

## Indiana "National Pollutant Discharge Elimination System" Tracking System

JAMES Y. HUNG, RICHARD D. MOSS  
and T. P. CHANG

Water Pollution Control Division  
Indiana State Board of Health, Indianapolis, Indiana 46206

### *Abstract*

The massive and complex water pollution control programs currently underway have created an acute need for the use of computerized data management systems. This paper summarizes the development of a computerized tracking system which is designed to assist Indiana in managing its National Pollutant Discharge Elimination System (NPDES). In addition to a short history of the development, the structures of inputs, system design and outputs of the NPDES tracking system will be presented. The paper is concluded by a discussion of the types of problems Indiana has encountered during the processes of system design and program implementation.

### **Introduction**

At the beginning of 1975, the U.S. Environmental Protection Agency (USEPA) granted permanent authority to the Indiana Stream Pollution Control Board (ISPCB) to administer the NPDES permit program for Indiana in accordance with 1972 amendments to the Federal Water Pollution Control Act. The ISPCB now has the responsibility of issuing discharger permits, monitoring effluent conditions and enacting enforcement programs.

The first step of the NPDES program involves a waste load allocation for each permittee to determine effluent limitations and a schedule of compliance (Figure 1). After receiving certification, each permittee submits a monthly report stating the self-monitoring results of effluent testing and progress with the compliance schedule. At the same time, ISPCB, in cooperation with the USEPA, will conduct compliance monitoring in order to check and verify the permittee's self-monitoring records. This monitoring also provides stream and effluent data to evaluate the effectiveness of the pollution abatement program. Once a violation is identified, either by self-monitoring or by compliance monitoring, enforcement action will be taken in order to correct the non-compliance conditions. At the end of a permit cycle, usually five years, ISPCB will re-evaluate the status of stream water quality, the progress of wastewater treatment technology, and will then re-evaluate permit conditions.

This paper describes Indiana's current efforts to establish a computerized NPDES tracking system that will handle its data base manipulation, violation identification as well as enforcement programs. A major portion of this system has been operational while others are still in the design stage. The Computer used for implementing this system is an IBM 370/165, model 2, which is accessed through an IBM 2780 terminal.

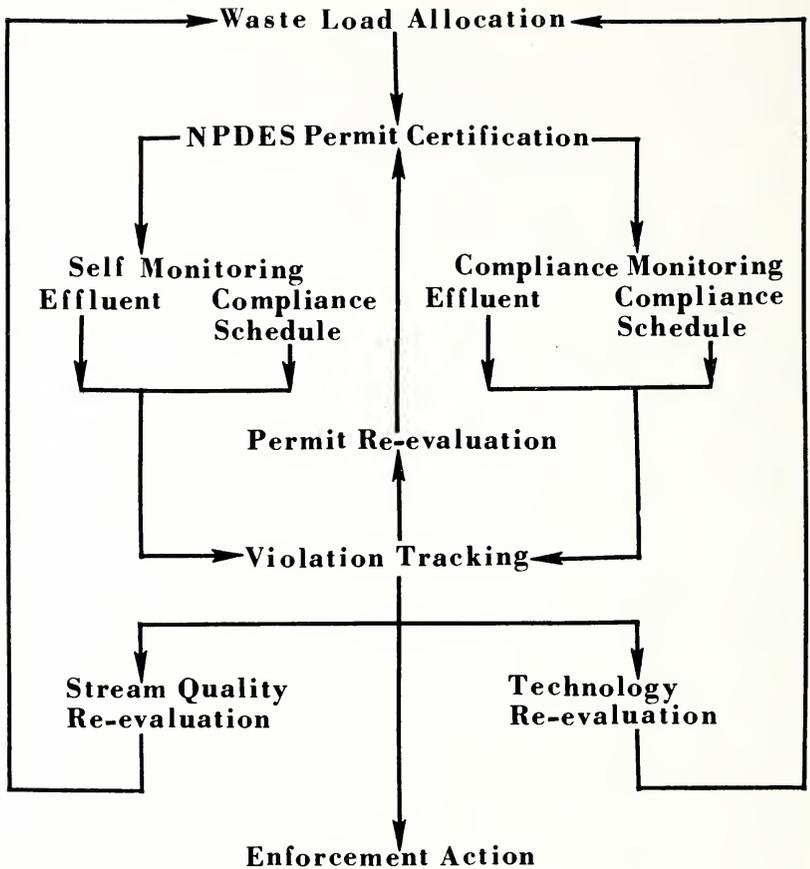


FIGURE 1. NPDES Permit Flow Diagram

#### A Short History

Between 1973 and 1974, the USEPA headquarters attempted to build an automated data tracking system named General Point Source File (GPSF) with remote data entry and retrieval through low speed terminals in USEPA regional offices and state environmental agencies. The plan consisted of a series of subsystems which handle NPDES permit application, post-issuance compliance as well as enforcement logs. By the end of 1974, the design of GPSF was discontinued because of both technical and economical difficulties. Instead, a much reduced-scale system named Permit Compliance System (PCS) was designed(3). The PCS provides forecasting capabilities for compliance schedules but does not handle effluent data. Furthermore, the PCS is intended for USEPA internal use only.

The design of Indiana computerized NPDES tracking system was commenced in the spring of 1974 as one component of the Indiana Water Pollution Control Information System(1). Its objectives are:

1. To provide a means to store and to retrieve compliance schedule data, effluent parametric data as well as compliance monitoring data.
2. To analyze the input data and to identify violations for self-monitoring report, both in effluent limitations and in compliance schedule.
3. To generate notice of violation monthly for dischargers and to prepare violation summary reports for USEPA quarterly.
4. To provide forecasting capabilities for compliance scheduling activities and dates for permit expirations.
5. To keep track of the enforcement action activities.

At the end of October, 1975, the major portion of the system had been completed and the first four objectives mainly achieved. The enforcement phase, item No. 5, will be operational by the spring of 1976. Due to the computer hardware limitations in ISPCB, the current system is operated in batch mode. Future plans will include the on line capability when ISPCB computer system is updated.

Another system named GPLAN(2) has been designed by Purdue University which emphasizes query and retrieval services related to water quality planning activities. The GPLAN also incorporates a portion of the effluent violation analysis similar to the ISPCB system.

#### System Input

Presently ISPCB handles nineteen hundred permits which include dischargers from industrial, municipal and other types of wastewater treatment plants. Data input for those dischargers has been the most expensive task in the total NPDES tracking processes. Current input data include three major files, i.e., permit conditions, monthly self-monitoring data and compliance monitoring data. Each file contains effluent parametric figures and dates for compliance scheduling. In addition, an independent permittee identification file has been generated. The above-mentioned four files can be interfaced through their common code, i.e., the NPDES permit number. Future plans for system input will add data for enforcement history.

The permit identification file contains information relative to the type of the discharger, its office address, permit number, facility location, county and segment codes, name of receiving stream, permit expiration dates and permit status, such as permit in modification or permit in adjudicatory hearing. Some of this information is stored in header records which are included with each permittee's condition file. The permit condition file comprises the effluent and scheduling requirements specified in the permit. The effluent limitations consist of interim and final discharge rate, pollutant concentration, sample type, sample frequency, etc. The scheduling data consists of dates for completing various phases of planning, design and construction tasks. The above described information is compiled and stored in cards as soon as the permit is issued and requires constant updating because new permit issuance and modifications take place almost every month.

The self-monitoring reports of effluent measurements are submitted to the ISPCB monthly, allowing twenty eight days for laboratory analyses. The ISPCB requires the recording of individual sampling values as well as a monthly summary. Notification of a compliance schedule action is to be submitted within fourteen days after the due date. The summary is to indicate the maximum, average and minimum values of each effluent parameter, as well as the sample type and sample frequency. Because of the current limitation on keypunch resources, present practice is to store and to use summary data only. Future plan will use the individual sample values rather than monthly summary values.

Presently, the compliance monitoring survey is mainly confined to the two hundred seventeen major dischargers in Indiana. Each survey will include the measurement of the effluent discharge rate and quality specified in the permit, and sometimes the samplings of stream water both upstream and downstream of the outfall. Each survey also reports the progress of the construction schedules.

Future plans will include the storage of the information relative to enforcement activities, such as ISPCB orders, court orders and so on.

### **System Design and Structure**

The present tracking system is designed for batch-mode operation. The input data is verified through pre-editing and updating routines and when ready, stored on disk and/or tape. Selection of appropriate data sets is done by computer control language as various programs are executed. The various files are manipulated by sorting and merging routines to create a data set structured for efficient analysis. Once this file has been created it is pre-examined by computer routines that further simplify it. This produces an idealized data stream for the complex violation analysis. Once the analysis has been made the violation results may be output to the various types of computer output media available.

### **Pre-Editing Subsystem**

The data pre-editing subsystem has proven to be essential to the successful operation of the tracking system. Because of the public and legal significance of the citing of permit violations it is essential that the data used be as free from human error as possible. Identification numbers and various other codes must be checked for validity. Invalid items must be found and removed by updating procedures. A simplified flow chart of this system may be found in Figure 2. Various checks are made to eliminate errors from such things as duplicate reporting, amended reports, or improper identification codes. Once this is done the data is ready for violation analysis.

### **Self-Monitoring Violation Analysis**

The analysis of self-monitoring reported data is an intricate process beginning with the determination of whether or not a report has been received. Even if no data are found in the file, special circumstances, such as permit under adjudication or modification, must be checked before a violation can be cited. If a report is received then

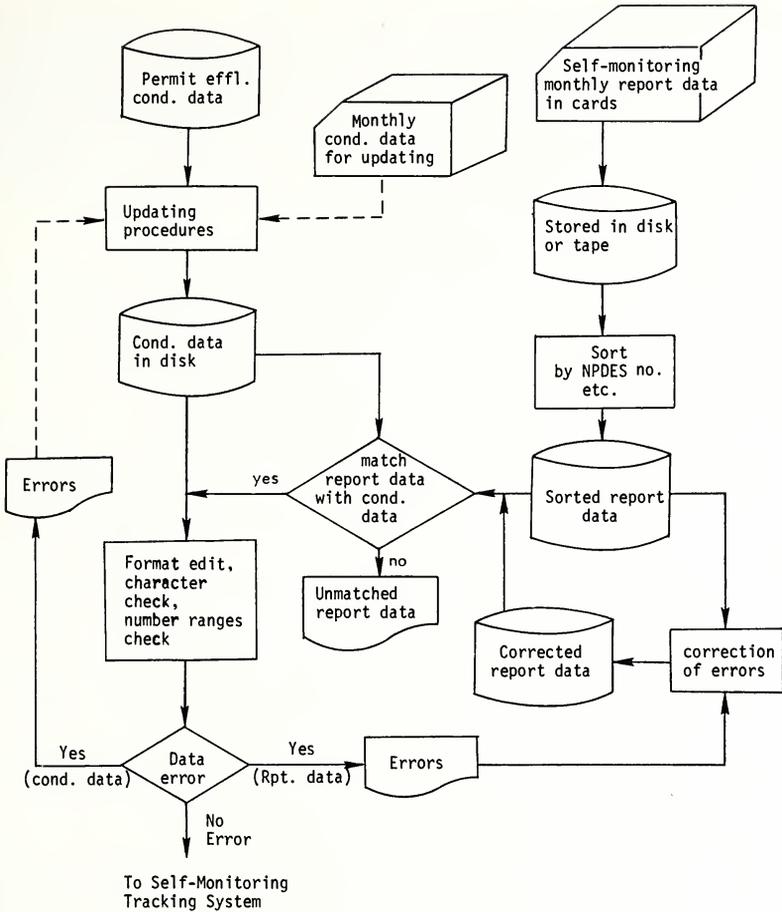


FIGURE 2. Data Pre-editing Program Flow Chart

each parameter enumerated in the permit must be examined. If zero effluent is indicated for a given outfall, the testing will proceed to the next outfall number in the data stream.

If an effluent discharge is indicated a check is first made to determine whether a given parameter is missing. Excuses such as permit modification or adjudication for that parameter, or measurement equipment problems, are also considered. The last step is to check violations due to effluent limitation exceedences, failure to comply with sampling frequencies or sampling methods. Figure 3 is a simplified flow chart of violation analysis.

### Compliance Schedule Tracking Subsystem

The requirements of the compliance schedules are that a specific action be taken and notification be mailed to the Indiana Stream Pol-

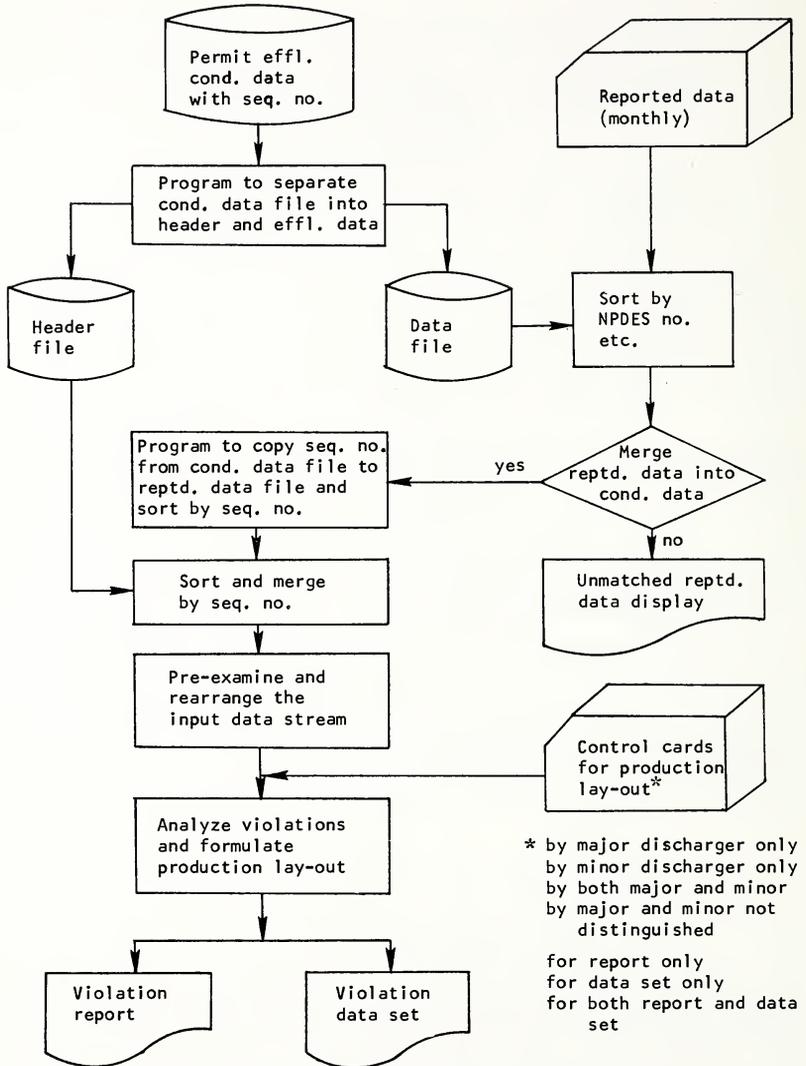


FIGURE 3. Self-Monitoring Violation Program Flow Chart

lution Control Board by a certain date. Four types of violations are possible. They are no action reported, action reported but not completed by schedule date, no notification received, notification received but late.

An inventory program assists in monitoring the progress of the permittees' actions. A register is generated listing schedules, reports received, and permit status. Also included with this inventory is a forecast of due dates. This aids in the determination of actions currently due or due in the near future.

### NOV Generation Subsystem

Violation data from the self-monitoring report analysis and the compliance schedule tracking subsystem are merged and matched with appropriate address information from the identification files. These re-organized data are then entered into the Notice of Violation (NOV) generation subsystem which transforms all violation information, such as time, location, violation items into a formal letter form.

### System Output

There are two basic types of output produced. One type is the "in-house" reports which are generated for violations and associated information and distributed to concerned departments. A second type is the "outgoing" reports or notices.

Currently there are five major "in-house" reports. One report represents a current inventory of dischargers requiring construction (compliance schedule), indicates dates which reports or actions are due, and forecasts items which are currently due or soon to be due. Another report presents monthly violations of these construction schedules. This includes items such as lateness, or failure to meet requirements and statistical summaries. Monthly reports are generated for effluent self-monitoring violations which indicate permit limits that were exceeded, improper sampling, or items missing in the data received.

This report includes many factors besides just data comparison. It indicates adjudication of items, permit modifications, major-minor status, current status of the discharge, and other special information. It is desirable to know well in advance which permits are approaching expiration in order to prepare for reevaluation and applications for new permits. A forecasting report is produced that can generate in advance a list of the dischargers that have permits expiring on or before a given month (generally 9 months in advance). A fifth type of "in-house" report is the report of data gathered by the monitoring surveys. This report shows the results of a survey, as they compare to permit requirements, and self-monitoring report data. A sixth type is in the planning stage. It will present an annual report from the self-monitoring data base.

There are two current "outgoing" outputs. The first of these are the violation letters generated by the computer and sent to violating dischargers as official notice that permit requirements are not being met. The volume on this may be as high as one thousand letters per month. A second outgoing output is generated quarterly and informs the Environmental Protection Agency of notices sent, and enforcement actions taken.

### Operational Problems

Within the experience of the Indiana Stream Pollution Control Board, the most difficult and time consuming step in its NPDES tracking program is the establishment and maintenance of a reliable data base. This includes the permit condition file, self-monitoring file and compliance monitoring file. When at its full load, the Indiana Stream

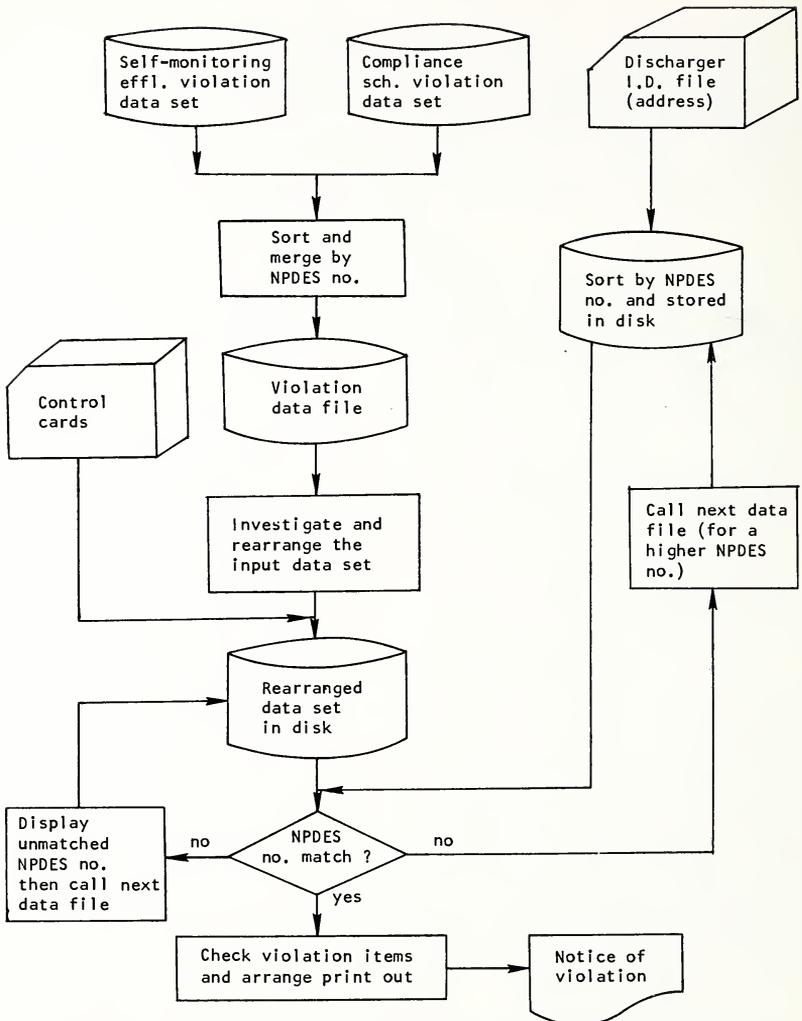


FIGURE 4. *The Notice of Violation Flow Chart*

Pollution Control Board will receive each month nearly a quarter million pieces of facility, time schedule, effluent sampling and stream sampling data. For each piece of data, coding, keypunching, verifying and editing procedures are necessary in order to assure proper entry into the data base.

Due to the dynamic nature of the current stage of the NPDES program, the required constant updating of the tracking system presents another operational difficulty. New rules and new elements of data are added monthly, which causes instabilities in the input format and in the program structure itself.

In order to maintain an effective and timely enforcement program, the meeting of the closely scheduled deadlines for each processing step is very critical. Current scheduling allows only two weeks of processing time each month between the deadline for monthly report submission and the printing of the Notice of Violation. To maintain a smooth and reliable production line such as this requires scheduling, planning and dedication especially when one has to compete with other ISPCB projects for the use of computer time and keypunch services.

Although a vast majority of the violation decisions are made by the predetermined rules which have been programmed in the system, it should be noted that administrative judgment still plays a certain role in the decision step. Deviations such as misinterpretations, mailing delays and other excuses due to circumstantial evidences have happened every month which are found difficult to be incorporated in the computer program and therefore complicate the operational problems.

### Discussions and Conclusions

The task of computerization of the NPDES tracking program for Indiana's nineteen hundred permits has been a challenging endeavor. The complex nature of the task is not only the result of the need to administer vast volumes of scheduling and effluent data, but results from the dynamic and complicated character of the process itself. Due to limited manpower availability in the ISPCB, and the pressing turn-around time required monthly in identifying violations and in sending notices to the violators, the computerized tracking system has become, in the past year, the key to successful enactment of the ISPCB's NPDES program.

In addition to the enforcement activity logging system, which is expected to be completed by next spring, the possible extension of the NPDES tracking system may include the incorporation of stream simulation models, for both conservative and non-conservative parameters. This extension will allow the system to handle such a permit that its effluent limitations are dependent on the stream flow, stream quality condition and seasonal factors. Secondly, this extension will facilitate the execution of future permit renewal program. The other possible extension is to tie the NPDES tracking system with GPLAN (2), which is capable of simulating stream quality parameters.

We have stated previously that the most expensive step is the establishment and maintenance of the data base. At this point, one should realize that the computerized effluent and stream sampling data base is not designed and used for short enforcement purposes only, it is also designed for the long-term goal, that is, to provide historical information in order to answer the future planning questions such as the impact of the permit program on water pollution control.

### Acknowledgements

The authors wish to express their appreciation to Mr. Samuel L. Moore for his support and encouragement in the preparation of this paper. Mr. Jerry George, Mr. Patrick O'Connell, Mr. Joseph Snyder and

Mr. Alberto Lao have made significant contributions to the work described in this paper.

#### Literature Cited

1. CHANG, T. P. 1975. Computer Applications in Water Pollution Control. Proc. 1975 International Computer Symposium. Taipei, Taiwan. Vol. II, 24-32.
2. HASEMAN, W. D., C. HOLSAPPLE, AND A. B. WHINSTON. 1971. Water Quality Management Information System. Proc. 1975 Midwest Amer. Inst. Decision Sciences Conf. Indianapolis, Indiana, 196-199.
3. ROCKWELL, D. C., AND R. M. KUNTZ. 1975. Data Systems for NPDES Enforcement. Proc. 1975 Midwest Amer. Inst. Decision Sciences Conf. Indianapolis, Indiana, 205-207