0 / 15
Ames Test	0 / 30	0 / 30	0 / 30	0 / 30	0 / 30

No. of scans

scans	'82	'83	'84	'85	'86
Industrial	15	20	40	50	70
Public	30	30	30	30	30

3.21 Water Quality Standards - Stream Uses Determined thru Biological Criteria

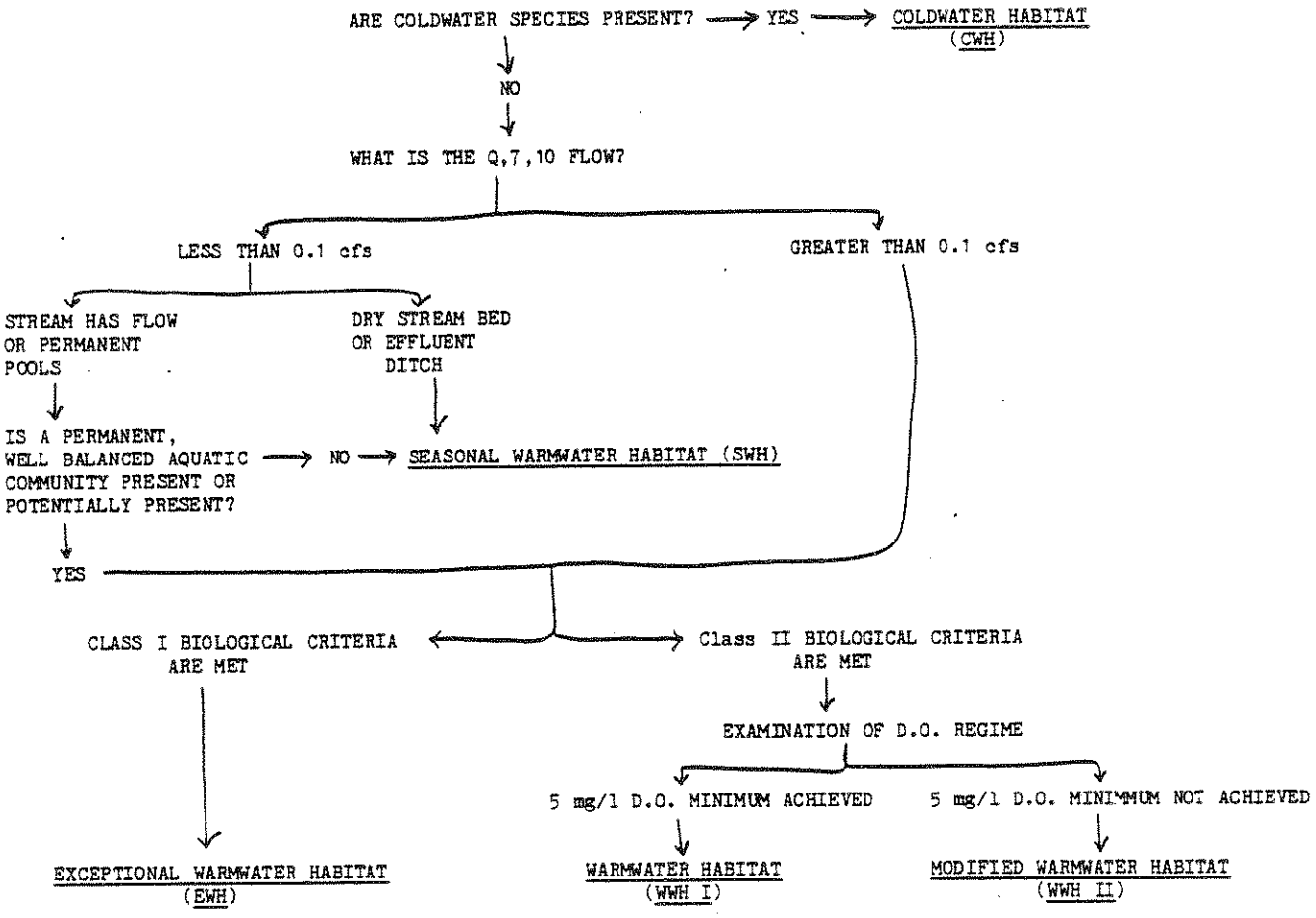
The primary data needs for the water quality standards program are for evaluating use designations and for establishing water quality limits or criteria for pollutants and other water body characteristics. A methodology for determining aquatic life uses has been developed. It is essential to refine the methodology through field studies in 1981 and to document the findings in a professional manner that will adequately support the agency's decisions on stream uses. A position paper or "White Paper on Aquatic Life Stream Uses in Ohio" will be produced in 1982. This position paper will address both existing stream uses and potential stream uses.

Constraints on available manpower and other resources are expected to preclude a detailed evaluation of stream uses for all waters of the State. Therefore when intensive survey/WLA studies are scheduled for a subbasin, the Division of Surveillance will review the appropriateness of the existing stream uses throughout the subbasin. This desk top review will involve consulting with district personnel, the Office of the Planning Coordinator, and other appropriate information sources. As many streams as possible in the subbasin will be examined but special emphasis must be given to segments which recieve point source discharges because of the potential impact on wastwater treatment facilities. However, all impacts on stream uses will be considered for all segments evaluated. The Division will recommend either a continuation of the existing stream uses or a re-evaluation of stream uses through the process described below. The reader is refered to Appendix 5 for a more in-depth discussion of the procedures and results of the desk top review.

Figure 3 summarizes the proposed methodology for determining aquatic life uses in Ohio's surface waters. Coldwater Habitat (CWH) waters are classified primarily from information on stocked streams supplied by the Ohio Department of Natural Resources (ODNR), and secondarily from information collected by Ohio EPA or others that would indicate that the stream use is attainable. The determination of the Q7,10 flow is based upon the records of USGS, ODNR, and Ohio EPA. Use classifications in streams with a Q7,10 of less than 0.1 cfs are determined acccording to the protocols established in "Procedures for Determining Use Designations for Low-Flow Streams", an Ohio EPA working document (Appendix 4). The U.S. EPA Rules concerning Ohio's WQS (45FR79053) requires that the Seasonal Warmwater Habitat use designation include a definition of the time period to which it applies and that it be done on a case by case basis.

Low flow streams and seasonal warmwater habitat will be evaluated in "White Paper on Aquatic Life Streams Uses in Ohio". The definition of SWH as currently used in the Ohio WQS is "...waters capable of supporting the propagation and habitation of aquatic organisms on a seasonal basis". At present, the use designation is not truly seasonal in that the set of criteria does <u>not</u> vary from one period of the year to another. Therefore, if this type of stream use and associated criteria are retained in the Ohio WQS a new set of seasonally variable criteria may be recommended. Although roughly correlated with flow, the designation of a SWH stream is <u>not</u> determined by the flow regime. The factor which characterizes such a stream is the presence or absence of certain biological communities on a year round basis (see Appendix 4). Thus, the stream is not seasonal in the sense that it lacks flow during part of the year, rather the stream is seasonal in the sense that it is without a certain characteristic fauna part of the year.

Fig. 3. A methodology for proposing stream aquatic life uses in Ohio's surface waters. The proposed use designations (underlined) are the starting point for wastewater management process chart (Fig. 1A, step 1.0).



Only a small fraction of the State's surface waters will be classified as Intermittent Streams or CWH. Most streams will be designated for other aquatic life uses based upon the biological criteria presented in Tables 5 and 6. Exceptional Warmwater Habitat (EWH) will be proposed in all cases where the Class I biological criteria are met. If conflicts arise where exceptional biological communities (Class I) are found in streams that do not meet the EWH WQS, then the level of protection (specific criteria) would be modified, provided the EWH WQS are not attainable because of environmental or economic reasons (see Part 1 and Fig. 1A). An evaluation of minimum dissolved oxygen (D.O.) concentrations will be conducted in streams where the Class II biological criteria are met. The issue of how and where to assess prevailing D.O. regimes and the influence of cultural modification in land use on the "natural regime" will be an important topic in the "White Paper on Aquatic Life Stream Use in Ohio." Warmwater Habitat (WWH I) will be proposed for those stream segments where Class II biological criteria are met and the minimum D.O. in stream sections unaffected by cultural impacts is 5 mg/l or above. Stream segments that cannot attain a 5 mg/l D.O. concentration because of prevailing land use impacts will be classified as Modified Warmwater Habitat (WWH II). Aquatic life stream uses that do not fully meet the fishable/swimmable goal of the Act are considered through the process outlined in Parts 1 and 3.23.

A procedure for determining other stream uses (i.e., public drinking water supply, industrial water supply, etc.) is being developed.

Data needs for criteria development are rather vague at this time. More specific information will be available once U.S. EPA gears up its WQS program to include criteria for toxic pollutants. Specific criteria are targeted for general review during the next revision of the Ohio WQS. The scientific basis and the attainability in Ohio waters of the iron, lead, and oil and grease criteria will be evaluated. Also, the table listing the ammonia criteria and the equation used to derive the values in the table must be examined for accuracy.

A list of the geographic locales where use attainability is an issue is provided in Appendix 5 of the 5-year Monitoring Strategy. Monitoring and data analysis activities in these stream segments will be a priority during the next five years. The 112 Limited Warmwater Habitat (LWH) stream segments are all candidates for a timely review of use-attainability because of their disapproved status with U.S. EPA. Stream segments where environmental conditions may substantially influence the attainability of a stream use are also listed in Appendix 5 of the 5-year Monitoring Strategy. All Exceptional Warmwater Habitat (EWH) streams and Secondary Contact Recreation (SCR) segments are also listed as locales where use-attainability data would be helpful because there is very little hard data supporting these classifications in most circumstances. We also suspect that some streams currently classified as WWH I or WWH II may qualify for the EWH designation.

!3.22 Wasteload allocations - section to be developed !

Table 5. Biological criteria (fish) for determining aquatic life use designations and attainment of Clean Water Act goals (November, 1980).

	CWA GOALS MET		CWA GOALS NOT MET	
Evaluation Class Category	"Exceptional" Class I (EWH)	"Good" Class II (WWH)	"Fair" Class III	"Poor" Class IV
1.	Exceptional, or unusual assemblage of species	Usual association of expected species	Some expected species absent, or in very low abundance	Most expected species absent
2.	Sensitive species abundant	Sensitive species present	Sensitive species absent, or in very low abundance	Sensitive species absent
3.	Exceptionally high diversity	High diversity	Declining diversity	Low diversity
4.	Composite index >9.0 - 9.5	Composite index >7.0 - 7.5, <9.0 - 9.5	Composite index >4.5 - 5.0, <7.0 - 7.5	Composite index <4.5 - 5.0
5.	Outstanding recreational fishery		Tolerant species increasing, beginning to dominate	Tolerant species dominate
6.	Rare, endangered, or threatened species present			

Conditions: Categories 1, 2, 3 and 4 (if data is available) must be met and 5 or 6 must also be met in order to be designated in a particular class.

Table 6. Biological criteria (macroinvertebrate) for determining aquatic life use designations and attainment of Clean Water Act goals (March, 1981).

	CWA GOALS MET		CWA GOALS NOT MET	
Evaluation Class Category	"Exceptional" Class I (EWH)	"Good" Class II (WWH)	"Fair" Class III	"Poor" Class IV
1.	Pollution sensitive species abundant	Pollution sensitive species present in moderate numbers	Pollution sensitive species present in low numbers	Pollution sensitive species absent
2.	Intermediate species present in low numbers	Intermediate species present in moderate numbers	Intermediate species abundant	Intermediate species present in low numbers or absent
3.	Tolerant species present in low numbers	Tolerant species present in low numbers	Tolerant species present in moderate numbers	Tolerant species abundant (all types may be absent if extreme toxic conditions exist)
4.	Number of taxa > 30	Number of taxa 25-30	Number of taxa 20-25	Number of taxa < 20
5.	Exceptional diversity Shannon index > 3.5	High diversity Shannon index 2.9-3.5	Moderate diversity Shannon index 2.3-2.9	Low diversity Shannon index < 2.3

!3.23 Ecomonic Evaluation and Analysis - this section still considered draft!

The basis in law for conducting economic analyses as part of the wastewater management process can be found in sections 302 and 303 of the Clean Water Act. In short, the Act states that the environmental benefits from a pollution abatement project must justify the costs of the project. More specifically, in section 303 of the Act there is a statement that the uses and values of a stream must justify the costs of a pollution abatement project. Therefore it is the policy of Ohio EPA to consider economic factors when stream uses and criteria are set.

Federal regulations concerning the downgrading of water quality standards for "widespread adverse economic impact" are published at 40 CFR 35.1550. Broad guidelines concerning downgradings were issued in Chapter 5 of "Guidelines for State and Areawide Water Quality Management Program Development" (USEPA, 1976), and within the last year a series of draft economic guidelines has been circulated by U.S. EPA. It is difficult to assess how the recent regulation "freeze" at the federal level will affect further development of national economic guidelines. In the absence of firm and reasonable federal guidelines the Ohio EPA will continue to refine its own economic analysis procedures.

For municipal projects income measurements are used to screen projects to see if the costs are too high. U.S. EPA is now using a table developed in the Illinois consent decree:

Median household income in community	Total wastewater service cost criterion (percent)	Wastewater service Cost/month
Less than $10,000	1.0	less than $8
$10,000 -17,000	1.5	$12 - $21
Over $17,000	1.75	$25 +

We consider these brackets too wide; also they haven't been adjusted for inflation so that almost all incomes in Ohio are in the top bracket. The bottom 5% income level villages fall in the second category which is much too high to avoid adverse economic impacts. The top category is much too low, the affluent communities in Ohio can pay as much as $50 per month. Because of these problems, we have our own measures of adverse impact - Tables A and B (Appexdix 7), which are inflation adjusted and better reflect actual conditions. These Table A serves as triggering mechanisms only. Detailed study of the ecomonic impact of a project is warranted wherever the wastewater service cost criteria in Table A is exceeded. Table B serves to delineate the uppermost financial burden of wastewater service cost that community can afford without "widespread adverse economic impact".

For industrial wastewater treatment projects the only measure now accepted for financial unreasonability is an expense which shuts the entity down. We are still working on a better measure of adverse impact.

The Ohio EPA is also developing a cost/benefit or use-value analysis. The Congress has mandated reviews of high cost projects to determine if they are justified and to avoid large expenditures for little or no environmental gain. While we are working on cost/benefit analysis, we have developed no objective tests for reasonability. Right now we are only considering projects where it seems obvious that the environmental gain does not justify the expense. We plan to draft a policy statement on the important issues to consider in use-value analysis. The policy statement must clearly communicate the ecological principles to consider when judging the value of individual components (e.g., stream segments) to the larger ecosystem (e.g., river basin). Guidelines must be given to ensure that the full range of actual and potential benefits are considered and given thier proper emphasis when weighing costs vs benefits. Cost/benefit analysis will never remove all subjectivity from the decision making on a project. What we hope to do is lower the subjectivity, not eliminate it from the decision making process.

3.24 Comprehensive Water Quality Evaluations

Purpose

The purpose of Part 3.24 is to outline the interactions of the Office of Constructions Grants and the Divisions of Water Quality Planning and Assessment (WQPA), and Surveillance and Standards, and Speical Projects in completing comprehensive water quality evaluations (i.e., WLA/intensive survey reports) needed for the management of water quality programs, especially wastewater programs.

Comprehensive Water Quality Evaluations

Why is a comprehensive water quality evaluation that simultaneously addresses wasteload allocation and intensive biological and water quality survey results needed? Most simply because it makes economic and environmental sense. The expenditure of public funds for the construction of advanced municipal treatment facilities will clearly continue to be monitored closely to ensure that the cost in dollars has real and worthwhile environmental benefits. The wasteload allocation (WLA) process, through assigning allowable pollutant loadings, sets the basis for the cost of wastewater treatment. However, the WLA process only simulates whether or not certain water quality parameters meet established water quality limits or standards. The WLA process alone does not adequately assess all of the environmental consequences of attainment or nonattainment of the water quality standards. In many instances, an intensive biological and water quality survey of the receiving waters must be made to appraise the real environmental benefits expected after advanced treatment is installed and operating as designed. Intensive surveys can also be used to evaluate stream uses and criteria (pollutant limits) and possibly recommend changes that will affect individual WLA's. Obviously, close coordination of WLA and intensive survey work is needed to insure the wise expenditure of construction grant funds. In recognition of this, the results of comprehensive water quality evaluations are depicted as a driving force behind the key management steps in the overall wastewater management process (see Part 1, Fig. 1A).

WQPA And Surveillance Interactions

Figure 4 illustrates the interactions of Construction Grants, WQPA, Surveillance, and economists (Division of Special Projects) in completing a comprehensive water quality evaluation. It is essential to recognize that each Office or Division retains complete autonomy over all activities for which it is responsible. The box shape in Fig. 4, denotes which group or division is responsible for the task or activity. Certain key elements in the process chart are denoted as coordinated activities to emphasize the need for close cooperation between the groups involved. This does not imply centralized authority or the absence of clearly assigned responsiblities: each division retains responsibility for their activities throughout the process chart. This is explained in more detail below.

Figure 4 also indicates the chronological sequence of steps in the process. Groups or blocks of activities are marked off with dashed lines and labeled with large numerals. These blocks of activities follow one another in the numerical sequence indicated. Concurrent blocks of activities appear as 2A, 2B, etc. The boxes for each activity are also numbered (0.101 to 0.20) for convenience in referencing and discussing the process chart.

Block 1 - Initial Planning

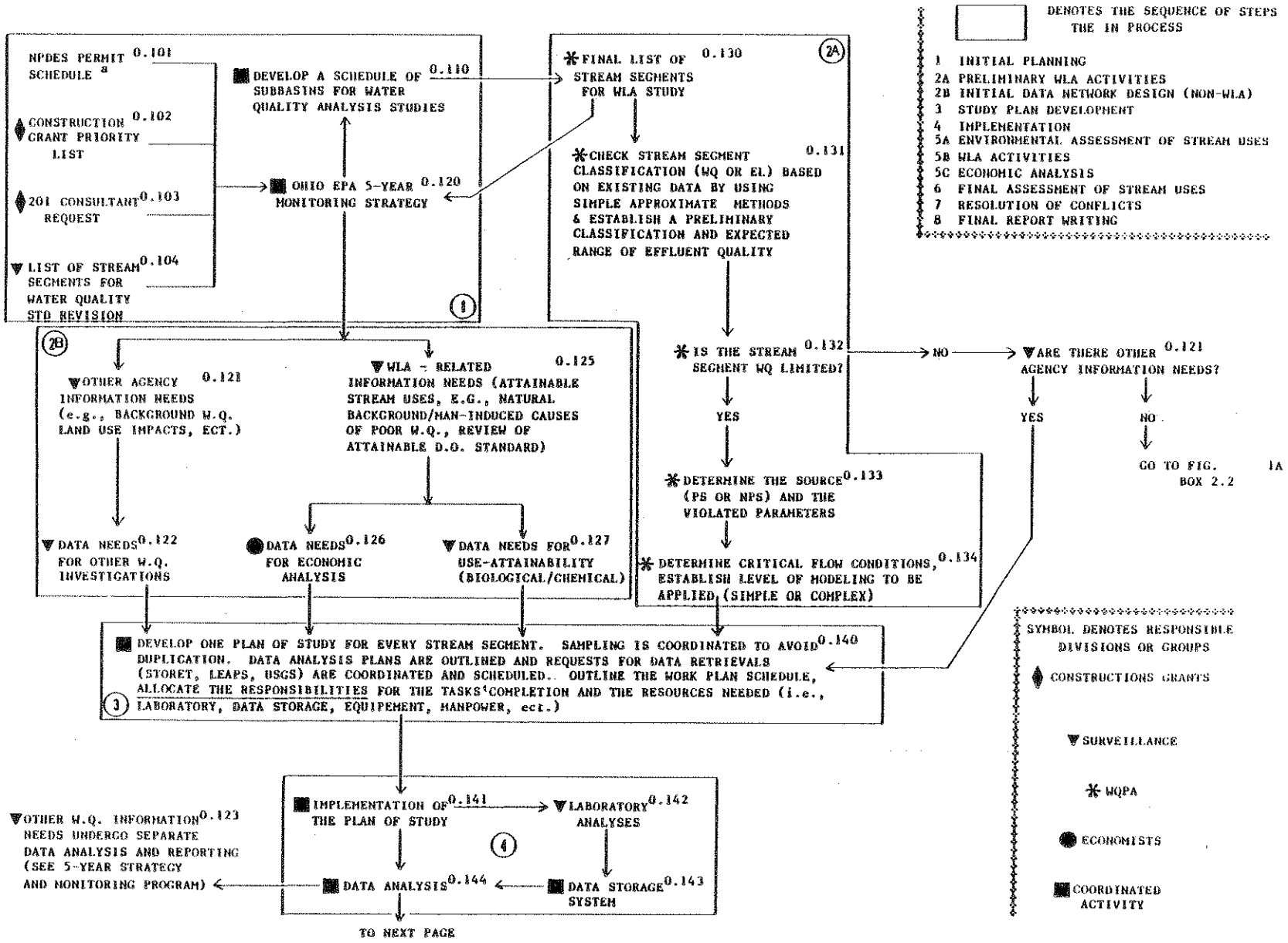
These activities result in a decision as to where WLA and intensive survey work will be done. The primary factors determining this are listed as 0.101 through 0.104. The 5-year strategy (0.120) serves as an organizational framework for this information. The 5-year strategy will project a schedule of subbasins for intensive monitoring efforts over the next five years. The schedule can be updated each year to reflect changing priorities on the construction grant list. However, the construction grant priority listing system must be revised to accommodate the limitations of the monitoring support activities upon which it depends. Substantial increases in monitoring support resources would be needed to adequately conduct water quality analysis studies as outlined here. Without the additional monitoring support to evaluate WQS and biological benefits at the same time that WLA's are done, there is no assurance that advanced municipal treatment projects will be cost beneficial.

Note that the 5-year strategy begins in 1982 meaning that the process was circumvented in 1981 (i.e. steps 0.101-0.104 directly to step 0.110). The initial planning steps will be greatly improved in subsequent years through the sequence of events discussed in Part 2.3.

Block 2A - Preliminary WLA Activities

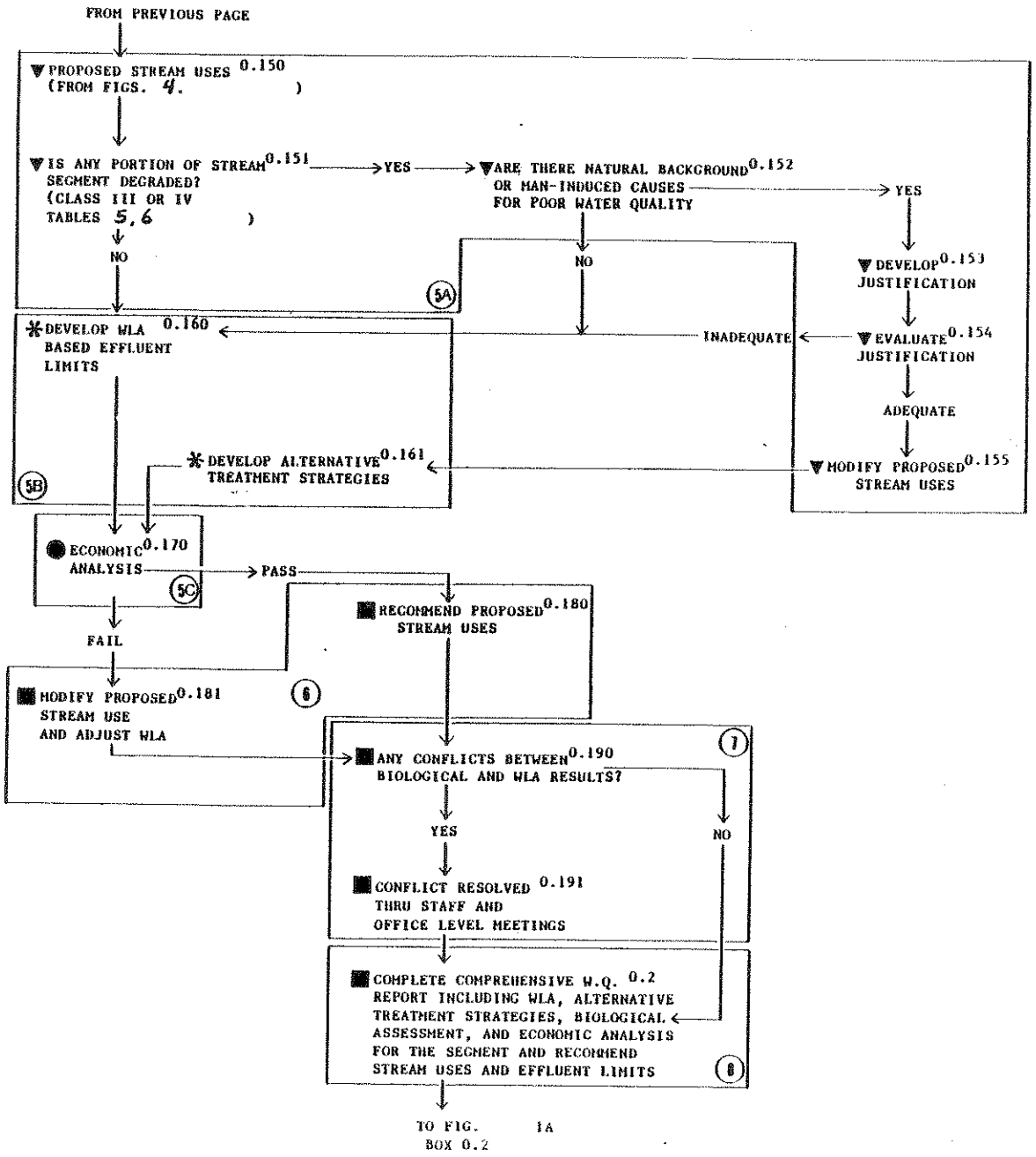
These activities are fairly self-evident and are discussed in further detail in Part 3.22. Responsibilities for the described activities are delegated within the division of WQPA. Note that the final list of stream segments where WLA studies will be done becomes part of the 5-year Monitoring Strategy.

Fig. 4. Process chart depicting the interactions of WQPA, Surveillance, Construction Grants, and economists in completing a comprehensive water quality evaluation. See Figs. V-5, 1A and 1B for a synopsis of how the evaluation is used in the overall wastewater management process of WQS, WLA and NPDES permits.



[a] Industrial and Public permitting groups are responsible for generating this schedule.

Fig. 4. (continued).



Block 2B - Initial Data Network Design

The Division of Surveillance will identify two categories of water quality information needs in subbasins scheduled for water quality analysis studies. First, information needs related to the WLA process such as stream uses and criteria, and secondly, other water quality information needs listed in the 5-year Monitoring Strategy. For some stream segments slated for WLA study, there may be no other information needs and the Division of WQPA would proceed independently, since there would be no need for coordination. However, it is very likely that other water quality information needs will be identified for most stream segments. At this point, a need for coordination of monitoring activities has been established and the process moves to block 3.

Block 3 - Study Plan Development

The Division of Surveillance will take the lead in coordinating development of study plans. This step represents the critically important coordination of monitoring activities between WQPA and Surveillance. Each group will bring to this step knowledge of the stream segment or segments in question obtained in the preliminary activities of blocks 2A and 2B. Each group involved will know what data is needed in order for them to complete their assigned tasks and will retain direct responsibility over seeing that it gets done. The major elements to be coordinated are spelled out in step 0.140 and the savings in manpower and resources should be obvious. A further benefit is that each group is aware of the others' activities and plans, which puts the overall study in perspective and improves the water quality evaluation.

Coordination between the Divisions of Water Quality Planning and Assessment and Surveillance and Standards will occur in the following specific areas:

1. The scheduling of stream segments for waste load allocation, water quality analysis, and intensive surveys must be coordinated between WQPA and Surveillance and take into account the 5-year Monitoring Strategy. Intensive stream surveys conducted by Surveillance for the purpose of establishing baseline conditions and use designations must precede or coincide with the WLA and water quality analysis.

2. Coordination in the development of AT justifications is particularly critical. The need for treatment beyond secondary must take into account the actual benefits that will be derived from the standpoint of both improved water quality and the recovery of degraded aquatic communities. The results of intensive stream surveys and WLA's will provide the basis for recommendations made regarding whether or not an AT project should be approved and to what degree advanced treatment should be provided.

3. The level of effort expended by Surveillance for a given project will largely depend on its size and complexity. Generally projects classified as simple by WQPA will require less effort than those classified as complex. These determinations will be made on a project by project basis in coordination with WQPA.

4. The development of a plan of study for each project must be closely coordinated between Surveillance and WQPA. Although many aspects of the field work for intensive surveys (Surveillance) and water quality analysis (WQPA) are different in scope and purpose certain areas require close coordination. Particularly important is the collection of data for model calibration and verification in which both Surveillance (Districts) and WQPA staff will be involved.

5. Coordination of field work between the intensive survey and water quality analysis parts of certain projects will be required to avoid duplication of effort. This coordination should be identified and detailed in the plan of study.

6. Although many aspects of the data analysis between Surveillance and WQPA are separate by definition, there are certain areas where close coordination is needed to avoid duplication. Requests for data from USGS, LEAPS, and STORET made by Surveillance and WQPA may often times overlap. It should be the responsibility of the Surveillance and WQPA project coordinators to cooperate in making such requests. It is also essential that the WLA report be comprehensive by combining the results, recommendations, and conclusions of the wasteload modeling, water quality analysis and intensive biological and water quality survey. This is a fundamental and necessary requirement for the eventual issuance of a NPDES permit as outlined in Figure 1A.

7. Although revisions to water quality standards is primarily a Surveillance responsibility, close coordination with WQPA will be necessary. This coordination is particularly important in the establishment and/or modification of use designations and water quality criteria. It is critical that water quality standards issues be resolved prior to finalizing WLA's and subsequent approval or denial of AT projects.

8. Laboratory analyses must be carefully projected and scheduled to avoid overloading the analytical capabilities of the OEPA and outside labs. The allocation (parameter specific) and scheduling must include all water quality studies undertaken by the agency in a given year.

9. Equipment ordering, inventory, and repair will be critical as more and more concurrent studies are undertaken. Detailed plans of study will allow maximum utilization of critical equipment items and hopefully avoid delays caused by unavailable equipment.

Block 4 - Implementation of Intensive Survey

The study plan is implemented in this block. These activities are self-evident, but deserving of mention because if not done correctly and carefully, the data will be of no value. Resources must be available to complete laboratory analyses in a timely fashion and to enter the data into a useable storage system. Note that a separate activity is listed (step 0.123) for analyzing data to meet other water quality information needs (e.g. those in step 0.121) because they are not directly involved in the WQS, WLA, construction grant process.

Basically, there are three general facets of each intensive biological and water quality survey, 1) chemical/physical water quality, 2) macroinvertebrates, and 3) fish. The collection of water samples for chemical analysis is performed in each survey at pre-determined sampling locations at frequencies ranging from 3-4 times per summer (July-October) to once per week depending on the survey level. This will include stream flows when feasible. These are normally collected by District personnel. These chemical samples are used to characterize instream water quality over the sampling period and cannot be used for determining decay rates for non-conservative parameters (e.g. biochemical oxygen demand, ammonia, phenols, cyanide). Macroinvertebrates are collected at pre-determined sampling locations by setting out artificial substrate samplers for a six week period, usually between June and October. This work is performed by Biomonitoring Section personnel. Fish are collected at pre-determined sampling locations largely via the boat electrofishing method during July-October. This work is performed by Water Quality Section personnel.

Data collected for modeling analysis will be planned and implemented by WQPA. This work will involve grab samples, cross-sectional measurements, flows, diurnal oxygen measurements and time of travel studies in stream segments where simplified modeling is appropriate. However, in complex situations stream flow, time of travel, and 24 hour composite sampling for a period of 1 to 4 days will be required. This detailed sampling is necessary to determine stream assimilation, instream decay rates for non-conservative parameters, model calibration and verification and is different from the chemical sampling program used by Surveillance to characterize water quality over the sampling period.

Block 5A - Environmental Assessment of Stream Uses

Stream uses are intially proposed by the Division of Surveillance (step 0.150) according to the methodologies discussed in Part 3.21. Stream segments that do not meet the goals of the Clean Water Act (e.g., Biological classes III or IV) are evaluated to determine if natural background or man-induced causes prevent attainment of the proposed use. Where justified, the proposed stream uses from step 0.150 may be modified in step 0.155. Part 1 briefly discusses the options available in modifying use designations.

Block 5B - WLA Activities

The details of the WLA procedures are discussed in Part 3.22. Some WLA activities proceed concurrently with Block 5A activities. However, the development of a final set of WLA-based effluent limits is dependent on the proposed uses in steps 0.150 or 0.155.

Block 5C - Economic Analyses

Economic analyses are discussed in Part 3.23

Block 6 - Final Assessment of Stream Uses

Dependent upon the economic analyses, the proposed stream uses (steps 0.150 or 0.155) are either endorsed or modified.

Block 7 - Resolution of Conflicts

Should conflicts arise between the biological and WLA results, these will be resolved as indicated below.

Step 1 - The respective WQPA and Surveillance technical staffs will meet to discuss and attempt to resolve the conflict(s). The initial discussions will take place within a maximum of two weeks time.

Step 2 - If step 1 fails the respective WQPA and Surveillance Division Chiefs will meet with both staffs to attempt resolution. These discussions will also be given a maximum of two weeks to be successful.

Step 3 - If step 2 fails the respective WQPA and Surveillance Division Chiefs and staffs will meet with the Chief, Office of Wastewater to resolve the conflict. This step will occur within a maximum of 1 week .

Block 8 - Completion of Comprehensive Water Quality Report

The comprehensive water quality evaluation is compiled into an integrated final report which includes the recommended stream uses, the WLA results, the recommended effluent limits, the biological assessment, and the economic analyses. As with the activities in Block 3, each group retains responsibility for completing their section of the report, but it is a coordinated activity to insure continuity and effective communication. It is essential to maintain continuity and effective communication because of the reports' importance in the overall wastewater management program (see Part 1). The Division of WQPA will be responsible for the printing and distribution of the final document.

!3.25 The Construction Grant Program in Ohio - section to be included in the Monitoring Strategy for FY '83-'87!

!3.26 NPDES Permits - Basis for Renewals and the Effluent Monitoring Program
this section still considered draft, subject to ongoing discussions with U.S. EPA, Region V!

The Federal Water Pollution Control Act Amendments of 1972 broke precedence with the previous water pollution control legislation by instituting effluent limitations as the primary means to abate pollution and achieve clean water. The National Pollutant Discharge Elimination System (NPDES) was established in Section 402 to enforce the effluent limitations mandated by other sections of the act. Effluent control was a quick and effective way to abate pollution because point source dischargers were forced to upgrade treatment facilities and to meet the initial technology based effluent limitations by 1977. However, the level of pollution abatement achieved in this way varied from state to state across the country depending upon the level of wastewater treatment commonly existing in the state prior to 1972. In Ohio, the requirement for secondary treatment was not a radical change because of the high percentage of municipalities operating secondary WWTP's since the 1960's. The second set of technology based effluent limitations required by Section 301 (BAT, BTWWT) becomes effective in 1983 or 1984 and may have a greater impact on reducing pollutant loadings from municipalities and industries in Ohio.

Other strengths of the NPDES permit program include the condition for determining compliance with permit limitations and the option to pursue legal action when a discharger is not in compliance. Further, the permitting program gives the entity a set, or table, of limitations that will be enforceable, and thus provides the basis for designing the needed wastewater treatment facilities.

However, the permitting program is not without its weaknesses and unneeded expeditures on wastewater treatment facilities may result unless careful attention is given to the process of renewing permits. The overriding weakness of the NPDES program is the tendency to emphasize pollution abatement irrespective of the Clean Water Act goals of fishable/swimmable waters. Section 303 mandates that NPDES permits must contain limitations that comply with water quality standards if those limitations are more stringent than the technology based guidelines. This extra measure of pollution abatement may or may not be required to meet the fishable/swimmable goal, but this can only be determined through a comprehensive water quality evaluation (see Part 3.23). As emphasized in Part 1.2 of this document, the foundation of wastewater management must be sound biological and water quality monitoring from which decisions are made concerning WQS, WLA, and permit limitations. Issuing water quality based permits without an examination of stream uses and criteria circumvents the process outlined in Part 1.2, and transfers to a final permit table limitations that have unproven environmental benefits. It must be stressed that it is a gross over-simplification to assume that environmental benefits result from meeting a given WQS criteria, and it is especially inappropriate to give the alleged environmental benefit complete precedence over the cost of wastewater treatment facilities. However, this is exactly what has happened in some instances in Ohio because the permitting program has not been integrated with the water quality standard revision process. The sequence of decision making steps outlined in Appendix V of 205(g) delegation agreement strategy and the development of a technically sound monitoring program will eliminate this problem in the future.

Permit Review and Renewals

A general discussion of the permitting program was given in Part 1 and Fig 1B . Details of the municipal review process (Fig 1B, steps 4.3 & 4.31) are shown in Fig. 5.

All municipal permits are drafted by the Districts and submitted to the Central Office for final approval and issuence. Effluent limitations for the major parameters (BOD, SS, ammonia, and D.O.) are essentially a function of whether the segment is effluent limited or water quality limited. The Central Office municipal permitting staff checks on the appropriateness of the classificaton used by the District Offices because the classification of effluent and water quality limited segments has not been standardized throughout the State. In effluent limited segments secondary treatment is usually enough to meet the WQS criteria for convential pollutants. If it is a water quality limited segment then whatever is necessary to meet the WQS is specified in the permits provided it is not more stringent than 10 mg/l BOD, 12 mg/l suspended solids, 1.5 mg/l ammonia, and 5.0-6.0 mg/l D.O. District office personnel utilize the best available information in drafting WQ based effluent limitations, which usually consists of outdated or un-approved WLAs. However, because the Advanced Treatment review process requires justification of limits more stringent than secondary treatment, Ohio EPA does not renew water quality based permits until after a comprehensive water quality evaluation is done and approved by U.S. EPA. The justification of Advanced Treatment levels is performed according to the guidelines of PRM-79-7 and the procedueres discussed in Part 3.23. The backlog of 50-60 expired major municipal permits (see Appendix 6) places a high priority on scheduling the necessary field and office work so that these permits can be renewed with solid and justified limits derived from the comprehensive WQ evaluations.

Most industrial dischargers in Ohio were issued BPT permits before the 1977 deadline and most of the permits have expired or will expire in June 1981. The U.S. EPA is long overdue in issuing the next set of effluent limitations (BAT or BCT guidelines). Ohio EPA and U.S. EPA are negotiating a workable solution for re-newing industrial NPDES permits in a manner consistent with the principals in Part 1.2 and Fig. 1B.

Fig. 5 The municipal NPDES permit review process at Ohio EPA. [draft]

STREAM CLASSIFICATION	DISTRICT OFFICE ACTION	PERMIT LIMITS	CENTRAL OFFICE ACTION	
Effluent limited segment	Draft permit using technology guidelines	30 BOD 30 SS	Approve choice of stream classification	Issue permit
Water quality limited segment	Draft permit using "available" information	no more stringent than: 10 BOD 12 SS 1.5 ammonia	Delay action until comprehensive WQ evaluation is completed	Issue permit based upon WLA in the comprehensive WQ report

STREAM CLASSIFICATION	WWTP CONSTRUCTION	CENTRAL OFFICE ACTION	
Water quality limited segment where limits more stringent than 10/12/1.5 are needed	Build and operate WWTP which meets 10/12/1.5 limits	Assess need for lower limits by conducting a new comprehensive WQ evaluation	Issue permit based new recommendations

Effluent Monitoring Program

After the permit is issued (Fig. 1B, step 4.0) the effluent monitoring program (step 4.1) must be maintained to ensure compliance with permit limitations. Actually, effluent monitoring itself only determines compliance with permit limitations, but its function is to provide a basis for persuing legal action against discharges that violate their permits. The Litigation Sceening Committee of the Ohio EPA assesses the needs for enforcement action and additional data (steps 4.11 &4.12) for all cases of permit non-compliance reported by District Offices of the Ohio EPA.

Because it is an enforcement tool, the effluent monitoring program must be designed to be an effective mechanism to catch any violations of permit limits. A heavy reliance is placed on the self-monitoring data supplied by the dischargers in conjunction with agency sampling, inspections, and quality assurance practices. Specifically, compliance monitoring refers to measuring and analyzing effluent and reviewing reports and information obtained from dischargers. Compliance review is conducted by the Ohio EPA and refers to the review of all written material relating to the status of compliance of an NPDES permit. Compliance inspection involves field related activities conducted to determine the status of compliance with permit requirements and includes evaluations (non-sampling), facility inspections, and sampling inspections. In those inspections where samples are collected, the integrity of the sample must be guarded and thoroughly documented. The Ohio EPA has compiled a Quality Assurance Manual and employs a QA officer within the Office of Wastewater, Division of Special Projects, to handle this aspect of the program.

The basic effluent monitoring program goals which have been followed by Region V and Ohio EPA are (USEPA, 1981):

1. sampling inspections annually at all existing major permittees,
2. evaluations completed annually at all major permittees that are under construction or have previously demonstrated compliance,
3. examination of permittees quality control procedures, and
4. coordination, where practical, of sampling inspections as part of intensive surveys.

The recommendations of that same report questioned whether the priorities of the effluent monitoring program are in line with the program's function as an enforcement tool. Two important recommendations of the EPA report are paraphrased below:

1. Coordinate compliance monitoring with intensive survey data needs and work schedule,
2. Concentrate compliance monitoring where self-monitoring data and/or operation and maintainance problems have been identified.

The effluent monitoring goals established through the criteria listed above are shown in Table 4. These goals are in the process of being revised downward because of resource availability and a change in emphasis brought about by the recommendations cited above. We plan to evaluate the effluent monitoring program and make more specific recommendations as soon as possible.

Other Data Needs

The drafting of municipal and industrial permits often calls for information concerning the concentration of a particular parameter in the receiving water in order to determine permit limits that will meet WQS. This is particularly true with non-conventional and toxic pollutants. In the absence of any information regarding the in-stream concentration of a parameter, the permit writer is faced with guessing at a number that sounds reasonable or simply assuming a zero background level for the pollutant. The specifics of this kind of data need (parameter and location) must be communicated by the District offices to the Division of Surveillance. We plan to establish a tracking system to organize the detailed data needs within the effluent monitoring program. If enough led time is given it would be possible to schedule the necessary sampling and analysis. The tracking system would aid in optimizing resources through facilitating coordinating of data needs for the permitting program with other data collection activities. Data collection, especially for toxic substances, would be most efficiently obtained by coordinating the activity with the other data needs and activities discussed in Part 3.27.

The use of biological toxicity testing as a component in NPDES permits has recently been proposed by the U.S. EPA (1981). Authorized by Sections 308 and 402 of the Clean Water Act the toxicity tests will be used in three aspects of the NPDES permit program: a requirement to provide information in the application phase, a permit limitation, and a compliance monitoring requirement or a reporting requirement.

Toxicity tests will be required when:

1. technology-based guidelines are not available, or analysis for priority pollutants indicates their absence or only small amounts present,
2. technology-based guidelines are available and the discharge meets such limits, but because BPT is the equivalent of BCT or BAT, no additional treatment is required,
3. technology-based guidelines are available and additional treatment is needed to meet the guidelines but evidence (in form of experience or research) indicates there is still toxicity, and
4. receiving water is water-quality limited and the discharge is expected to have significant impact on it (need to have mixing zone study).

Our immediate goal in this area is to establish how managers would use bioassay toxicity data in writing permits in Ohio.

3.27 Toxic Pollutants

Environmental managers and the general public have voiced increasing concern over the occurrence of toxic and hazardous wastes in the environment during the past year or two. This concern has led to a strong emphasis on toxic water pollutants (also known as priority pollutants) within national water pollution control policies. Specifically, several factors are expected to prompt a rapid increase in the data needs related to toxic pollutants (Section 307(a)(1) of the Clean Water Act). New federal regulations on water quality standards may call for including selected toxic pollutants in state water quality standards. This will entail the establishment of criteria tailored to site-specific locales and will obviously require substantial information. In addition, fish tissue analysis, effluent monitoring, and enforcement monitoring will include the measurement of toxic pollutants.

Meeting the data needs of all toxic water pollutant issues must be an important component of the monitoring program. Two very general information needs have been established. The first is to compile previous data on toxic pollutants in the aquatic environment and also information on the generation and/or disposal of toxic substances within Ohio. This is a prerequisite for the design and operation of an effective toxics monitoring program. The immediate goals are to develop as much information as possible from a variety of sources and include the findings as part of the 1982 305(b) report. The second need is to establish a data network design to monitor the aquatic environment for the presence of toxic pollutants. Immediate goals here include developing scientifically based methodologies for evaluating the problem and developing process charts for using the information at the management level.

Two specific information needs concerning effluent monitoring of toxic water pollutants are included in Table 4. Both of these activities must be coordinated with other data networks aimed at determining the presence of toxic substances in the aquatic environment. Very rough projections of the number of bioassays and GC/MS scans are listed in Table 4. These estimates will be changed to reflect available resources and the requirements of evolving data networks.

Ohio EPA currently does not have the laboratory resources to conduct a comprehensive toxics monitoring program. Until such resources are developed, toxics monitoring by Ohio EPA will be limited. The Ohio Department of Health (ODH) acquired a gas chromatograph-mass spectrophotometer (GC-MS) in November 1980. Although a limited number of samples can be run by the ODH laboratories, fish tissue analyses and sediment analyses will be very restricted until additional manpower and space are made available.

!3.208 Water Quality Planning &
3.209 Lakes Program sections not avaliable!

3.210 The 316 Program

The Ohio EPA 316 program involves the assessment of impacts to fish and other aquatic life caused by thermal dischargers, 316(a), and cooling water intakes, 316(b). The program is administered by the Division of Industrial Wastewater. Guidelines for the program have been published (OEPA, 1978).

Many thermal dischargers (especially large electric utilities) cannot meet the Ohio in-stream water quality standards for temperature and thus have been required to submit reports or demonstrations that detail the impacts of the discharge on the receiving stream. The Ohio EPA has granted specific variances from the in-stream WQS to nine electric generating stations because, based upon an evaluation of the 316(a) demonstrations, they do not significantly harm the resident aquatic community. Intensive surveys performed on river basins where power plants are located would give Ohio EPA a means of verifying the findings of 316(a) demonstrations. In some cases, such as the Muskingum River, where 316(a) and 316(b) demonstrations are still under review the additional information provided by an intensive survey would be a valuable addendum to the reports submitted by the utilities.

The 316(b) demonstrations submitted by Ohio electric utilities show that cooling water intakes on Lake Erie kill more than 115 million fish per year. Ohio EPA is seeking to reduce these fish losses by requiring the utilities to modify the equipment or operating regimes of their plants. A sampling methodology needs to be developed to determine the effectiveness of cooling water intake modifications. Once a method is developed, the power plants should be evaluated on a yearly basis until such time that they demonstrate a significant reduction in the numder of fish killed.

3.211 The 305b program

Section 305(b) of the Clean Water Act requires each State to prepare and submit a biennial water quality report to the Adminstrator. This report is to include:

1. A description of the existing water quality of all navigable waters during the reporting period;

2. An analysis of the extent to which all navigable waters of the State provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water;

3. An analysis of the extent to which the elimination of the discharge of pollutants and a level of water quality which provides for the protection and propagation of a balanced population of shellfish, fish, and wildlife and allows recreational activities in and on the water, have been or will be achieved by the requirements of the Clean Water Act, together with recommendations as to additional action necessary to achieve such objectives and for what waters such additional action is necessary;

4. An estimate of (i) the environmental impact, (ii) the economic and social costs necessary to achieve the objective of the Clean Water Act, (iii) the economic and social benefits of such achievement, and (iv) an estimate of the date of such achievement; and

5. A description of the nature and extent of nonpoint sources of pollutants, and recommendations as to the programs which must be undertaken to control each category of such sources, including an estimate of the costs of implementing such programs.

The U.S. EPA uses the 305(b) biennial water quality report as a reference for the review of federal program areas such as the continuing planning process, the water quality monitoring strategy submissions, and various grant applications filed under Sections 106, 201, 208 and 314 of the Clean Water Act.

The State of Ohio has outlined three basic functions of the 305(b) biennial water quality report:

1. An outlet for feedback concerning federal water quality programs,
2. A resource document containing information needed in management decisions including an assessment of the State's water pollution control programs, and
3. A reporting mechanism to the general public.

The feedback concerning federal programs is channeled into several categories including an analysis of the effectiveness of the Clean Water Act and an appraisal of U.S. EPA's administration of the Act. Specific changes in national water quality programs will be recommended wherever possible.

Future 305(b) reports submitted by Ohio will build upon the comprehensive reporting format initiated in 1980. The usefullness of the report in making management decisions on water quality issues will be strengthened through integrating 305(b) report planning with the 5-year Monitoring Strategy. Some water quality issues identified in the 5-year Monitoring Strategy will have specific 305(b) reporting plans outlined 2 or even 4 years in advanced. This will allow long range planning and allocation of resources for the completion of 305(b) reports. It will save time in compiling the report because the last minute "scramble" to assemble data and analyze it in a maner appropreiate for the 305(b) report will be avoided. Instead, specific data networks, designed for specific purposes and described in the Monitoring Program, ensure that data analysis will proceded quickly and with minimum effort. It may then be possible to devote more time to improving the presentation of results (graphs, maps, figures, summary statements) so that environmental managers and the general public are better informed about water quality in Ohio.

A basic outline for the 305(b) report is given below.

Core Report

Volumn 1. Executive Summary
- a. summary of conclusions from other volumns
- b. feedback concerning federal programs
- c. summary of results targeted for management decisions
- d. abstracts of other volumns (expanded table of contents)

Volumn 2. Monitoring Program Document
- a. description of monitoring activities
- b. evaluation of monitoring activities

Volumn 3. Ohio Lakes and Reservoirs
- a. basic reporting of data
- b. results targeted for management decisions

Volumn 4. Subbasin Reports
- a. major basin summaries
- b. subbasin summaries and detailed results
  1. attainment of CWA goals, assessments made only where chemical/physical plus fish and/or benthos data is available
  2. W.Q. degradation areas, assessments made where only chemical/physical data is available, or fish and/or benthos data is limited
  3. results targeted for management decisions if the issue is confined to a specific subbasin

Reference Document 1
Annual summary statistics for ambient W.Q. network

Reference Document 2
WQS Violations tables for ambient W.Q. network

Supplemental Reports and Reference Documents

Volumns 5 thru ?
These volumns will be added as needed to report the results which are targeted for specific management purposes when it is not appropriate to integrate the results into the Core Report. An example from the 1980 report was "Water Quality Analysis of Ohio Surface Waters in Abandoned Coal Mine Watersheds".

GLOSSARY

Data needs are general or specific types of data requested in the Monitoring Strategy or Program. These data supply the information required to make decisions regarding water quality management in Ohio.

Data network is a set of locations at which one or more types of data are collected for a single purpose or use (i.e., to fulfill specific information needs). Because data from any particular site may be used for more than one purpose, a single data collection site may play a role in more than one data network.

Fixed station monitoring means the repeated, long-term sampling or measurement of parameters at representive sites for the purpose of determining water quality trends and characteristics. A fixed station monitoring site may play a role in one or more data networks.

Information needs are general or specific types of information needed to manage the various programs administered by the agency. Also included are requests for information made by U.S. EPA.

Intensive survey means the frequent sampling or measurement of parameters at representive sites for a relatively short period of time (e.g., several days to several months). These surveys are designed to accurately assess water quality conditions and to determine cause/effect relationships primarily with regard to point source pollution impacts.

Monitoring Program refers to the document (Ohio Water Quality and Pollutant Source Monitoring Program) describing water quality monitoring in Ohio pursuant to Section 106(e)(1) of the Clean Water Act. This document is submitted to U.S. EPA, Region V, in August of each year and describes in detail the monitoring activities planned for the following federal fiscal year.

Monitoring Strategy (Ohio 5-year Monitoring Strategy) refers to the document describing the design and management of monitoring activities in Ohio. It is a 5-year planning tool which presents an organized system for the collection of information needed to manage the water quality of Ohio's surface waters. The document is revised in January of each year, is submitted to U.S. EPA Region V for review and comment, and then becomes the basis upon which the Monitoring Program for the next federal fiscal year is revised.

Monitoring activities refer to specific data collecting networks, systems, or surveys (i.e., NAWQMN, effluent bioassay screening, intensive survey) or monitoring-related activities (i.e., WQS review, 305b report) identified in the Monitoring Program or Strategy. They may fulfill one or more purposes.

Monitoring goals are projections of the amount and kinds of monitoring to be accomplished over a 5-year time period. The goals are designed to meet information needs based upon a system of high, medium, or low priority. Resources will be expended to meet all high priority goals before medium, and then low, priority goals are addressed.

Synoptic survey means the sampling or measurement of parameters at representive sites for a moderate period of time (e.g., several months to several years). The surveys are a middle ground between intensive surveys and fixed station monitoring. They are designed to answer specific questions about water quality conditions that cannot be assessed within a short time period, and yet are not adequately addressed through fixed station monitoring either. Examples of the uses of such surveys are assessing the impact of land-use on specific water quality characteristics, assessing background water quality, and determining sediment losses and the need for non-point pollution contol measures.

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